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VOL. IV

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UNDER THE DIRECTION OF

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PRESIDENT OF THE UNIVERSITY OF WISCONSIN

EDITOR-IN-CHIEF

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Note.—The publishers beg to direct attention to the following changes in the constitution of the editorial staff: Prof. J. Mark Baldwin, Ph. D., Stuart Professor of Experimental Psychology in the College of New Jersey, has been associated with Dr. Harris in the department of Philosophy, Psychology, Ethics, etc.; and Prof. Francis M. Burdick, Dwight Professor of Law in Columbia College, New York, has taken the place of President Henry Wade Rogers, whose other duties compelled him to relinquish his connection with the cyclopædia. By the death of Dr. Philip Schaff, as already noted, full charge of the department of General Church History and Biblical Literature now devolves on Dr. Samuel Macauley Jackson.

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PECULIAR PHONETIC SYMBOLS

USED IN THE WRITING OR TRANSLITERATION OF THE DIFFERENT LANGUAGES.

ā, ē, etc.: long vowels; in the Scandinavian languages the accent (*á*, *é*, etc.) is used to denote length.

ą: a nasalized *a*; so used in the transliteration of the Iranian languages.

å: labialized guttural *a* in Swedish.

æ: open *a* of Eng. *hat*, used chiefly in O. Eng.

aí: used in Gothic to denote *e* (open), in distinction from *ái*, the true diphthong.

aú: used in Gothic to denote *o* (open), in distinction from *áu*, the true diphthong.

bh: in Sanskrit a voiced labial aspirate (cf. *ch*).

ƀ: voiced bilabial (or labio-dental?) spirant, used in discussions of Teutonic dialects.

ç: voiceless palatal sibilant, similar to Eng. *sh*, used especially in transliteration of Sanskrit.

č: frequently used, e. g. in Slavonic languages, to denote the sound of Eng. *ch* in *cheek*.

c: voiceless palatal explosive, commonly used in transliteration of Sanskrit and the Iranian languages.

ch: as used in the transliteration of Sanskrit, a voiceless palatal aspirate, an aspirate being an explosive with excess of breath; as used in German grammar, the symbol for a voiceless palatal or guttural spirant.

dh: voiced dental aspirate (cf. *ch*) in Sanskrit.

ḍ: voiced cerebral explosive, so used in transliteration of Sanskrit.

ḍh: voiced cerebral aspirate (cf. *ch*) in Sanskrit.

đ: voiced dental (interdental) spirant, equivalent to Eng. *th* in *then*; so used in the Teutonic and Iranian languages and in phonetic writing.

ë: a short open *e*, used in Teutonic grammar, particularly in writing O. H. G.

e: the short indefinite or "obscure" vowel of Eng. *gardener*; used in the reconstruction of Indo-Eur. forms, and in transliterating the Iranian languages.

gh: in Sanskrit a voiced guttural aspirate (cf. *ch*).

ǥ: voiced velar (back-guttural) explosive, used most frequently in Indo-Eur. reconstructions.

ɣ: voiced guttural (or palatal) spirant, equivalent to Mod. Greek γ, and used in transliteration of Iranian languages and O. Eng.

ḥ: a voiceless breathing, the Sanskrit *visarga*.

hᵛ: a labialized *h*, similar to *wh* in Eng. *what*; used in transliteration of Gothic and the Iranian languages.

ḥ: voiceless guttural (or palatal) spirant, equivalent to German *ch*, and used in transliteration of the Iranian languages.

i̯: the semi-vowel *y*, or consonant form of *i*; used in phonetic writing and reconstructions of Indo-Eur. forms.

j: in the transliteration of Sanskrit and the Iranian languages a voiced palatal explosive; in the Teutonic languages a semi-vowel (= *y*), for which in Indo-Eur. reconstructions *i* is generally used.

jh: in Sanskrit a voiced palatal aspirate (cf. *ch*).

kh: in Sanskrit a voiceless guttural aspirate (cf. *ch*).

ł: the guttural ("thick" or "deep") of the Slavonic and some of the Scandinavian languages.

l̥: vowel *l*; used in transliterating Sanskrit, in reconstructing Indo-Eur. forms, and in other phonetic writing.

m̥: nasal vowel; used in reconstruction of Indo-Eur. forms and in phonetic writing.

ṇ: in Sanskrit the cerebral nasal.

ñ: in Sanskrit the guttural nasal (see following).

n: the guttural nasal, equivalent to Eng. *n* in *longer*; used in transliteration of Iranian languages.

ñ: palatal nasal, similar to *gn* in Fr. *regner*; used in transliterating Sanskrit and in phonetic writing.

ȫ: palatalized *o*; used in German and in phonetic writing.

o̯: short open *o* in Scandinavian.

ȯ: short palatalized *o* (ö) in Scandinavian.

ph: in Sanskrit, voiceless labial aspirate (cf. *ch*).

q̡: voiceless velar (back-guttural) explosive; used in reconstructions of Indo-Eur. forms and in other phonetic writing.

r̥: vowel *r*; used in transliterating Sanskrit, in reconstructions of Indo-Eur. forms, and in other phonetic writing.

ṣ: voiceless cerebral sibilant, equivalent to Eng. *sh*; used in transliterating the Iranian languages and in phonetic writing.

ṣ: voiceless cerebral spirant; used in transliterating Sanskrit.

th: in Sanskrit a voiceless dental aspirate (cf. *ch*).

ṭh: in Sanskrit a voiceless cerebral aspirate (cf. *ch*).

ṭ: in Sanskrit a voiceless cerebral explosive.

ţ: a form of dental spirant used in transliterating the Iranian languages (represented in Justi's transliteration by t̨).

þ: voiceless dental (interdental) spirant, equivalent to Eng. *th* in *thin*; used in Teutonic dialects and in phonetic writing.

u̯: consonant form of *u*; used in phonetic writing.

ż: voiced cerebral sibilant, equivalent to *s* in Eng. *pleasure*, and to *j* in Fr. *jardin*; used in Iranian, Slavonic, and in phonetic writing.

ʒ: a symbol frequently used in the writing of O. H. G. to indicate a voiced dental sibilant (Eng. *z*), in distinction from *z* as sign of the affricata (*ts*).

EXPLANATION OF THE SIGNS AND ABBREVIATIONS USED IN THE ETYMOLOGIES.

>, yielding by descent, i. e. under the operation of phonetic law.
<, descended from.
=, borrowed without change from.
:, cognate with.
+, a sign joining the constituent elements of a compound.
*, a sign appended to a word the existence of which is *inferred*.

ablat.	ablative
accus.	accusative
adjec.	adjective
adv.	adverb
cf.	compare
conjunc.	conjunction
deriv. of	derivative of
dimin.	diminutive
fem.	feminine
genit.	genitive
imper.	imperative
impf.	imperfect
indic.	indicative
infin.	infinitive
masc.	masculine
nomin.	nominative
partic.	participle
perf.	perfect
plur.	plural
prep.	preposition
pres.	present
pron.	pronoun
sc.	scilicet, supply
sing.	singular
subst.	substantive
vocat.	vocative

Anglo-Fr.	Anglo-French
Arab.	Arabic
Avest.	Avestan
Dan.	Danish
Eng.	English
Fr.	French
Germ.	German
Goth.	Gothic
Gr.	Greek
Heb.	Hebrew
Icel.	Icelandic
Ital.	Italian
Lat.	Latin
Lith.	Lithuanian
Mediæv. Lat.	Mediæval Latin
Mod. Lat.	Modern Latin
M. Eng.	Middle English
M. H. Germ.	Middle High German
O. Bulg.	Old Bulgarian (= Church Slavonic)
O. Eng.	Old English (= Anglo-Saxon)
O. Fr.	Old French
O. Fris.	Old Frisian
O. H. Germ.	Old High German
O. N.	Old Norse
O. Sax.	Old Saxon
Pers.	Persian
Portug.	Portuguese
Prov.	Provençal
Sanskr.	Sanskrit
Sc.	Scotch
Span.	Spanish
Swed.	Swedish
Teuton.	Teutonic

KEY TO THE PRONUNCIATION.

aa..... as *a* in *father*, and in the second syllable of *armada*.

ăa..... same, but less prolonged, as in the initial syllable of *armada*, *Arditi*, etc.

a..... as final *a* in *armada*, *peninsula*, etc.

ă..... as *a* in *fat*, and *i* in French *fin*.

ay or ā.. as *ay* in *nay*, or as *a* in *fate*.

aў or ā.. same, but less prolonged.

ă..... as *a* in *welfare*.

aw..... as *a* in *fall*, *all*.

ee..... as in *meet*, or as *i* in *machine*.

ĕe..... same, but less prolonged, as final *i* in *Arditi*.

e..... as in *men*, *pet*.

e..... obscure *e*, as in *Bigelow*, and final *e* in *Heine*.

é..... as in *her*, and *eu* in French *-eur*.

i..... as in *it*, *sin*.

ī..... as in *five*, *swine*.

ĭ..... same, but less prolonged.

ō..... as in *mole*, *sober*.

ŏ..... same, but less prolonged, as in *sobriety*.

o..... as in *on*, *not*, *pot*.

oo..... as in *fool*, or as *u* in *rule*.

o͝o..... as in *book*, or as *u* in *put*, *pull*.

oi..... as in *noise*, and *oy* in *boy*, or as *eu* in German *Beust*.

ow..... as in *now*, and as *au* in German *haus*.

ö..... as in *Göthe*, and as *eu* in French *neuf*, *Chintreuil*.

ŭ..... as in *but*, *hub*.

ŭ..... obscure *o*, as final *o* in *Compton*.

ü..... as in German *süd*, and as *u* in French *Buzançais*, *vu*.

y or *l*.... see *l* or y.

yu..... as *u* in *mule*.

yŭ..... same, but less prolonged, as in *singular*.

ch..... as in German *ich*.

g..... as in *get*, *give* (never as in gist, congest).

hw..... as *wh* in *which*.

kh..... as *ch* in German *nacht*, *g* in German *tag*, *ch* in Scotch *loch*, and *j* in Spanish *Badajos*, etc.

ṅ..... nasal *n*, as in French *fin*, *Bourbon*, and nasal *m*, as in French *nom*, Portuguese *Sam*.

ñ or n-y.. Spanish *ñ*, as in *cañon*, *piñon*, French and Italian *gn*, etc., as in *Boulogne*.

l or y.... French *l*, liquid or mouillé, as (-i)ll- in French *Baudrillart*, and (-i)*l* in *Chintreuil*.

th..... as in *thin*.

th..... as in *though*, *them*, *mother*.

v..... as *w* in German *zwei*, and *b* in Spanish *Cordoba*.

sh..... as in *shine*.

zh..... as *s* in pleasure, and *j* in French *jour*.

All other letters are used with their ordinary English values.

NOTE.

The values of most of the signs used in the above Key are plainly shown by the examples given. But those of ö, ü, *ch*, *kh*, ñ, and *v*, which have no equivalents in English, can not be sufficiently indicated without a brief explanation, which is here given.

ö. The sound represented by this symbol is approximately that of -u- in *hurt* or -e- in *her*, but is materially different from either. It is properly pronounced with the tongue in the position it has when ä is uttered and with the lips in the position assumed in uttering ō.

ü. This vowel is produced with the lips rounded as in uttering oo and with the tongue in the position required in uttering ee, into which sound it is most naturally corrupted.

ch and *kh*. These are both rough breathings or spirants made with considerable force, *ch* being made between the flat of the tongue and the hard palate, and *kh* between the tongue and the soft palate. *ch* approaches in sound to English sh, but is less sibilant and is made further back in the mouth; *kh* is a guttural and has a hawking sound.

l or y. These are both used to represent the sound of French l mouillé, in (-i)ll- and (-i)l, which resembles English -y- in *lawyer*. Final *l*, that is, (-i)l, may be approximated by starting to pronounce lawyer and stopping abruptly with the -y-.

ñ or n-y. The consonants represented by ñ (Spanish ñ, French and Italian gn, etc.) are practically equivalent to English -ni- or -ny- in bunion, bunyon, onion, etc., and, except when final, are represented by n-y. Final ñ, as French -gn(e), may be produced by omitting the sound of -on in the pronunciation of *onion*.

v. This may be pronounced by attempting to utter English v with the use of the lips alone.

See PREFACE (vol. i., p. xxiv.) and the article PRONUNCIATION OF FOREIGN NAMES.

GREECE
Scale of Miles
Longitude H 20 East from I Greenwich
Longitude H 97 East from I Washington
THESSALY
EPIRUS
ACARNANIA
AETOLIA
PHOCIS
BOEOTIA
ATTICA
ACHAIA
ELIS
ARCADIA
ARGOLIS
MESSENIA
LACONIA
CRETE OR CANDIA
NORTHERN SPORADES
IONIAN SEA
AEGEAN SEA
MEDITERRANEAN SEA
Olympus
Pindus
Parnassus
Helicon
Parnes
Cithaeron
Taygetus
Lemnos
Lesbos I.
Samos I.
Andros I.
Paros I.
Naxos I.
Patmos
Rhodes I.
Rhodes
Scarpanto I.
Caxo I.
Thera I.
Amorgos
Astropalia or Stampalia
Kos I.
Gulf of Kos
Gulf of Smyrna
Gulf of Scala Nova
Gulf of Volo
Gulf of Lepanto or Corinth
Gulf of Arcadia
Gulf of Laconia
Gulf of Sude
Gulf of Candia
Gulf of Messara
Gulf of Spezzia
Gulf of Nauplia
Gulf of Arta
Gulf of Patras
Gulf of Salona
Gulf of Zante
Gulf of Cerigo
Gulf of Kissamo
Gulf of Mirabella
Gulf of Almyro
Gulf of Volo
Gulf of Kolokythia
Gulf of Koron
Gulf of Kalamata
Gulf of Marathon
Gulf of Athens
Gulf of Eleusis
Gulf of Salamis
Gulf of Aegina
Gulf of Nauplia
Gulf of Argos
Gulf of Corinth
Gulf of Patras
Gulf of Arta
Gulf of Volo
Gulf of Almyro
Gulf of Zeitun
Gulf of Salona
Gulf of Lepanto
Gulf of Patras
Gulf of Corinth
Gulf of Nauplia
Gulf of Arcadia
Gulf of Laconia
Gulf of Messara
Gulf of Candia
Gulf of Sude
Gulf of Kissamo
Gulf of Cerigo
Gulf of Zante
Gulf of Arta
Gulf of Volo
Gulf of Almyro
Gulf of Zeitun
Gulf of Salona
Gulf of Lepanto
Gulf of Patras
Gulf of Corinth
Gulf of Nauplia
Gulf of Arcadia
Gulf of Laconia
Gulf of Messara
Gulf of Candia
Gulf of Sude
Gulf of Kissamo
Gulf of Cerigo
Gulf of Zante

JOHNSON'S
UNIVERSAL CYCLOPÆDIA.

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reece [from Lat. *Græ'cia*, Greece, deriv. of *Græ cus*, Greek, a Greek. The Greek words are Ἑλλάς, Greece, and Ἕλλην, a Greek]: the southern part of the most eastern of the three peninsulas of Europe which project into the Mediterranean Sea. The ancient Greeks called their country *Hellas*, and styled themselves *Hellenes*; and these names prevail among the modern Greeks. The Romans originated the designations Greece and Greeks, giving the name *Græcia* to the country and *Græci* to its inhabitants, from the name of a small tribe (*Graikoi*) in Epirus, with whom they first came in contact as they approached Hellas. Aristotle (*Meteor.*, i., 14) is the first Greek author who applies the term Græci to designate the Hellenes. The term Hellas originally designated only a small district in Thessaly, and was subsequently used to denote the entire country settled by the Hellenes.

Ancient Greece proper extended from 40° N. lat. to 36° 23′. It was bounded on the N. by the Cambunian Mountains, which separated it from Macedonia. The Ægean Sea was upon the E., the Cretan upon the S., and on the W. were the Ionian and the Adriatic. Its greatest length was about 250 miles, its greatest breadth 180 miles. Its area, exclusive of Epirus (4,690 sq. miles), but including Eubœa (1,410 sq. miles), was 21,121 sq. miles. (Clinton, *F. H.* ii., 385.) Heeren, however, makes its superficial extent (including all the islands) 29,600 sq. miles. Modern Greece is more limited in extent. Contrary to the wishes of the Greek people, the great powers of Europe allowed not only Epirus and Macedonia (which did not belong to ancient Hellas), but Thessaly and a part of Acarnania, or more than one-third of the whole country, to remain under Turkish control. In 1834 the north boundary was fixed on a line 137 miles long following mainly the summit of the range of Mt. Othrys from 39° 11′ N. and 22° 42′ E., on the Gulf of Volo (Pagasæ) to Menidhi at 39° 3′ N. and 21° 5′ E., on the Gulf of Arta (Ambracia) in the west. The Ionian islands were also placed under the protection of Great Britain, and were not annexed to Greece until 1864. By the Congress of Berlin a large territory, forming parts of Albania, Thessaly, and Epirus, was detached from Turkey and added to Greece; but the stipulations of the congress were only partially executed by the treaty of June 14, 1881. The area of modern Greece is 25,041 sq. miles.

Greece is triangular in shape, and is almost surrounded by water. It is divided near the middle by the Corinthian and the Saronic gulfs, which are separated by the Isthmus of Corinth, only 3½ miles wide. The three natural divisions of ancient Greece were—Northern Greece, extending from the Cambunian Mountains to the Ambracian and Malian gulfs; Central Greece, between these gulfs and the Isthmus of Corinth; and the Peloponnesus (now the Morea), which lies S. of the isthmus. There were anciently seventeen states, varying greatly in extent and importance. In the N. were Thessaly on the E. and Epirus on the W. (which do not belong to modern Greece); in the center were Locris E. and W., Phocis, Bœotia, Ætolia, Acarnania, Megaris, and Attica; in the Peloponnesus were Corinth, Sicyonia, Argolis, Achaia, Arcadia, Elis, Messenia, and Laconia. The islands are of three classes: (1) Those near the coast, as the Ionian isles, Eubœa (Negropont), Cythera, Ægina, Salamis, etc.; (2) the Cyclades, around Delos, and the Sporades, scattered in the Ægean Sea; and (3) the large separate islands, as Crete and Cyprus. Ancient Greece had many colonies and dependencies on the coasts of Asia, Europe, and Africa, and the neighboring islands; modern Greece has none.

Physical Features and Climate.—Greece is exceedingly irregular in form. Its surface is greatly diversified by mountains, and its coast-line is very extensive in comparison with its surface. It has in this last respect the same characteristic among European countries that Europe has among the continents. Less than Portugal in area, it has more extent of coast than "the whole Pyrenean peninsula." Its mountain system divided the country like a checker-board, and gave character to its people and their civilization.

The Pindus range is composed of primitive and metamorphic rocks, such as granite, mica-schist, serpentine, etc., while Parnassus, Helicon, etc., are mainly of a hard gray limestone, the characteristic rock of Greece, which often assumes the form of the most beautiful marble. There are no volcanoes, but traces of volcanic action are everywhere manifest in the forms of the mountains, fissures, caverns, mineral springs, etc. The hot springs of Thermopylæ and the mephitic vapors that inspired the priestess at Delphi are famous in history. Copper, lead, iron, silver, and even gold are found. The silver mines at Laurium in the south of Attica were formerly valuable. Antimony, cobalt, manganese, and sulphur exist, and also salt. Gypsum and porphyry are quarried, but the most beautiful products of the quarries are the white marble of Mt. Pentelicus and the green and red marbles of the Peloponnesus and some of the islands.

The *climate* of Greece varies according to location, and in March the heat of summer may be found in the south, the warmth of spring in Laconia, and the severity of winter in Arcadia. Near the coast snow is rare; on some of the mountains it lies nearly the entire year. The cold N. wind prevails even in summer. The sirocco often sweeps over the southern portions, and the S. E. wind brings the rains of spring and autumn; but even in these rainy seasons the atmosphere is fresh and clear, except in Bœotia, the land of fogs and malaria, which affect body and mind. Attica has a pure, dry atmosphere, a sky of deep and beautiful blue.

Population, etc.—Modern Greece is divided into nomes (νόμοι), which correspond in names, and often in extent, to the states of ancient Greece. These nomes are divided into eparchies (ἐπαρχίαι), which are subdivided into demes (δῆμοι). The devastation of the Greek revolution reduced the population to 612,608 in 1832; in 1853 it was 1,042,529, while the Ionian isles had 230,000. In 1870 the total population was 1,457,894, while in European Turkey there were 6,000,000 Greeks; the table on the next page gives the figures for 1889, no later figures being available. The principal towns are Athens, pop. (1889) 107,251; Piræus, 34,327; Patras, 33,529; Hermopolis (or Syra), 21,998; Corfù, 19,025; Zante, 16,603; Larissa, 13,610; Pyrgos, 12,847; Trikala, 12,662; Volo, 11,029; Tripolis, 10,098; Calamata, 10,696.

DIVISIONS AND POPULATION OF GREECE.

NOMARCHIES.	Area, sq. miles.	Population, 1889.
NORTHERN GREECE —		
Attica and Bœotia	2,472	257,764
Phocis and Phthiotis	2,044	136,170
Acarnia and Ætolia	3,013	162,020
PELOPONNESUS —		
Argolis and Corinth	1,442	144,836
Achaia and Elis	1,901	210,713
Arcadia	2,020	148,285
Messenia	1,321	183,232
Laconia	1,679	126,888
ISLANDS —		
Eubœa and Sporades	2,216	103,442
Cyclades	933	131,508
Corfu	431	114,535
Zante	277	44,070
Cephalonia	302	80,178
THESSALY —		
Arta	395	32,890
Trikala	2,200	143,143
Larissa	2,478	168,034
Totals	25,041	2,187,208

Products, Industry, etc.—In ancient as in modern times the domestic animals of Greece were the horse, ass, mule, ox, sheep, goat, hog, and dog. Oxen are used for agriculture; sheep and goats constitute the wealth of the rural population. In ancient times swine's flesh was the favorite meat; now it is mutton. The bear, wolf, boar, lynx, wild cat, jackal, deer, etc., are found in the mountains; eagles, vultures, hawks, owls, etc., are numerous, and game is abundant. Many of the mountains have been stripped of their forests, so that the fertility of the soil and the climate have been unfavorably affected. Taygetus, Parnassus, Helicon, and others have not been denuded. The pine is the most common tree; the beech, chestnut, cypress, and oak are found. The soil is thin, and agriculture is backward. Irrigation is practiced, but the implements generally are as primitive as in the days of Hesiod. Mountains and marshes occupy one-half of the land, and only one-fifth of the remainder is cultivated. The state owns more than three-fourths of this, renting it on the metayer system, the oxen and seed being furnished by the proprietor, who receives a large percentage of the crop. Wheat, barley, and maize are raised; rice is produced in the plains of Argos and Marathon, and in the marshy regions. Cotton and tobacco grow in the plain of Argos and elsewhere. Vineyards are numerous, but the wine is poor. In Laconia, Messenia, and the islands the mulberry is cultivated for the silkworm. Almonds, figs, oranges, lemons, and other fruits abound. Olives are produced in all parts of Greece; the oil is used for light and instead of butter. The currant, or small Corinthian grape, is raised in large quantities along the shores of the Gulf of Corinth and on the islands. The figs of Attica and the honey of Hymettus are proverbially excellent. Manufactures are unimportant. In the towns they are of cutlery, earthenware, hardware, articles in leather, silk, hats, cotton and woolen cloths, brandy, vinegar, etc.; in the country cotton and woolen cloths are woven. Ship-building is carried on at the seaports, and salt is made in a few places.

Commerce and Transportation.—The position of Greece, the conformation of the country, its numerous bays and islands, all tend to make the Greeks a seafaring people. For centuries it was in the pathway of commerce. Its exports have always been the simple products of the country. The imports are manufactured goods from Western Europe, such as cloths, hardware, and fancy articles; coffee, rice, drugs, and spices from Turkey. The grain-trade of the Black and Mediterranean Seas is almost exclusively in the hands of Greek merchants. The principal ports are Hermopolis (*Syra*), the center of steam-navigation in the Levant; Hydra, Spezia, Corcyra (*Corfù*), Zacynthus (*Zante*) on the islands; Piræus (the port of Athens), Patras, Missolonghi, and Nauplia. In 1821 Greece had 440 vessels, of 61,450 tons burden, most of which were destroyed in her revolution, when her navy became so distinguished. In 1895 her commercial marine amounted to 107 steamers, with a capacity of 87,620 tons, and 613 sailing vessels, with a capacity of 167,015 tons. The ports have been improved and lighthouses erected. The Euripus between Bœotia and Eubœa has been rendered navigable, and the Isthmus of Corinth is pierced by a ship-canal, which was opened for traffic in 1893. Until modern times there were very few roads that were practicable for carriages; but the means of communication have been greatly improved, and in 1896 about 2,043 miles of good roads had been constructed. In Jan., 1869, the first railway was opened in Greece. In 1896 the railways open for traffic were 578 miles in length, while 310 miles were under construction. The postal service is good, and has 310 post-offices, handling, in 1894, 4,124,000 letters and post-cards.

Form of Government.—The government is a constitutional hereditary monarchy. King Otho governed the country from 1833 to 1843 without a constitution. The liberty-loving Greeks effected a bloodless revolution on Sept. 14, 1843, and a national assembly was called, which framed a constitution that was approved by the king Mar. 16, 1844. It established hereditary monarchy, and the Holy Orthodox Catholic and Apostolic Church as the state church. All persons are equal before the law; personal liberty is inviolate; titles of nobility and slavery are forbidden; the right of petition, trial by jury, the freedom of the press, the public administration of justice, the independence of the judiciary, the security of letters and domicile, are all guaranteed. The king appoints his ministers, seven in number, who are responsible to the legislature, and take part in its deliberations. At first there were a senate (Γερουσία), named by the king for life, and a house of representatives (Βουλή), elected by the people for four years. But in 1864, after the expulsion of Otho and the accession of George I., the senate was abolished, and the legislative power was vested in the *Boule*, which now consists of 207 members. The suffrage is universal, and elections are by ballot. A council of state examines all bills, and may offer amendments to the boule within a certain time. The king must be a member of the Greek Church, unless special exception is authorized. The king receives 1,125,000 drachmas (£40,718) per annum, and has a palace in Athens and a summer residence in Corcyra (*Corfù*). The present king is George I., second son of Christian IX., King of Denmark; b. Dec. 24, 1845. He accepted the crown from the national assembly June 5, 1863. He married Olga, daughter of the Grand Duke Constantine of Russia, Oct. 27, 1867. The crown prince, Constantine, b. Aug. 2, 1868, received the title Duke of Sparta. See the article GREECE, HISTORY OF MODERN.

Defense.—All able-bodied men in Greece are held to military service for nineteen years, two of which must be in the regular army. In 1896 the army consisted of 25,333 men, all others in the service being styled national guards. The officers are chiefly graduates of the military school at Athens. The navy consists of 3 port-defense armor-clads, 6 cruisers, 17 torpedo-boats, and 12 gunboats. There are 3,165 sailors, who are obtained by conscription among the seafaring people. The police or *gendarmerie* often need the assistance of the regular army against the brigands. Brigandage, for which the Government is often unjustly blamed, is becoming more and more frequent, and is a relic of the war of independence.

Finance, etc.—The debt of Greece in 1896 was 655,128,897 drachmas in gold, and 167,981,781 paper drachmas, contracted mainly in achieving her independence. This was greatly increased in 1897 by the operations in Crete and the war with Turkey. The revenue in 1893 was 106,470,571 drachmas and the expenditure 101,563,761 drachmas. The revenue is derived from duties on imports, a tithe of the gross product of the farming lands, and a royalty of 25 per cent. as rent for the lands belonging to the state.

Administration of Justice.—The supreme court of Greece is called the Areopagus. The kingdom is divided into four judicial districts, each having a royal court of appeal; there are thirteen primary courts of appeal, and 120 justices of the peace. The judicial legislation is excellent, and is based mainly on the Code Napoléon. Criminal cases and offenses of the press are tried by jury. Judges and advocates must have received the degree of LL. D. from the University of Athens or from one of the universities of Europe, and must have passed a satisfactory examination before a special commission. The judges are appointed by the king, and removable, but they are noted for their independence and integrity. Punishments are fines, imprisonment, and in capital cases death by guillotine. The prisons are rather defective in construction and administration.

The *religion* established is the Holy Orthodox Catholic and Apostolical Church, to which nearly all the population belong. All religions are tolerated, but proselytism is forbidden, and in 1888 there were only 14,677 members of other Christian churches, 5,792 Jews, and 24,165 Mohammedans. The Church in Greece became virtually independent of the patriarchate of Constantinople at the time of the revolution (1821), and was or-

ganized by decree July 15 (27), 1833, upon the model of the Russo-Greek Church, but its independence was not acknowledged by the patriarch until 1850. Its supreme council is the Holy Synod of five members, appointed annually by the king. The Metropolitan Archbishop of Athens is *ex officio* the president, and a majority must be archbishops or bishops. Two royal officials may assist in the deliberations of this body, which elects archbishops and bishops, who must be approved by the crown. There are 26 archbishops and 29 bishops—one for each nome. There are 4 ecclesiastical seminaries, containing 115 students. A certain degree of instruction is prescribed for all priests, and the higher dignitaries are selected only from those of the highest culture and blameless lives. The priest is generally married, but must have married while a deacon, and can not marry a second time without demitting his office. The priests do not preach, but other well-qualified persons are appointed to do so. The archbishops and bishops are paid small salaries by the state, but the priests depend upon their flocks, and receive only a meager support. The monks inhabiting the numerous monasteries are ignorant and degraded.

Education.—By law, all children between five and twelve are required to attend school; but the law is not rigorously enforced. Under Otho primary schools were established by law in every deme. Education is free even in the university. In 1835 there were 71 primary schools, with 6,721 pupils; 21 Hellenic schools, with 2,528 pupils; 3 incomplete gymnasia, and an inchoate university. In 1892 there were a university, 35 gymnasia, 300 Hellenic schools, 1,800 commercial schools, 600 elementary schools, 80 private schools, 5 ecclesiastical schools, and a polytechnic school. According to the census of 1879, 86·06 males and 23·03 females in every 100 could read and write. To enter the University of Athens, Greek students must have completed the course of the gymnasium. It opened in 1837 with 52 students; in 1895 it had 2,987, of whom 604 were from abroad, chiefly Turkey. There are the four faculties of theology, law, philosophy (literature and science), and medicine. The university has a large library and valuable museums. Baron Sinna, a wealthy Greek of Vienna, erected an astronomical observatory on the Hill of the Nymphs at Athens. He and other Greeks have founded other public institutions. Polytechnic schools exist in several places; archæological, medical, natural history, and other societies exist at Athens.

The press is free in Greece. Art is not much cultivated, and time alone can determine whether the Greeks have inherited the æsthetic nature of their ancestors.

Authorities.—The handbooks of Baedeker and Murray, and the works of Maurer, Schmidt, and Wyse. Of the greatest importance are the official publications of the Greek Government and of the consuls of Great Britain, France, and Germany. Revised by C. K. Adams.

Greece, History of Ancient: The early history of Greece is enveloped in the clouds of fable. In the exploits of imaginary heroes are presented the movements of nations, and the events of an era are shadowed forth in the traditions of a people.

Mythological Age.—The earliest inhabitants of Greece were probably the Pelasgi, an Aryan nation who came from the high table-land of Asia, passed around the Caspian Sea into Europe, and settled in Greece and Italy. They left traces of their existence in the religion of the Greeks, in the names of places, and in the walls composed of huge stones found in various places. They were composed of various tribes, among whom the Hellenes were the most powerful, and before whom the others disappeared. Their original seat, according to Aristotle (*Meteor.*, i., 14), was near Dodona in Epirus, but they first appear in the southern part of Thessaly about B. C. 1384. The Hellenes represented themselves as the descendants of a common ancestor, Hellen, son of Deucalion and Pyrrha. The name Pelasgia was supplanted by that of Hellas, denoting at first a small district, and subsequently the entire land inhabited by the Hellenes. The names Greece and Greeks are derived from the Romans. The Hellenes were divided into Dorians, Æolians, Ionians, and Achæans, descended respectively from Dorus and Æolus, sons of Hellen, and Ion and Achæus, sons of Xuthus, the third son of Hellen. Hellen and his sons were purely mythical persons. These four divisions of the Hellenic people were distinguished from one another by their institutions, and even the peculiarities of their language. The physical features of the country exerted a powerful influence upon the people, determining their character, giving form to their political institutions, and assisting in the development of a peculiar type of civilization. High mountains and small inclosed plains open to the sea tended to produce a bold, adventurous people, who loved individual liberty, who were jealous of the rights of their little states or cities, but who could rarely unite for a grand purpose except under a conqueror or a pressing necessity. There are traces of Oriental influence in Greece, and tradition attributes the first elements of civilization to colonies from the East. To Cecrops, a native of Sais in Egypt, Attica is said to have owed the institution of marriage, religion, and the foundation of Athens. Argos is said to have been founded by Danaus, an Egyptian, and the Peloponnesus owes its name to Pelops, a Phrygian, son of Tantalus, who by his wealth and influence became King of Mycenæ. Cadmus, a Phœnician, is said to have built Cadmea, afterward the citadel of Thebes, in Bœotia. The earliest forms of the Greek letters, and especially their names, show their Phœnician origin; weights and measures, and ship-building also, the Greeks probably received from the Phœnicians.

Heroic Age.—From the appearance of the Hellenes in Greece, about B. C. 1384, to the siege of Troy, B. C. 1184, is called *the heroic age.* The heroes were represented as of divine descent—superior to ordinary men in qualities of mind and body. Hercules was the national hero of Greece, and his labors represented in mythical form the triumph over physical and moral evil, the attainment of wealth and power. Theseus represented the establishment of civil government in Attica, and Minos the triumph of law and social order. So the expedition of the Argonauts under Jason presents the progress of commerce; and the Trojan war, the greatest of the heroic achievements, as sung by Homer in the *Iliad* and the *Odyssey*, gives not only a vivid picture of the manners and institutions of early Greek society, but also exhibits the contest between Greek and Oriental civilization. Although the Greeks were divided into many small communities, yet there were bonds of union in their community of blood and language, of religious rites and festivals, of manners and character. In these respects they were distinguished from all other people, whom they styled barbarians. Their most celebrated oracles were at Dodona and at Delphi, and public games (see Isthmian, Nemean, Olympian, and Pythian Games) were held in honor of different gods at stated intervals. Thus the Greeks were brought together and reminded of their common origin and mutual interests. The state of society in Greece in the earlier ages was not unlike that of the feudal ages in Europe. Each state had its own king, whose authority was not limited by laws, but was partially restrained by the council of chiefs, or *boule.* The *agora*, or assembly of the people, merely met to hear the decision of the kings and chiefs. There were three classes of persons—the nobles, powerful and wealthy; the freemen, some of whom possessed estates; and the slaves. The manners even of the highest class were simple; nobles were proud of their skill in the manual arts, and their wives and daughters performed the various household duties. The Greeks dwelt in fortified towns adorned with palaces and temples, and the poems of Homer attest alike their skill in war and their culture in poetry and in art. War was their delight, and even piracy was honorable. Æolus, son of Hellen, succeeded his father, and his descendants occupied Central Greece, and even the west coast of the Peloponnesus. The Æolians were widely scattered, and became a seafaring people. The Achæans in the heroic age were the most warlike of the Greeks, and their chiefs were the most distinguished in the Trojan war. At that time they dwelt in Thessaly, and also possessed Mycenæ, Argus, and Sparta in the Peloponnesus. The Dorians and Ionians were of small importance in the earlier history. The former were confined to Doris, a small mountainous district between Thessaly and Phocis; the latter were settled on the north coast of the Peloponnesus and in Attica. In historical times these became the leading races of Greece, the Dorians being represented by Sparta, the Ionians by Athens. Thucydides (i., 12) speaks of the migrations that occurred among the Greeks. The Dorians overran the Peloponnesus B. C. 1104. This invasion was styled the "return of the Heraclidæ," because led by the descendants of Hercules, who had long been fugitives from Argos. The country was divided among the leaders, and the defeated Achæans drove out the Ionians from the north coast of the Peloponnesus, which portion was henceforth called Achaia. The Ionians went to Attica, and thence to Asia Minor. The earliest migration from Greece was in B. C. 1124, when the Æolian clans proceeded from Thessaly

and Bœotia to the north of Asia Minor and the islands of Lesbos and Tenedos. The Ionians followed B. C. 1040, and settled on the coast of Lydia and the islands of Chios and Samos. The Dorians soon after settled the south part of the coast and the islands of Rhodes and Cos. Cumæ was founded B. C. 1050 by a colony from Cyme in Asia and Chalcis in Eubœa. Colonies were subsequently planted in the south of Italy and in Sicily. So numerous and important were the colonies in Southern Italy that it was called Magna Græcia. Colonies were also planted at Cyrene in Africa, Massilia (Marseilles) in Gaul, and along the coast from Greece to the mouth of the Danube, at Selymbria, Byzantium, and many other places. These colonies show the hardy and adventurous spirit of the Greeks. The most noted in Asia were Smyrna, Ephesus, and Miletus; in Italy, Sybaris, Croton, and Tarentum; in the island Corcyra; and Syracuse and Agrigentum in Sicily.

Establishment of Colonies and the Persian Wars.—We have already alluded to the migrations of the Greeks, which occurred shortly after the Trojan war. Colonies were of two classes—the one sent out under chosen leaders with religious ceremonies, and were really independent; the other were merely garrisons. The Greek settlements in Asia Minor and the adjacent islands consisted of Æolians in the north, Ionians in the middle, and Dorians and Achæans in the south. These colonies were conquered by Crœsus, King of Lydia, who ascended the throne B. C. 560. Cyrus, King of Persia, overthrew him B. C. 546, and also subdued the Greek cities except Samos. The Ionians revolted against the Persians, B. C. 500, and the Athenians sent twenty ships and the Eretrians sent five to assist them. The combined forces entered, plundered, and accidentally burned Sardis. Great numbers were slain in the retreat. The Athenians returned home, and the enraged Darius, King of Persia, vowed vengeance upon them. He crushed the rebellion, and then sent Mardonius, his son-in-law, to punish the Athenians and Eretrians. Mardonius crossed the Hellespont, conquered Thrace and Macedonia, but lost 300 ships and 20,000 men in a hurricane at Mt. Athos, and led his forces back to Asia (B. C. 492). Datis and Artaphernes were now sent with 600 galleys, besides transports, and 110,000 men. They captured Eretria, and landed on the plain of Marathon, under the guidance of Hippias. Sparta, the leading state of Greece, through superstition, did not send aid in time. Only the little town of Platæa sent 1,000 heavy-armed soldiers to assist the 10,000 Athenians, and a few slaves as light-armed troops. Under the skillful leadership of Miltiades, assisted by Callimachus, Aristides, and Themistocles, the Athenians gained a most brilliant victory (B. C. 490). The Persians lost 6,400, the Athenians only 192, who were buried on the field, and the mound over their remains still exists. The Persians sailed back to Asia. Athens had saved Greece and gained immortal glory. The conduct of Ægina in favoring Persia led to a war between her and Athens. This war and the foresight of Themistocles made Athens a maritime power. She prepared a fleet of 200 ships, to which 20 were annually added. In B. C. 480, Xerxes, the son of Darius, led an immense army against Greece. He threw a bridge of boats across the Hellespont and cut a canal through Mt. Athos. When he reached the pass of Thermopylæ his land and sea forces amounted to 2,641,610, and the attendants swelled the number to 5,283,220. So great was the terror inspired by this vast army that only a few cities of the Greeks took part in the Congress which Athens and Sparta summoned to meet at Corinth. A stand was made at THERMOPYLÆ (*q. v.*). Xerxes conquered Greece, except Delphi, as far as Athens, which was burned. The Persian fleet sustained heavy losses in storms on the Greek coast and in battle at Artemisium, but after the battle at Thermopylæ the Greek fleet retreated to Salamis. It was prevented from dispersing only by the skill and policy of Themistocles. The Persians had about 1,200 vessels; the Greeks had less than 400, of which 200 were Athenian. The battle took place in the narrow strait between Attica and Salamis. Xerxes from his throne on the shore beheld the defeat of his fleet and the loss of 200 vessels. Becoming alarmed, he returned to Asia, leaving Mardonius with 350,000 men in Thessaly to conclude the war. Mardonius again invaded Attica, and the Athenians again abandoned their city. Their patriotism, and their intimation to Sparta that they might not continue this course, at last alarmed and aroused the Spartans. A Greek army of 110,000 defeated the Persians at Platæa (B. C. 479), and Mardonius was slain. On the same day the Persian army was defeated and their fleet burned at Mycale in Asia. The patriotism and sacrifices of Athens had made her the leader of Greece, and the treachery of Pausanias, the Spartan commander, confirmed her position.

The confederacy of Delos was now formed against Persia, and delegates from the different states met regularly in the temple of Apollo and Artemis on that island. Aristides the Just, who had been ostracized, but returned to take part in the battle of Salamis, fixed the assessment in ships or money on the different states. The yearly amount was 460 talents, nearly $500,000, and the treasury was in Delos. Athens was now rebuilt, and through the energy and diplomacy of Themistocles was surrounded with walls, and Piræus became its port. From the battle of Marathon (B. C. 490) to the beginning of the Peloponnesian war (B. C. 431) was the most brilliant period of Athenian history. Themistocles had created her navy, Aristides had conciliated her allies, Cimon increased her reputation, and Pericles enlarged her resources, formed alliances, and conquered her enemies. The prosperity of Athens excited the jealousy of Sparta, and her treatment of her allies produced great dissatisfaction. She had freed the Greek cities in Asia Minor from taxation, but the death of Cimon, who had been recalled, brought an end to the Persian war (B. C. 448). Athenian power culminated in the defeat of the Thebans at Œnophyta (B. C. 456).

Age of Pericles.—Pericles revolutionized the Athenian constitution amid many struggles, making it completely democratic, impairing the power of the Areopagus or supreme court, and of the senate of five hundred. He endeavored to consolidate Athenian power, and but for her arrogance and unwise conduct she might have continued much longer to exercise the hegemony or leadership of Greece. A revolution in Bœotia and her defeat by the Thebans at Chæronea (B. C. 447) were the beginning of her reverses. She soon lost her control of Central Greece, and Pericles reconquered only Eubœa. By the thirty years' truce (B. C. 445) she abandoned all her acquisitions in the Peloponnesus. Pericles now devoted himself to the internal affairs of the city. He erected the Propylæa, the Parthenon, and the temple of Victory on the Acropolis, the Theseum and other buildings in the city. He built the long walls to the Piræus and sent out colonies. Athens became the center of art and literature. Architecture and sculpture reached their highest excellence. The greatest names in Greek literature adorn this century: in tragedy, Æschylus, Sophocles, and Euripides; in comedy, Aristophanes; in history, Herodotus and Thucydides; all of whom, except Herodotus, were Athenians, and even he resided at Athens.

Peloponnesian Wars.—Athens had lost her supremacy on land, and her allies in the confederacy of Delos were dissatisfied with the heavy tribute (now 600 talents) exacted by Athens, her misapplication of it, and the oppression of the members. Samos revolted, but was subdued and punished. Nearly all, however, waited only an opportunity to free themselves. A dispute between two Corinthian colonies led to the war that overthrew Athens. The Lacedæmonians were urged by their allies to declare war against Athens. War was determined upon at Sparta B. C. 431, although it was precipitated by a treacherous attack of Thebes upon Platæa. This war was one of races and of principles; Athens represented the Ionian tribes, democracy, and progress; Sparta, the Dorians, aristocracy, and conservatism. Athens was a maritime power, and controlled Eastern and Asiatic Greece and most of the islands; Sparta was a land power, and controlled Western Greece, Southern Italy, and Sicily. The states with Athens were mainly subject allies; those with Sparta constituted a voluntary confederacy. Athens had great financial resources; Sparta depended upon occasional contributions. The Peloponnesians, except Argos and Achaia, were with Sparta, hence the name of the Peloponnesian war. It may be divided into three periods: (1) From its beginning to the Peace of Nicias (B. C. 431–421); (2) from its peace to its rupture by the Spartans (421–413); (3) from this rupture to the capture of Athens (413–404). The contest was one of the most memorable in history. For more than twenty years the desolations of war were experienced not only in the peninsula, but on the islands and about the Greek colonies along the shores of the Mediterranean. During the whole of this period it was uncertain which of the two contending states would ultimately prevail. But the scale was finally turned in favor of Sparta. The victory of Ægospotami (B. C. 405) destroyed the Athenian fleet; and the Spartan general Lysander compelled the surrender of Athens in the following year. The city was completely humbled; her walls were demolished to the

music of the flute, her ships were surrendered, and she was stripped of all her foreign possessions.

Spartan Supremacy.—Oligarchical principles triumphed with Sparta, and decarchies with a Spartan harmost were appointed in the Athenian cities. At Athens a committee of thirty, known as the Thirty Tyrants, supported by a Lacedæmonian garrison, supplanted the democracy, and a reign of terror ensued. Throughout Greece the rule of Sparta became more cruel than that of Athens had ever been, and a revulsion of feeling occurred in reference to Sparta and Lysander. Thrasybulus and other exiles seized Phyle on Mt. Parnes, took the Piræus, defeated the force of the Thirty, and killed their leader, Critias. The Thirty were deposed and a committee of ten was appointed. Lysander came with a Lacedæmonian force, but was superseded by King Pausanias. Matters were finally arranged; a general amnesty was proclaimed, the obnoxious laws were changed, Thrasybulus and the exiles entered Athens, and the democracy was restored (B. C. 403).

It was at this time that Socrates, the wisest and best of the Greeks, a martyr for the truth, was put to death upon the false charge of infidelity and corrupting the youth. The Anabasis, or expedition of Cyrus the Younger to dethrone his brother, Artaxerxes, occurred B. C. 401. Xenophon led back from Cunaxa to the sea the 10,000 Greeks who were a part of the army. The weakness of Persia was thus revealed to the Greeks. A war ensued between Sparta and Persia. Agesilaus was called home from Asia by the troubles in Greece, which were aided by Persia. The Thebans defeated the Spartans and slew Lysander at Haliartus (B. C. 395), and compelled Pausanias to retreat. Athens, Corinth, Argos, and other states formed an alliance with Thebes against Sparta. Agesilaus defeated the allies at Coronea (B. C. 394), but Conon and Pharnabazus destroyed the Lacedæmonian fleet at Cnidus, and the Spartans lost their maritime supremacy. The combined fleet came to Greece, and Conon rebuilt the fortifications of the Piræus and the long walls. The war continued with varying success in Greece and in Asia until Sparta induced Persia to impose a disgraceful peace on the Greeks (B. C. 387). Sparta now attacked Bœotia, seized the citadel of Thebes by treachery, and conquered Olynthus. Her power on land was at its height B. C. 379, and her unpopularity was commensurate. Pelopidas and other exiles recovered Thebes: Athens and Thebes organized a confederacy of seventy cities against Sparta. A war of seven years ensued, and through Athenian jealousy of Theban success the Peace of Callias was made (B. C. 371). Thebes refused to sign the peace unless acknowledged as the head of Bœotia.

Theban Supremacy.—In the war that ensued, Epaminondas, the great Theban commander, utterly defeated the Spartans at Leuctra (B. C. 370). This event electrified Greece. Epaminondas next ravaged Laconia, established an Arcadian confederation at the new city, Megalopolis, and restored the Messenians. Sparta fell at once from her high position, and even asked the aid of Athens. Pelopidas settled disturbances in Thessaly and in Macedonia, and Epaminondas again successfully invaded the Peloponnesus. Pelopidas and other deputies went to the King of Persia, who declared Thebes to be the head of Greece (B. C. 366). Pelopidas was slain in an expedition into Thessaly. A war broke out between Elis and Arcadia, the Mantineans and Spartans supporting the former. Epaminondas marched into the Peloponnesus to assist the Arcadians. He gained a decisive victory over the combined force at Mantinea (B. C. 362), but himself fell mortally wounded. The greatness of Thebes began and ended with this able man. Peace was now made, according to his dying advice. Greece was now completely exhausted by these struggles. Athens regained some of her former prosperity, but lost much in every way by a war with her allies, whose independence Persia compelled her to acknowledge (B. C. 355).

Macedonian Supremacy.—A new power was now rising in the neighborhood of Greece. Macedonia lay N. of Thessaly; its people were despised as barbarous; its kings claimed to be of Hellenic descent. Philip, the youngest son of Amyntas II., became King of Macedon B. C. 359, at the age of twenty-three. He took Amphipolis and defeated the Illyrians. He conquered Pydna, Potidæa, and Thrace as far as the Nestus, thus gaining control of the gold mines of Pangæus, which yielded him 1,000 talents annually. The Sacred war, between Thebes and Phocis, prepared the way for Philip's supremacy. The Amphictyonic council imposed a heavy fine on the Phocians for cultivating sacred soil. Driven to desperation, they seized Delphi and appropriated the sacred treasure. Philip appeared as champion of the Delphic god, slew the Phocian leader, and became master of Thessaly. An Athenian army prevented him from passing Thermopylæ. Demosthenes, the great Athenian orator, now appeared as the opponent of Philip. When Philip threatened Olynthus, Demosthenes infused more energy into the Athenians. His *Olynthiacs* and his *Philippics* are among his most celebrated orations. Olynthus was taken B. C. 347, and many other towns fell into Philip's hands. By deceit and bribery he gained as much as by war. He induced the Athenians to make peace, but excluded the Phocians, who soon surrendered. They were ruined, and the Amphictyonic council at Delphi gave him the seat of which the Phocians were deprived. He shared in the honor of presiding at the Pythian games, and in B. C. 346 Macedon became the leading state of Greece. His attempts on Byzantium, Perinthus, and the Chersonesus were successfully resisted by aid of the Athenians. He went into Greece to conduct a sacred war against Amphissa, but seized Elatea, showing that he aimed at Bœotia and Attica. Demosthenes aroused the Athenians to resistance. They united with the Thebans, and on Aug. 7, B. C. 338, was fought the battle of Chæronea, which crushed the liberties of Greece. Philip treated Thebes with severity, but offered advantageous terms of peace to Athens. A congress of Greek states, except Sparta, met at Corinth, declared war against Persia, and appointed Philip commander-in-chief. While making preparations for the expedition he was assassinated, and his son Alexander, then twenty years old, succeeded him. He was thoroughly educated. The courage and energy he displayed secured his appointment as leader of the expedition against Persia. He suppressed disturbances in Thrace and Illyria. Thebes revolted, and was utterly destroyed, save Pindar's house, and the inhabitants reduced to slavery. Greece was terror-stricken, and leaving Antipater as regent Alexander set out for Asia with 35,000 soldiers (B. C. 334). He marched along the coast of the Propontis, and defeated the Persians at the river Granicus. Turning S., he took Sardis, then Ephesus, Magnesia, Miletus, and many other places. In the spring he received re-enforcements at Gordium, marched E. without resistance until he reached Issus, where he defeated the immense army of Darius, 600,000 strong. He conquered Phœnicia and Egypt in twenty months. With 47,000 troops he marched toward the center of the empire, and encountered and defeated the immense army of Darius about 20 miles from Arbela. The capitals, Babylon, Susa, and Persepolis, with their enormous treasures, surrendered. Three years were spent in conquering the northeast provinces of the Persian empire, and then Alexander advanced into India, conquered Porus, and overran what is now called the Punjaub. His army refused to go farther than the Hyphasis (Sutlej), and he then descended the Indus, and after terrible sufferings returned to Persepolis. At the height of his power, he now meditated the conquest of Arabia. After a banquet, given in connection with the preparations, he was seized with a fever and died (June 28, B. C. 323). His plans perished with him, and his empire was divided among his generals. Philip Arrhidæus, his half-brother, was proclaimed king, reserving, however, to Alexander's child by Roxana (whom he had also married), if a son, a share in the empire. Perdiccas eventually became the guardian of Philip, Roxana, and her son Alexander, but was murdered in Egypt. Antipater now became regent; Ptolemy received Egypt; Seleucus took the satrapy of Babylon; and Antigonus had Susiana, Phrygia, Lycia, and Pamphylia. Harpalus had wasted the royal treasures at Ecbatana, and fled when Alexander returned from the East. Demosthenes was falsely accused of receiving a bribe from Harpalus at Athens, and was fined and imprisoned, but managed to escape. Upon the death of Alexander, Hyperides in Athens and Demosthenes in exile endeavored to arouse the Greeks to revolt, but only the smaller states joined Athens. Antipater took refuge in Lamia, but was re-enforced, and defeated the allies at Crannon in Thessaly (B. C. 322). Demosthenes had been recalled to Athens, but was now demanded as one of the conditions of peace. He escaped to Calaurea, and in the temple of Poseidon took poison and died. Antipater died soon after, leaving the regency to Polysperchon, and not to his son Cassander. He, however, shortly became regent, and murdered Olympias, and finally Roxana and her son. Various changes occurred in the East.

Achæan League and Roman Conquest.—After the death of Cassander, Macedonia changed rulers repeatedly and rap-

idly, until Antigonus Gonatas gained control of nearly all Greece. His oppression caused the revival of the Achæan league (251 B. C.). It was originally for religious purposes; it now embraced Athens, Corinth, Megara, Ægina, Salamis, and the Peloponnesus, except Sparta, Elis, and a few others. In B. C. 221 Sparta opposed the league, but by the assistance of the Macedonians was completely defeated. An Ætolian league had been formed in Central Greece which defeated the Achæans, and Philip, King of Macedonia, was called in by the latter. He gained several victories, but soon made peace. Siding with Carthage in her struggle, he was defeated by the Romans. Philopœmen led the Achæans and defeated the Lacedæmonians, allies of Rome. The Romans made peace and retired, but at the close of the second Punic war they declared war against Philip, and both the Ætolian and the Achæan leagues joined them. He was defeated at Cynoscephalæ (B. C. 197), and his supremacy was destroyed. Flaminius proclaimed the freedom of Greece (B. C. 196). The Ætolian league was crushed (B. C. 189). Perseus succeeded Philip (B. C. 179). War broke out, and L. Æmilius Paulus defeated Perseus at Pydna (B. C. 168), and led him to Rome to adorn his triumph. Thus ended the Macedonian empire, and Macedon became a Roman province. Sparta appealed to Rome against the Achæans, and in B. C. 147 Roman commissioners decided that Sparta, Corinth, and all the cities except those in Achaia should be independent. Riots ensued in Corinth, and the commissioners barely escaped. A second embassy was insulted, and Rome declared war. Metellus defeated the Corinthian leader, Critolaus, and Mummius overthrew his successor, Diæus, near Corinth. The inhabitants of the city were reduced to slavery, its priceless treasures of art were carried away, and the city was consigned to the flames. Greece perished B. C. 146, and henceforth was only a province of the Roman empire under the name of *Achaia*. Greece was conquered, but her civilization and culture conquered Rome.

AUTHORITIES.—For the general history of Greece the following are the most important works: Grote, Curtius, Duncker, Thirlwall, Abbott, and Duruy. For the history of the Peloponnesian war Thucydides will always be superior to any modern work. The period immediately after the Peloponnesian war is most successfully treated by Thirlwall and Freeman. For the period of Roman occupation the works of Hertzberg and Finlay are the most important.

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Revised by C. K. ADAMS.

Greece, History of Modern: After the Roman conquest in B. C. 146, Greece had no independent life, but continued to form a part of the Byzantine empire until the time of the fourth crusade (A. D. 1202–4). The old empire was then broken up, and its provinces divided among the Frankish princes, who interrupted the history of the Greek empire by a period of fifty-seven years of Latin rule. In 1261 the Byzantines regained the throne. The dukedom of Athens belonged successively to several different families from A. D. 1205 to 1453, when, on the fall of Constantinople, Greece came under the Moslem yoke. After the signal defeat of the Turks at Vienna (A. D. 1684) the Venetians joined the Christian league, and with a powerful fleet under the command of Francesco Morosini, invaded Greece, conquered the Peloponnesus, and took possession of Athens (A. D. 1687). It was during the bombardment of the citadel by the Venetians at this time that the Parthenon, in which the Turkish garrison had stored their powder, was shattered by an explosion. But the Venetians did not take much trouble to keep what they had won. It was scarcely a dozen years ere they abandoned Athens, and by A. D. 1718 the whole of Greece was again in the power of the Turks. For a century longer the Greeks groaned under this cruel despotism, but the latter part of this period saw the rise of new intellectual aspirations which, fostered by the earnest efforts of the great scholar Koray, sought the improvement of the race by reviving the study of the classic authors and promoting education.

War of Independence.—Along with this movement came the patriotic impulse to shake off the Turkish yoke. In the spring of 1821 the war of independence began with a revolt in the Danubian principalities. From the first it was badly managed, the leaders relying on the support of the czar and on the fidelity of the Roumanian peasants, the former of whom condemned the movement as a rebellion, while the latter deserted the Greeks at the critical moment. The first battle, fought on June 19, was disastrous for the Greeks. Prince Alexander Ypsilanti, the chief of the *Hetaeria*, a secret association for the purpose of winning independence for Greece, was defeated, with the loss of 400 men, most of whom were among the noblest and bravest youth of the country. In Jan., 1822, the first national assembly met at Epidaurus and framed a provisional constitution. In the same year occurred the terrible massacre in Scio (Chios) by which the population of that beautiful island was reduced between Apr. and Aug., 1822, from about 100,000 to 1,800 souls. This year was also marked by several gallant and successful exploits of the little Greek navy, especially by the burning of the flagship of the Turkish commander by the fireships of Admiral Kanaris. The slaughter of Scio was thus at least partly avenged, for the Turkish admiral, who perished in dreadful agonies in this engagement, was the same who had led the bloody expedition against that ill-fated island. The next year (1823) witnessed the bold and successful midnight attack upon the Turkish camp at Carpenesion, in which 800 Turks were slain, with a loss of only 50 on the part of the assailants. But among these 50 was the heroic Suliote chief himself, Marcos Botzares. It was in this year also that Lord Byron arrived in Greece, or rather in the Ionian islands. He reached Missolonghi on Jan. 5, 1824, and died there on the 19th of the following April. In Apr., 1826, Missolonghi, that important fortress, fell before the army of Ibrahim Pasha after a gallant defense and many instances of heroic valor worthy of Marathon and Thermopylæ. Nearly the whole of Greece was now at the mercy of the Turks. In July of this year they laid siege to Athens, which after an obstinate resistance fell into their hands in June, 1827. The cause of Greek independence seemed hopeless, unless the Christian powers of Europe should interpose in her behalf. After many unsuccessful embassies on the part of Greece, and much fruitless correspondence between the courts of Great Britain, France, and Russia, a treaty was at last signed in London on July 6, 1827, by the plenipotentiaries of these three powers, providing that an immediate armistice should be established between Turkey and Greece, and proposing to place Greece on the footing of a tributary province, with the right to choose her own governors. Greece was in no condition to reject these humiliating terms; but, happily for her, the Porte was too proud or too obstinate to accede to them. The sultan's government indignantly resented any interference, and even refused to receive a written communication from the allied powers. These last now perceived that they must either adopt more rigorous measures or else stand before the world in a very humiliating position. They at once increased their fleets in the Mediterranean, and instructed Admiral Codrington, who was chief in command, to prevent the landing of any more hostile troops upon the soil of Greece. Ibrahim Pasha, the commander of the Turco-Egyptian fleet, refused to comply with this demand. His force, consisting of 120 vessels, including 79 ships of war, and carrying more than 2,000 guns, was lying in the harbor of Navarino. On Oct. 20 the allied fleets, consisting of only 26 vessels, and carrying about 1,300 guns, entered the harbor, but without intending to make an immediate attack. This was brought on, however, by the enemy, who fired upon a boat sent with a flag of truce, and killed several persons. After a bloody action of three or four hours the allies gained a complete victory. The Turkish squadron was almost annihilated. This was a decisive blow; the freedom of Greece was now secure. But the triumph was embarrassing to the victors. It was not the policy of France and England to weaken so fatally the Ottoman power. The King of Great Britain, in his address to his Parliament, expressed his regret at "this unfortunate collision with an ancient ally." The Duke of Wellington spoke of it as an "untoward event." But Greece was exultant. It was nearly two years, however, before hostilities entirely ceased, the last battle having been fought in Bœotia on Oct. 7, 1829. In this engagement Prince Demetrius Ypsilanti, the brother of him who was so disastrously defeated in the first battle of the war, gained a brilliant victory over a Turkish force of 7,000 men.

Period of Independence.—At the close of the war the Government was in the hands of the Count Capodistrias, who had left the Russian service and assumed the presidency of Greece at the beginning of the year 1828. When the protecting powers had at last come to an agreement to erect Greece into an independent kingdom, Prince John of Saxony, a scholar and a poet, had the first offer of the throne. Upon his refusal, Prince Leopold of Saxe-Coburg was the

next choice of the guardians of Greece. He accepted the crown on certain conditions, but some of these conditions being unacceptable to the allies, and other difficulties arising, he soon resigned the honor. Both these princes afterward enjoyed prosperous and peaceful reigns, the former as King of Saxony (1854–73), and the latter as King of Belgium (1831–65). In October, 1831, the president, Capodistrias, was assassinated at Nauplia. This event accelerated the negotiations of the protecting powers, and their third choice fell on Otho, second son of Louis, King of Bavaria. This choice was solemnly ratified by the national assembly of the Greek people, and in Feb., 1833, the young prince, then not quite eighteen years of age, arrived at Nauplia, then the seat of government. A Bavarian regency managed the government until 1835, when Otho, then twenty years of age, assumed the reins of government and transferred the capital to Athens. For ten years Greece was governed by the house of Bavaria without a constitution. The Greeks have never been lovers of despotism, and during all the stormy period of the revolution the forms of constitutional government had been generally observed.

Constitutional Period.—After much discontent and several unsuccessful insurrections, the will of the people at last expressed itself in a manner not to be resisted. On the night of Sept. 14, 1843, the palace of Otho was surrounded by the entire garrison of the capital and a crowd of excited citizens. Gen. Kalerges, who commanded the military force, informed his majesty that they had come to demand a constitution, and that they should remain until their demand was granted. There was no alternative; the king promised to call a national assembly at once to frame a constitution; and thus in one night Greece became a constitutional kingdom. The national assembly met on Nov. 20; its discussions on the articles of the constitution continued until Mar. 14, 1844; and on the 16th of the same month the constitution was definitively adopted and received the royal signature. The executive power was vested in the king and his responsible ministers. The legislative power was vested in a senate and a chamber of representatives, called the *Boule*, elected by manhood suffrage. (See GREECE.) Amid frequent complaints and several conspiracies Otho administered the government under this constitution for twenty years longer. But in Oct., 1862, while the king and queen were making an excursion in their yacht on the Ægean, Greece decided to change her master; and when their majesties returned after about ten days they were met in the harbor of Salamis by a deputation, who informed them that the throne of Greece had been declared vacant, and that the provisional government would not allow them to come on shore. The royal pair were obliged to board a British man-of-war, which bore them to Venice, whence they proceeded to Bavaria. On Dec. 1 the provisional government issued a decree ordering the election, by universal suffrage, of a new constitutional king. The vote resulted in the almost unanimous choice of Prince Alfred, second son of Queen Victoria; but former treaty stipulations between the three protecting powers forbade that any member of the royal family of either should ever wear the crown of Greece. A joint protocol of the three powers, dated May 27, 1863, declared the throne of Greece still vacant, and on June 5 another similar protocol offered the crown to Prince George of Denmark, second son of King Christian IX., and younger brother of Alexandra, Princess of Wales. He accepted the offer on condition that the Ionian islands, which had been since 1814 a nominal republic under the protection of the British crown, should be annexed to the kingdom of Greece. The protecting powers assented, and the national assembly of Greece ratified the whole proceeding, and declared the prince already of age, though he yet wanted six months of having completed his eighteenth year. Near the end of Oct., 1863, King George I. arrived in Athens, and took possession of his throne. In the new constitution adopted in 1864 the senate was abolished. On Oct. 27, 1867, he was married to Her Royal Highness the Princess Olga, daughter of the Grand Duke Constantine and niece of Alexander II., Emperor of Russia. During the reign of King George Greece has been rapidly developed. Athens has once more become the seat of letters as well as of a stable and efficient constitutional government. THESSALY (*q. v.*) was added to the kingdom in 1881.

In the early part of 1897 a rising of the Christian population of Crete and a declaration by them in favor of annexation to Greece led to the landing of a Greek army in Crete. The so-called "concert of the great powers," then treating with Turkey in regard to the Armenian question, forbade the interference of Greece, blockaded the Cretan ports, and shelled the insurgents when they attacked the Turkish forts and garrisons. The autonomy promised by the powers was unsatisfactory to both Crete and Greece, and the latter prepared for war. In the hostilities which followed the Greeks were compelled to yield point after point, and now (June, 1897) Thessaly is held by a large Turkish army. The armistice agreed upon and the peace negotiations in progress have as yet revealed no way of settlement short of the recession of Thessaly to Turkey and the payment of a large money indemnity.

See Finlay's 7 vols. on *Greece*; Tricoupis's *History of the Greek Revolution*; Timayenis's *History of Greece*; Field's *Greek Islands and Turkey*; and Tuckerman's *Greeks of To-day*.

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Greek Church: the Church or group of Oriental churches which adhere only to the doctrinal decrees of the first seven œcumenical councils. I. *Name and Extent.*—The full title is the *Holy Oriental* (or *Eastern*) *Orthodox Catholic Apostolic Church*. The words *Holy Catholic Apostolic* are derived from the Nicene Creed, and are also claimed by the Roman Church, but in an exclusive sense. *Oriental* or *Eastern* designates the origin and geographical territory. The greatest stress is laid on the title *Orthodox*, and a special festival is devoted to its celebration—viz. "Orthodoxy Sunday," at the beginning of Lent, when a dramatic representation of the old œcumenical councils is given in the churches, and anathemas are pronounced against heresies. The popular designation *Greek* Church, though not strictly correct, refers to the prevailing nationality and language in which most of its creeds, liturgies, and theological and ascetic literature are composed and its worship mainly conducted.* The Greek Church embraces, however, also the Russian and other Slavonic nationalities. It has its seat in Western Asia and Eastern Europe, chiefly in Turkey, Greece, Russia, and some parts of Austria. It never spread southward and westward except in a few isolated congregations of Greek merchants and colonists, or in connection with the Russian embassy (at Vienna, Trieste, Geneva, Berlin, Paris, London, New York). The numerical strength of the Greek Church is estimated at 84,000,000 (71,000,000 in Europe, mostly in Russia, 9,000,000 in Asia, 3,000,000 in Africa, 10,000 in America).

II. *Divisions.*—The Greek Church is divided into three great branches: 1. The Orthodox Church in Turkey, under the Patriarch of Constantinople, with the subordinate patriarchates of Alexandria, Jerusalem, and Antioch. Constantinople, the city of the first Christian emperor (New Rome), though since 1453 in the hands of the Turk, is still the natural center of the whole Greek Church, and may become for the Eastern world, at some future day, in Christian hands what Gregory Nazianzen eloquently described it to be in the fourth century, "the eye of the world, the strongest by sea and land, the bond of union between East and West, to which the most distant extremes from all sides come together, and to which they look up as to a common center and emporium of the faith." 2. The Orthodox Church in Russia, under the permanent Holy Synod of St. Petersburg and the czar, whose dominion now stretches in unbroken line across the two continents of Europe and Asia. The czar is the personal, as Constantinople is the local, center of the whole Greek Church. 3. The National Church of the kingdom of Greece, which since 1833 is governed likewise by a permanent holy synod, but is less dependent upon the state than the Russian Church. 4. Distinct from these, and belonging to the Roman Church, are the United Greeks, scattered through Turkey, Hungary, Galicia, Transylvania, and Russia. They acknowledge the authority of the pope, and adopt the dogma of the double procession of the Holy Spirit, but are otherwise allowed to hold to their ancient discipline, marriage to the lower clergy, *communio sub utraque*, leavened bread, their liturgy, and the use of the Greek language. 5. The Greek or rather Oriental Schismatics, Nestorians, Jacobites, Armenians, Maronites, etc., are separated from the Greek and Latin Catholic Church mostly on the dogma of Christ's person, and have independent organizations, which rise up as the broken fragments of

* Owing to the long connection with the East Roman empire of Byzantium (New Rome the Greek language is now known in the East as "Romaic," not as "Hellenic," and for many years the Greeks distinguished themselves as "Romans" from the surrounding Turks. The term Ἕλλην used by Polybius as equivalent to the Latin *Graecus* was by the Greeks themselves always regarded as archaic. They called themselves *Hellenes*.

ancient national churches from surrounding Mohammedanism and heathenism in Western Asia and Africa.

III. *Historical Survey.*—The Greek Church has no continuous history like the Latin or the Protestant. She has long periods of monotony and stagnation; she is isolated from the main current of progressive Christendom; her languages and literature are little known among Western scholars; she has more interest for the antiquarian and traveler than for the historian and philosopher. Yet this Church is the oldest in Christendom.* She still occupies the sacred territory of primitive Christianity, and claims most of the apostolic sees, as Jerusalem, Antioch, Ephesus, and the churches founded by Paul and John in Asia Minor and Greece. All the apostles, with the exception of Peter and Paul, labored and died in the East. From the old Greeks she inherited the language and certain national traits of character, while she incorporated into herself also much of Jewish and Oriental piety. She produced the first Christian literature, apologies of the Christian faith, refutations of heretics, commentaries of the Bible, sermons, homilies, and ascetic treatises. The great majority of the early fathers, like the apostles themselves, used the Greek language.† Polycarp, Ignatius, Clement of Alexandria, Origen, Eusebius, Athanasius, Basil, Gregory of Nazianzen, Gregory of Nyssa, Chrysostom, Cyril of Jerusalem, and Cyril of Alexandria, the first Christian emperors from Constantine the Great, together with a host of martyrs and confessors, belong to the Greek communion. She elaborated the œcumenical dogmas of the Trinity and Christology, and ruled the first seven œcumenical councils, which were all held in Constantinople or its immediate neighborhood (Nicæa, Chalcedon, Ephesus). Her palmy period during the first five centuries will ever claim the grateful respect of the whole Christian world, and her great teachers still live in their writings far beyond the confines—nay, even more outside of her communion, as the books of Moses and the prophets are more studied and better understood among Christians than among the Jews for whom they wrote. But she never materially progressed beyond the standpoint occupied in the fifth and sixth centuries. She has no proper middle age, and no Reformation, like Western Christendom.

IV. There are three periods in the history of the Greek Church.

1. The *classical* or *productive* period, embracing the first six or seven centuries, which has just been characterized. The last great divine of the East is John of Damascus (about 750), who summed up the scattered results of the labors of the preceding Fathers into a tolerably complete system of theology. But he is an isolated phenomenon. The process of degeneracy and stagnation had already set in, and the former life and vigor gave way to idle speculations, distracting controversies, dead formalism, and traditionalism.

2. The *Byzantine* period, corresponding to the Middle Ages of the Latin Church, from the rise of Mohammedanism to the fall of Constantinople (A. D. 750–1453). This includes the gradual separation from the West and from all progressive movements; dependence on the imperial court at Constantinople; continuation of a certain literary activity; philological and biblical studies in slavish dependence on the Fathers; commentaries of Œcumenius (A. D. 1000), Theophylact (d. 1107), Euthymius Zigabenus (d. about 1120); large literary collections, classical and Christian, of Photius (about 890), Balsamon, Zonaras, Suidas, and Simeon Metaphrastes; the liturgical works of Maximus, Sophronius, Simeon of Thessalonica; the Byzantine historians; the image-controversy (726–842); inroads and conquests of Mohammedanism (after 630) in Syria, Persia, Egypt, North Africa; temporary suspension of the patriarchates of Alexandria, Antioch, Jerusalem; finally, the conquest of Constantinople by the Turks and the extinction of the Greek empire (1453), which stimulated the emigration of Greek scholars (Chalcondylas, Chrysoloras, Pletho, Michael Apostolius, Theodore Gaza, George of Trebizond, etc.) to the West, the revival of letters, the study of the Greek Testament, and, aided thereby, the preparation for the Reformation. Yet during this period of decline in her original home the Greek Church made a great conquest in the conversion of the Slavonians—namely, the Bulgarians and Russians (in the ninth and tenth centuries), while the Latin Church converted the Celtic and Teutonic races.

3. The *modern* period, which may be dated from the downfall of the Greek empire (1453). It presents in Asia stagnation and slavery under the tyranny of the Turks, but with great tenacity and independence as to all internal affairs; in Europe rapid external growth through the rising power of Russia, with some reforms in manners, customs, and the introduction of Western culture; protests against Romanizing and evangelical movements; the orthodox Confession of Peter Mogilas (1642); the Synod of Jerusalem (1672); the Russian Church; the patriarchate of Moscow; the reforms of Patriarch Nicon (d. 1681), and of the czar Peter the Great (d. 1725); the reaction of the Old Believers (Raskolniki); the Holy Synod of St. Petersburg (since 1721); the New Greek Church in Hellas (since 1827); modern influences from the West.

V. *Doctrine and Theology.*—The Greek Church is in doctrine substantially agreed with the Roman, but upon the whole more simple and less developed, though in some respects more subtle and metaphysical. The only serious doctrinal difference is that on the PROCESSION OF THE HOLY SPIRIT (*q. v.*). She holds to the leading principles, but rejects many of the consequences or results, of Roman Catholicism. She adheres to the theology of the Fathers, and ignores the succeeding scholastic theology of the Schoolmen, who completed the Roman system. The Eastern theology is not properly systematized. It remains rigidly in the fragmentary state of the old councils. The resistance to the Western clause *filioque* implied a protest against all further progress both in truth and in error, and meant stagnation, as well as faithful adherence to the venerable symbol of the first and most important of the œcumenical councils. The Greek theology is most full on the doctrine of God and of Christ, but very defective on the doctrine of man and the order of salvation. The East went into all sorts of theological and Christological subtleties, especially during the long and tedious Monophysite controversies, which found little or no response in the West; but it ignored the Pelagian controversies, the development of the Augustinian and later evangelical theology. It took the most intense interest in the difference between *ousia* and *hypostasis*, the *homo-ousion*, the relations of the persons in the Trinity, the *perichoresis*, the relation of the two natures in Christ, the Nestorian, Eutychian, and Monophysite heresies, but was never seriously troubled with the questions about predestination and election, total depravity and freedom, vicarious atonement, justification and imputation, conversion and regeneration, faith and good works, merit and demerit, vital union to Christ, and cognate doctrines which absorbed the attention of Western Christendom. The cause for this difference must be sought in the prevailing metaphysical, rhetorical, and objective character of the Eastern Church, inherited partly from Asia, partly from Greece, as distinct from the practical, logical, and subjective tendency of the Western churches, which is derived from the Roman and the Teutonic nationalities. The difference is illustrated already by the Nicene Creed, with its metaphysical terms about the Son, as compared with the more simple and popular Apostles' Creed, which originated in the West and is very little used in the East.

VI. *Government.*—The Greek Church is a patriarchal oligarchy, in distinction from the papal monarchy. The episcopal hierarchy is retained, the papacy rejected. The Vatican decrees of 1870 have intensified the separation between the two churches. Centralization is unknown in the East. The patriarchs of Constantinople, Alexandria, Antioch, and Jerusalem are equal in rights, though the first has a primacy of honor. The Eastern hierarchy resembles the Jewish type. The Greek priest within the veil of the sanctuary is concealed from the eyes of the people, but in social respects he is nearer the people than the Romish priest. He is required to marry once, but forbidden to marry twice. Celibacy is confined to bishops and monks. Absolution is given only in the form of a prayer, "May the Lord absolve thee!" instead of the positive form, "I absolve thee." The confessional exists, but in a milder form, with less influence than in Romanism. The laity are more independent, and the Russian czar, like the Byzantine emperor of old, is the head of the Church in his dominion. The unction of confirma-

* The Jews were indeed converted before the Greeks (Ἕλληνες), but the Jewish Christian churches passed over into the Greek, and the majority of the original Jewish converts were Greekish Jews or Hellenists.

† Even Clement of Rome, Hermas, Irenæus, Hippolytus, and others who belong to the Western Church, wrote in Greek. The early popes were Greeks. The very name of pope is Greek, and belongs to every pastor in the East. The Roman congregation itself was originally a colony of Greek Christians, Hellenes, and Jewish Hellenists. In this sense, too, the maxim of Horace holds good: "*Græcia capta ferum victorem cepit.*"

tion is made to symbolize the royal priesthood of every believer. The monastic orders, though including many clergy, are not clerical institutions; the community of Athos is a lay corporation with chaplains.

The administration of the churches as developed in the Byzantine empire is most complicated, and involves, besides the regular clergy, an army of higher and lower ecclesiastical offices, from the first administrator of the church property (*ὁ μέγας οἰκονόμος*), the superintendent of the sacristy (*ὁ σκευοφύλαξ*), the chancellor or keeper of ecclesiastical archives (*ὁ χαρτοφύλαξ*), down to the cleaners of the lamps (*οἱ λαμπαδάριοι*), the bearer of the images of saints (*ὁ βασταγάριος*). These half-clerical officers are divided into two groups—one on the right, the other on the left; each is subdivided into three classes, and each class has again five persons. Leo Allatius and Heineccius enumerate fifteen officials of the right group, and even more of the left. But many of these offices have either ceased altogether or retain only a nominal existence.

VII. The *cultus* is much like the Roman Catholic, with the celebration of the sacrifice of the mass as its center, with an equal and even greater neglect of the sermon, and is addressed more to the senses and imagination than to the intellect and the heart. It is strongly Oriental, unintelligibly symbolical and mystical, and excessively formalistic. The Greeks reject organs, musical instruments, and sculpture, and make less use of the fine arts in their churches than the Roman Catholics; but they have even a more complicated system of ritualism, with gorgeous displays, semi-barbaric pomp, and endless changes of sacerdotal dress, crossings, gestures, genuflexions, prostrations, washings, processions, which so absorb the attention of the senses that there is little room left for intellectual and spiritual worship.* They use the liturgy of St. Chrysostom, which is an abridgment of that of St. Basil, yet very lengthy, and contains, with many old and venerable prayers, later additions from different sources to an excess of liturgical refinement.

The most characteristic features of Greek worship, as distinct from the Roman, are—the threefold immersion in baptism, with the repudiation of any other mode as essentially invalid; the simultaneous performance of the act of confirmation and the act of baptism, which in the West have been separated: the anointing with oil in cases of dangerous illness, which Rome has changed into extreme unction of the dying; infant communion, which the Latin Church has not only abandoned, but forbidden: the communion under two kinds (*κατὰ τὰ δύο εἴδη, sub utraque*); the use of leavened instead of unleavened bread in the Eucharist; the standing and eastward posture in prayer; the stricter separation of the sexes; the use of the screen or veil before the altar, and the withdrawal of the performance of the mysteries from the eyes of the people.

The worship of saints, relics, flat images, and the cross is carried even further than in the Roman Catholic Church, but statues, bas-reliefs, and crucifixes are forbidden. In Russia, especially, the veneration for pictures is carried to the utmost extent, and takes the place of the Protestant veneration for the Bible. The picture with the lamp burning before it is found and worshiped in the corner (the sacred place) of every room, in the street, over gateways, in offices, taverns, steamers, railway and telegraph stations, in the knapsack of every soldier—not as a work of art, but as an emblem, a lesson of instruction, an aid to devotion. The vernacular languages are used in worship—the Greek in Turkey and Greece, the Slavonic in Russia—but they have to a considerable extent become unintelligible to the people. The Oriental sects hold to their native dialects, the Syriac, Armenian, etc. The old Greek calendar is eleven days behind the new style introduced by Gregory XIII.

VIII. The Greeks and Russians are very religious in outward observances and devotions. They are liberal in unmeaning compliments. The Greek Christians surpass their Mohammedan neighbors in chastity, but are behind them in honesty. In Russia there is the same divorce between religion and morality. The towns are adorned with churches and convents; every public event is celebrated by the building of a church; every house has an altar and sacred pictures; every child his guardian angel and baptismal cross; a Russian fasts every Wednesday and Friday, prays early and late, regularly attends mass, confesses his sins, pays devout respect to sacred places and things, makes pilgrimages to the tombs and shrines of saints, and has the phrase *Slava Boga* (Glory to God) continually on his lips. And yet many of the priests are grossly intemperate.

IX. *The Greek Church and the Bible.*—Concerning the extent of the canon of the Scriptures the Eastern Church is not quite consistent, and stands midway between the Roman and the Protestant view concerning the Jewish Apocrypha. The Orthodox Confession repeatedly quotes the Apocrypha as authority, and the Synod of Jerusalem mentions several apocryphal books (The Wisdom of Solomon, Judith, Tobit, the History of Bel and the Dragon, the History of Susannah, The Maccabees, and The Wisdom of Sirach) as parts of the Holy Scriptures. On the other hand, Metrophanes enumerates only twenty-two books of the Old Testament (according to the division of Josephus, who counts the twelve minor prophets as one, and combines several historical books), and eleven books of the New Testament (counting fourteen Epistles of Paul as one book, and so the two Epistles of Peter and the three of John), and then speaks of the Jewish Apocrypha as not being received by the Church among the canonical and authentic books, and hence not to be used in proof of dogmas. The Longer Catechism of Philaret likewise enumerates (with Josephus, St. Cyril, and St. Athanasius) only twenty-two books of the Old Testament and twenty-seven books of the New, and says that "the Wisdom of the Son of Sirach and certain other books" are ignored in the list of the books of the Old Testament "because they do not exist in the Hebrew." The use of the Apocryphal books is founded in this, that "they have been appointed by the Fathers to be read by proselytes who are preparing for admission into the Church."

As to the *circulation* of the Scriptures among the laity, it is not encouraged, and certain portions, especially of the Old Testament, are declared to be unfit for general use. But the Greek Church has never expressly prohibited the reading of the Bible to the people; and the Orthodox Church of Russia has always had a popular version of the Bible, first in the old Slavic, and now in modern. Alexander I., by a ukase of Jan. 14, 1813, allowed even the British and Foreign Bible Society to establish a branch in St. Petersburg. Through the labors of this society nearly 500,000 copies of the New Testament and the Psalms were scattered in thirty-two languages all over the empire. But it should be remembered that not more than one out of ten Russians can read at all. In 1825 Nicholas, under the influence of the monks, or the black clergy, placed the book under arrest, and replaced it by an official Book of Saints. But his successor, Alexander II., the emancipator of the serfs, also emancipated the Bible, and restored in part, at least, the liberty of the Bible Society, but restricted it to the Protestant population. The printing and circulating of the Bible in the Russian language and within the Orthodox Greek Church is under the exclusive control of the Holy Synod of St. Petersburg.

LITERATURE.—The chief sources are the acts of the first seven œcumenical synods (from the first of Nicæa, 325, to the second of Nicæa, 787); above all, the creeds and canons of the Council of Nicæa, 325, and the Council of Chalcedon, 451. The writings of the Greek Fathers, especially Athanasius, Chrysostom, and John of Damascus. The Confession of Gennadius, Patriarch of Constantinople (delivered to the Turkish sultan, Mahomet II., 1453); the Orthodox Confession of Peter Mogilas, Metropolitan of Kiev (1643); the eighteen decrees of the Synod of Jerusalem and the Confession of Dositheus (1672, mainly directed against the patriarch Cyril Lucar and his attempt to Protestantize the Greek Church); the Russian catechisms of Platon, and especially of Philaret (Metropolitan of Moscow, d. 1867). The Longer Catechism of Philaret, issued by authority of the Holy Synod of St. Petersburg, 1839, is used in all the churches and schools of the Russian empire, and is by far the best modern exposition of the orthodox doctrine of the Eastern Church. It contains in questions and answers a commentary of the Nicene Creed, the Lord's Prayer, the Nine Beatitudes, and the Ten Commandments. See Leo Allatius on the consent of the Greek and Latin Churches (Col., 1648); Le Quien, *Orions Christianus* (1740); Jac. Goar, *Euchologium, s. Rituale Græcum* (1667); John King, *Rites and Ceremonies of the Greek Church in Russia* (London, 1772); John Mason Neale, *History of the Holy Eastern Church* (London, 1850); Dean Stanley, *Lectures on the Eastern Church* (London and New York, 1861; 3d ed. 1866); Gass, *Symbolik der Griech. Kirche* (1872). On the Russo-Greek Church, see also the works of Strahl, Moura-

* Stanley (*Eastern Church*, p 32) characterizes the Greek worship as "a union of barbaric rudeness and elaborate ceremonialism."

vieff, Pinkerton, Blackmore, *The Doctrine of the Russian Church* (1865); Haxthausen, Philaret, *Geschichte Russlands* (1872); Basaroff, Boissard, *L'église de Russie* (1867, 2 vols.). PHILIP SCHAFF.

Greek Empire: See BYZANTINE EMPIRE.

Greek Fire: a highly inflammable compound, probably made of naphtha, saltpeter, and sulphur, and much used by the Byzantine Greeks in defensive and offensive warfare; but there is much doubt as to its composition. It was thrown upon the enemy by means of a copper tube, or pledgets of tow were dipped in it and attached to arrows, which were discharged at hostile ships or towns. This material was also used in Western Europe and in Asia to some extent in the Middle Ages. Its invention was ascribed to Callinicus of Heliopolis, in Egypt, in 668 A. D.; and it was first used by Constantine Pogonatus against the fleet of the caliph Moawia at the siege of Constantinople in 673, with the most complete success. It is, however, generally considered an Arabian or an East Indian invention. The use of similar compounds called by the name has been attempted in modern times without much success, the new plan being to throw them in shells or grenades.

Greek History: See GREECE, HISTORY OF ANCIENT.

Greek Language: the vernacular of the inhabitants of Greece. It belongs to the Indo-European family of languages. Its chief characteristics are copiousness of inflection and vocabulary, and consequent capacity for fine distinctions, wonderful power of self-development, great vivacity, flexibility of expression, and freedom from arbitrary rules.

The Greek language may be divided into two main divisions, *Ancient Greek* and *Modern Greek*, the latter beginning with the end of the eighth century. The history of ancient Greek may be subdivided into two chief periods: (1) the classic period, from the earliest times to 330 B. C.; (2) the post-classic period, from this date to about 800 A. D.

ANCIENT GREEK.

Dialects.—In the classic period the Greek language was by no means uniform. Though all Greeks felt their community of speech, and seemed to have understood one another without difficulty, yet the dialectic variations were considerable. Most of these dialects were little cultivated by literary use. Only two, Ionic and Attic, do we know through literary remains of any extent; of all the others, our knowledge depends chiefly on inscriptions. The number of dialectic inscriptions has greatly increased, and discoveries are constantly bringing more to light the astonishing multiformity of the Greek tongue. The traditional division of the dialects into Ionic, Doric, and Æolic, which has come down to us from the ancients, has been found inadequate. It is impossible to unite in a single group the six or more dialects which are neither Ionic nor Doric; it is evident that two or three such groups must be recognized, and the term Æolic can not be extended over all of these. It will be convenient for the present to divide the Greek dialects into four groups: Ionic, Doric, Æolic, and other dialects. The following are the chief individual dialects, with some characteristics of each:

A. IONIC, including Attic, which is but a branch of Ionic. Characteristic of the Ionic is the change of original long *α* into *η*, the particle *ἄν* = *κα*, *κε*, and the loss of digamma.

1. *Attic*, the chief literary dialect. It retains long *α* in certain positions (*πράσσω*, *σοφία*), verging in this respect toward the Doric. It was by holding this middle position the better fitted to become the universal Greek language. Unlike the other Ionians, the Athenians contracted contiguous vowels freely; indeed, some contractions, as that of *φιλέομεν* to *φιλοῦμεν*, are found only in Attic.

2. *Ionic of the Asiatic coast and islands*, often called simply Ionic, distinguished by avoidance of contraction and tolerance of successive vowel-sounds (*δηϊόφεν*), including—

(*a*) *Old Ionic* of the Homeric poems and all later epics, a partly conventional and artificial language, containing much that is extremely ancient (genitive in *οιο*, futures and aorists with *σσ*, traces of digamma), side by side with forms of a later stage.

(*b*) The so-called *New Ionic*, the spoken language of the Asiatic Ionians; its local variations are no longer traceable. It is known by the writings of Herodotus and Hippocrates. It has *κ* for *π* in interrogatives, as *κοῦ*, where.

B. DORIC.—All Doric dialects have *μες* for *μεν* in 1st pers. pl.; *ντι* in 3d pers. pl. (*λέγοντι* for *λέγουσι*); future in *σιω* or *σεω* for *σω*: infinitive in *μεν* for *ναι* (*δόμεν* = *δοῦναι*); *κά* for *ἄν*; gen. pl. 1st decl. in *ᾶν*, gen. sg. masc. in *ᾱ* (*πολίτα πολιτᾶν* = *πολίτου*, *πολιτῶν*). The W-sound (digamma) was, as a rule, retained. Many of the Doric dialects have *η* and *ω* for Attic *ει* and *ου* in certain situations, as *μῶσα*, *δάμω*, *τιθῆσα*, *ἦχον* = *μοῦσα*, *δήμου*, *τιθεῖσα*, *εἶχον*; others agree with the Attic.

1. The *Doric* of Crete, known chiefly from the laws of Gortyn. Samples: *ϜίσϜος* = *ἴσος*, *ὁπόττος* = *ὁπόσος*, *δικάδδω* = *δικάζω*. *Ϝειπάδδω* = *εἰπάσδω*.

2. The *Doric* of Laconia, Messene, and the colony Heraclea in Italy. The Laconian changed *σ* between two vowels to *h*: *πᾶά* = *πᾶσα*.

3. *Doric* was also spoken in Rhodes, Melos, Thera, and some other islands, in Megara, Argos, Corinth, Cyrene, Corcyra, and Sicily. The Megarian had *χρῆδδω* = *χρῄζω*, etc. The Argive preserved *νς* like the Cretan. The Rhodian had a peculiar infinitive in *-μεν*: *θέμεν* = *θεῖναι*.

4. A special group is the *Northern Doric* of Phocis, Locris, etc. Peculiar is the use of *ἐν* for *εἰς* with accus., of *-οις* in dat. pl. 3d decl., as *Ϝετέοις* = *ἔτεσι*. The Locrian has *ἐ* = *ἐκ*, *στ* for *σϑ* in verbal forms (*χρήστω* = *χρήσϑω*), *πατάρα*, *ἀμάρα* for *πατέρα*, *ἡμέρα*.

C. ÆOLIC.—Three dialects may be here included:

1. The language of *Lesbos* and the neighboring coast. *Ἀπύ* = *ἀπό*, *κρέτος* = *κράτος*: *αις οις* from *ανς ονς*, thus accus. *μοίσαις* = *μούσας*, *λόγοις* = *λόγους* (the Lesbian datives being *μοίσαισι*, *λόγοισι*); doubled consonants, *βόλλα* = *βουλή*, *ἔνεμμα* = *ἔνειμα*; general retraction of the accent, and disappearance of the rough breathing, *ὕμμες* = *ὑμεῖς*. This is the language of Alcæus and Sappho, often called simply Æolic.

2. *Thessalian.*—Peculiar is *ου* for *ω* (*τοῦν πολιτάουν* = *τῶν πολιτῶν*); genitive of 2d decl. in *οι* (*λόγοι* = *λόγου*), and dative in *ου* (*τοῦ κοινοῦ* = *τῷ κοινῷ*); *μά* = *δέ*; pronoun *ὄνε* = *ὅδε*; 3d pers. plur. in *-εν* for *-ν* (*ἐδώκαεν* = *ἔδωκαν*).

3. *Bœotian.*—*βανά*, *βανῆκος* = *γυνή*, *γυναικός*; *δ* for *ζ*, as *δυγόν*, *γραμματίδδω* = *ζυγόν*, *γραμματίζω*; 3d pers. pl. in *νθι* (*ἔχωνθι* = *ἔχωσι*); a very peculiar vowel-system by which many of the long vowels and diphthongs are replaced by others, *ει* standing for *η* and *ῃ*, *η* for *αι* and *ᾳ*, *ι* for *ει*; in the later stage *υ* stands for *οι* and *φ*, *ου* for long and sometimes for short *υ*; examples, *Ἠολεῖα* = *Αἰολῆα*, *Γελατιήν* = *Ἐλατειαίφ*, *τούχα* = *τύχη*, *τραγαϜυδός* = *τραγῳδός* (*-αοιδός*). The dative sg. of 1st and 2d decl. ends in earlier times in *αι* and *οι* (*ταῖ ὁδοῖ* = *τῇ ὁδῷ*), but sometimes in the Latin-like diphthongs *αε* and *οε* (*Πλαύχαε*, *Διωνύσοε*); in later times in *η* and *ν* (*τῆ ὁδῦ*). *Σανκράτεις* stands for *Σωκράτης*.

D. OTHER DIALECTS.

1. *Arcadian.*—*Ἐς* for *ἐξ*; *ἰν*, *κατύ*, *ἀπύ* for *ἐν*, *κατά*, *ἀπό*; *δέλλω* for *βάλλω*; *κ'ἄν* = *ἄν*; genit. of 1st decl. in *-αυ*, *ζαμίαυ* = *ζημίας*.

2. *Cyprian.*—Related to Arcadian. *σίς* = *τίς*; *αἶλος* = *ἄλλος*. Many peculiar words, as *ὔϜαις ζᾶν*, during life.

3. *Elean.*—Fondness for *a*-sound. *Ϝάργον*, *πάρ*, *Ϝράτρα*, *μά*, *ἔα* = *ἔργον*, *περί*, *ῥήτρα*, *μή*, *εἴη*, words in which even the Doric has *ε*, *η*.

ALPHABET.—Though not strictly a part of the language, the alphabet may receive some notice here. The Greeks received their letters from the Phœnicians, at what time is uncertain, but the earliest known inscriptions were not written before 650 B. C., and the Homeric poems make no mention of writing. The Phœnician alphabet of twenty-two signs ending with T, was increased by a new vowel-sign Υ at the end, and later by the letters Φ, Χ, Ψ, but these last two were differently employed, the western Greeks using the sign Χ for the sound *x* (so too the Latins), and Ψ for *ch*, while with the eastern Greeks the Χ was *ch* and Ψ *ps*. The letter Ξ was employed by the eastern Greeks as *x*, but dropped by the western. The Phœnician alphabet furnished two signs for *s*; after some fluctuation one of these was dropped. The forms of the letters varied much at different times and places, but became fixed in the fourth century B. C. The letters at first were turned (Ǝ, Ͷ), and the writing proceeded from right to left; this, however, was early reversed. Ε and Ο stood originally for the long as well as the short *e* and *o* sounds; Η in earlier times generally represents the rough breathing *h*. The Ionians first began regularly to use Η for the long *ē*, and they also invented the sign Ω for the long *ō*. This mode of writing, and with it the complete Ionic alphabet, became general about 400 B. C., superseding the older alphabets. Breathings and accents were unused till long afterward. Capitals only were known to the ancients; the cursive letters were developed in the mediæval period.

PRONUNCIATION.—The vowels in the classical period were sounded as in Italian or German, except that *υ* early assumed in many dialects the sound of the French *u*. The

diphthongs αι, ει, οι, αυ, ευ, υι sounded as in *ay, rein, boil, how, few, we*; the ι in ᾳ, ῃ, ῳ was distinctly heard; ου assumed early a simple sound, as in *youth* = Roman *u*. The guttural nasal (*n* in *ink*) was expressed by ν or γ indifferently. The aspirates φ, ϑ, χ were at first tenues with following breathing, as in *haphazard, pothook, blockhead*; later they came to be merely spirants (*f*, Eng. *th*; Germ. *ch*). *F* sounded like Eng. *w*, ζ like *dz*, but in some parts of Greece like *zd*.

Phonetic Relations to Parent Language.—The vowels α, ε, η, ο, ω, ι, υ correspond in general to the sounds *a, e, o, i, u* of the original Indo-European tongue. But short ᾰ, standing before or after ρ and λ, has, in many words, grown out of the liquid consonant; as ἔτραπον for ἔ-τρπ-ον. Similarly ᾰ with μ and ν, sometimes even replacing those consonants; βατός for older βν-τός. In Ionic two kinds of η have to be distinguished—the original Greek η (θήρ, μή, μήδομαι) and that which has arisen from ᾱ (ἵστημι, ἡδύς = Doric ἵστᾱμι ἁδύς). The diphthongs αι, ει, οι, αυ, ευ, ου often correspond to similar diphthongs of the parent language—thus Foῖδα, εἶμι (origin. *voida, eimi*, Sans. *vēda, ēmi*). Elsewhere diphthongs have arisen from the accidental concurrence of two vowels, as γένει from γενε(σ)ι, by the dropping of σ. From the above rule of correspondence must be excepted the spurious diphthongs ει and ου, to be spoken of below. The so-called *improper* diphthongs ᾳ, ῃ, ῳ, ηυ, ωυ are specifically Greek and of secondary origin, the result of contraction. Noteworthy is the interchange of ε, ο, α (τρέπω, τρόπος, ἕτραπον), ει, οι, ι (λείπω, λέλοιπα, ἔλιπον), and ευ, υ (φεύγω, ἔφυγον), in the process of inflection and word-formation. Analogous in English is *sing, sang, sung*; *ride, rode, ridden*. Of consonants, σ, κ, γ, τ, δ, π, β answer in general to the same sounds in the parent language; the aspirate χ, ϑ, φ to original *gh, dh, bh*; compare ἐ-λαχύς, τίϑημι, φημί with Sans. *laghus, dadhāmi, bhāmi*. The nasals μ, ν Indo-European *m, n*, but ν final often represents an *m*; ζυγό-ν = Lat. *jugu-m*. Greek ρ = original *r*; λ responds to either *l* or *r* of cognate languages. Greek *F* answers to the semi-vowel *v* (*w*) of the cognate tongues. The double sounds ξ, ψ arose in various ways too complicated to be here detailed. Z is in most cases the product of a union of δ or γ with following ι; when initial it responds to *y* of other languages; ζυγόν = Lat. *jugum*. The Greek rough breathing is (except where of secondary origin) a remnant of a lost consonant (oftenest σ or σ*F*), and never corresponds to Latin or Sanskrit *h*.

Principal Phonetic Tendencies.—1. *Disappearance of consonants* was the most prolific cause of changes of form in Greek. *F* disappeared entirely in the Ionic branch, and to a great extent in the others. Σ falls out between two vowels and at the beginning of a word; γένεος from γενεσ-ος (Lat. *gener-is* for *genes-is*), ῥόος from σροFος. Many words have lost initial σ*F*, as ἡδύς from σFαδυς (Lat. *sva(d)vis*, Eng. *sweet*). Difficult combinations of consonants may be lightened; τ, δ, ϑ regularly disappear before σ. The combination νσ is especially disliked, and is avoided by nearly all dialects, oftenest by dropping the ν. 2. *Changes of Consonants.*—Ι often turns a preceding τ to σ, though not in all dialects: εἴκοσι, πλούσιος (from πλοῦτος), φησί; but Doric Fίκατι, πλούτιος, φατί. Τ, δ, ϑ before μ become σ, but not universally; Ionic ἴδμεν, Doric ϝεδμός or τεδμός for Attic ἴσμεν, ϝεσμός. Assimilation, either total, as ὔμμα (Æol. ὔππα) for ὔπ-μα, or partial, as ἐμβαλεῖν, γέγραπται for ἐν-βαλεῖν, γεγραφται, is frequent. Metathesis (transposition of a vowel and consonant) occurs in root-syllables, chiefly affecting liquids and nasals: ἔ-ϑαν-ον, ϑνή-ισκω. Noteworthy is the spontaneous generation of β between μρ, μλ, and δ between νρ, νλ; ἀνδρός for ἀνερός, μέμβλωκα for μέμλωκα; so French *chambre, cendres* from *camera, cin(e)res*; when initial the μ, ν are dropped: (μ)βλώσκω, (μ)βροτός for μλω-σκω, μρο-τος, roots μολ, μορ. Change of organ in mutes is seen in many words: ποῦ, Ionic κοῦ; βάλλω, Arc. δέλλω; πέσσω (i. e. πεκ-ιω) Lat. *coqu-o*; πέντε, Æol. πέμπε, Lat. *quinque*; τίς, Lat. *quis*, etc. In such cases the original is believed to have been a peculiar *q* or *g* sound. The vowel ι or its consonant form ϳ unites with preceding δ or γ to form ζ, with κ, τ, χ, ϑ to form σσ or ττ. This is regularly the origin of σσ (= ττ) and ζ in Greek; πεζός = πεδ-ιος, ἐλάσσων = ἐλαχιων; so Æol. κόρζα, ζά for καρδία, διά. The process is the same as in Italian *mezzo* (*medius*), French *face* (*facies*). 3. *Contraction of vowels*, which are brought together mostly by the loss of intervening consonants. The rules for Attic can be found in any Greek grammar, but the usage of the dialects differed much; thus αε gave in Doric η, ἑνίκη = Att. ἑνίκα; εε, οο gave in some dialects η and ω; ἀγῆται, ἵππω; in others, as in Att., ει and ου. ἠγεῖται, ἵππου. The epic dialect shows certain uncontracted verbal forms with a peculiar modification, as ὁρόω, αἰτιάασϑε, from ὁράω, αἰτιάεσϑε. 4. *Loss of Vowels.*—The Greek often drops the close vowels ι, υ between other vowels, changing them first into the semi-vowels *F*, ϳ: Ἀθηναία, Ἀθηνάα; βασιλην-ος, βασιληF-ος, βασιλῆος. 5. *Vicarious lengthening of a vowel* in compensation for an omitted consonant. When μ, ν, ρ, λ are dropped *before a continuant consonant*, the preceding vowel is often lengthened to compensate for its loss of position. The commonest case is (ν)σ. The dialects differ widely in respect of this process. The Lesbian often avoids it, contenting itself with assimilation of the consonants. Otherwise it replaces omitted ν by ι. Examples are—ἐσ-μι, Lesb. ἔμμι, other dialects ἠμί and εἰμί; aorist ἐμεν-σα, Lesb. ἔμεννα, other dialects ἔμηνα and ἔμεινα; ξεν-Fος, Lesb. ξεννος, Ionic ξεῖνος, Attic and other dialects ξένος; παν-σα, Lesb. πᾶσα, other dialects πᾶσα; ϑεν-σα, strict Dor. ϑῆσα, other dialects ϑεῖσα; μον-σα, Lesb. μοῖσα, strict Dor. μῶσα, other dialects μοῦσα; τόνς retained by Cretans and Argives, other Dorians τώς τός and τούς, Ionic τούς, Lesb. τοίς. The Ionic, Attic, and some Doric dialects lengthen ε and ο to the false diphthongs ει, ου, which must be distinguished from the genuine ει and ου, as they were originally neither written nor sounded as diphthongs. The same is true of the ει and ου which arise from the contraction of εε, οε, οο, εο (see above). 6. *Transposition of Iota.*—Ι (or ϳ) sometimes appears to spring over a consonant and intrude itself into the previous syllable: τείν-ω for τεν-ιω. 7. *Prothesis* of vowel at beginning of a word, to assist in the enunciation of a difficult consonant or combination; so in Italian, *i-scrivere*; French, *e-sprit* (*spiritus*); χϑές or ἔχϑες; often before *F*, where it remains after the latter's disappearance: ἄεδλον, ἑείκοσι for ἀ-Fεδλον, ἐ-Fεικοσι; even before a simple liquid ἐ-ρυϑρός = *ruber*. 8. *At the end of a word* no consonant but ν, ρ, σ can stand. Others drop off: γάλα for γαλακτ. Α ν, sometimes fixed, sometimes movable, attaches itself to some final syllables: 1st pers. pl. -με-ν, Dor. -μες, Lat. -*mus*; dat. pl. -σι or -σι-ν. In other words an adventitious *s* is seen, πολλάκι-ς.

Inflection.—1. *Of Nouns.*—The eight cases of the Indo-European language are in Greek reduced to five (nominative, accusative, genitive, dative, vocative). The lost cases, ablative, locative, and instrumental, are preserved only in adverbial forms, though some forms of the Greek dative sing. and dative plur. are original locative forms. Other locatives are οἴκοι, χαμαί (*humi*); instrumentals are κρυφῇ, ἅμα. The ablative is preserved in the common adverbs in -ω or -ως; οὕτω, οὕτως, originally οὕτωτ, like Latin *bonō(d)*. The stems of Greek nouns end in long α (1st declension), ο (2d declension), and in close vowels, diphthongs, and consonants (3d declension). The case-endings, added to these stems, are in the oldest authenticated Greek forms: For ο and α stems; nom. sg. -ς (but fem. α-stems have no case-ending), gen. (σ)ιο or ς, dat. ι with long vowel preceding, acc. ν, nom. plur. ι, gen. ων or (σ)ων, dat. ισι or ις, acc. νς. For consonant and close-vowel stems; nom. sg. ς, gen. ος, dat. ι, acc. ν or α, nom. pl. ες, gen. ων, dat. σι, acc. νς or ας. Neuters in nom. acc. pl. have the ending α; in nom. acc. sg. they have in the consonant declension no ending, but the ο-stems take the accusative ending ν. The Greek has retained the dual number more fully than most of the related languages, though only in two case forms; its endings are ε, οιν. Vocative cases proper have no ending. The union of stems and endings gives rise to many phonetic changes in accordance with principles explained above. 2. *Of Pronouns.*—The flexion of pronouns differs in many points from that of nouns, and is too complicated to be discussed here. The Greek ὁ, ἡ, τό = Sanskr. *sa, sā, tat*; τοῖο = *tasya*, τόν = *tam*, τήν (Dor. τάν) = *tām*, etc. The Dorians and most Æolians had τοί, ταί in the nom. pl., not οἱ, αἱ. The relative pronoun ὅς, ἥ, ὅ = Sans. *ya-s, yā, ya-t*. The interrogative τίς is Sans. *ki-s*, Lat. *quis*. 3. *Of Verbs.*—The structure of the Greek verb is in several ways remarkable. First, in the number of significant variations of form; the Greek finite verb (excluding infinitives, participles, and all periphrastic forms) has about 250 different forms, in contrast with 94 of the Latin. Second, the Greek alone of all Indo-European languages has preserved intact the original distinction of the tenses. It never allows the perfect to become a mere preterite, and it has, in its use of present and aorist, carefully kept up the distinction between continued and momentary action, which enables it, for example, to express directly such differences as "be ill" and "fall ill," "weep" and "burst into tears," which we accomplish only by circumlocutions. The Greek

finite verb has three voices; besides the active and the passive, the *middle* voice, representing the subject as acting upon, for, or with himself; this is made the means of many fine distinctions. The middle and passive are distinguished in form only in future and aorist, and here the distinction is not very old, and not uniformly kept up. Besides the indicative and imperative moods, there are two oblique moods —subjunctive (conjunctive) and optative. The tenses fall into three groups, representing continued, momentary, and completed action. The distinction of time belongs to the indicative only; its seven tenses being thus classified:

	Continued.	*Momentary.*	*Completed.*
Present,	Present,	.....	Perfect.
Past,	Imperfect,	Aorist,	Pluperfect.
Future,	Future,	.....	Future Perfect.

The oblique moods do not distinguish time, and have three tenses only, the present for continued, the aorist for momentary, the perfect for completed action. The structure of most of these tenses is inherited from the parent language. The present and imperfect are often distinguished by some amplification of the stem of the verb; this is of several sorts, and furnishes the best ground for a classification of verbs. The so-called second aorist lacks this, and is thus distinguished from the present. The perfect and pluperfect have for their characteristic the reduplication, primarily a repetition of the initial syllable. All these tenses exist in two forms (called respectively the ω-conjugation and the μι-conjugation), as they are with or without a certain vowel (thematic or connecting vowel) appended to the stem; most verbs follow the former. The future and the so-called first aorist are formed (in the first person sing.) by adding to the stem the suffixes σιω (Attic σω) and -σα. The future perfect is peculiarly a Greek formation; the same is true of the passive aorist and future. The Greek has preserved dual forms of the verb in the 2d and 3d persons. The personal endings of the verb vary for the different moods and tenses. The following may be considered the oldest authenticated Greek forms: 1. For pres., perf., fut., and subj.; active sing. μι (or none), σι, τι; plur. μες, τε, (α)ντι; dual τον; passive sing. μαι, σαι, ται; plur. μεσθα, στε, (α)νται; dual στον. 2. For past tenses and optative, active sg. ν, ς, τ; plur. μες, τε, ν; dual τον, την; passive sing. μαν, σο, το; plur. μεσθα, στε, (α)ντο; dual στον, σταν. The imperative has separate endings. Participles and infinitives are formed from present, aorist, perfect, and future. There is also a rare future optative, a special Greek development.

Formation of Words.—The suffixes by which nominal stems are formed from roots are part of the inheritance from the parent language. Some of these are—α, ο, ι, υ; κο, το, μο, νο, ρο, λο. Fo, ιο (and the corresponding feminines, κα, etc.), εσ, ασ, εν, ον, τηρ, τορ, and various compounds of these. Nouns derived from verb-stems are called primary; those derived from other noun-stems are called secondary; thus δό-σι-ς, κρι-τή-ς, πρεσβευ-τή-ς are primary, but δίκα-ιο-ς, πρεσβύ-τη-ς are secondary, derived from δίκη, πρέσβυ-ς. The commonest secondary suffix is ιο (ια); before it ο is dropped; ἵππ-ιος from ἵππο-ς. Another is Fεντ (χαρι-Fεντ, nom. χαρί-εις), signifying 'abounding in.' The comparative suffixes ιον or ιοσ, τερο, and the superlative ιστο, τατο, deserve mention. To few of these suffixes can a uniform meaning be attached, as that of the *doer* to τηρ. In compound words two stems are united; the latter only is inflected, ἱππο-κόμο-ς. The Greek is rich in compounds, but they rarely contain more than two members. Verbs (called denominative) are freely formed from nouns; most of these end in αω, εω, οω, αζω, and ιζω, the first vowel belonging to the noun-stem; φιλέ-ω from φίλο-ς, with ο changed to ε. From the stems of denominative verbs other nouns may be formed in the same manner as from roots.

Accent.—The accent of the Greeks was not, like ours, a stress on a particular syllable, but is an elevation in pitch. It is confined to the last three syllables of words. The ordinary tone of accented syllables is called *acute* (marked ´), and when it falls on long vowels extends to the end of the same. But long vowels in either of the two final syllables have sometimes the high tone restricted to the first half, the voice descending on the last half; this kind of accent is called *circumflex* (marked ˜). If the final syllable of a word be long, the tone can in no case stand further back than the end of the penultimate vowel; that is, the circumflex can not stand on the penult nor the acute on the antepenult; thus ἀνδρώποις, not ἄνδροποις or ἀνδρῶποις. The accent of most words is *recessive*, going as far back as this rule will allow; but in some words it adheres to the ultimate or penult. An acute at the end of a word is lowered in pitch if other words follow in close connection; so arises a third variety of tone, called *grave* and marked `. Some short words (enclitics and proclitics) have no accent of their own, but lean, as it were, on the preceding or following word.

Syntax.—The structure of Greek sentences is natural and unfettered, giving rise to many colloquial idioms, and admitting many slight inconsistencies which are not looked upon as blemishes. The rules are singularly flexible, the variety of possible constructions very great. As peculiarities of Greek syntax might be named the frequency of *attraction* of case in connection with relative clauses, the wide development of the *inner* accusative ("live a *life*," "run a *race*") in its different varieties, the particle ἄν which plays an important part in the syntax of the verb. The genitive and dative cases have a complex office, the former having taken on itself, in addition to its own, most of the functions of the lost ablative; the dative in like manner those of the old locative and instrumental cases. To explain the Greek uses of these cases from a single fundamental notion is impossible. The Greek is the only language of the Indo-European family which, retaining both the subjunctive and optative formations, has kept them distinct, and made them the basis of different shades of modality. They have each two uses—a primary use, in which they have the force of a modified future (opt. of wishing, subj. of request, and in protasis and apodosis of future conditions); and a secondary use, in which they refer to indefinite frequency in present and past time respectively, the idea of futurity being given up: ἐὰν τοῦτο ποιῇ, εἰ τοῦτο ποιοίη = if he (ever) does (or did) this. The optative has yet another use in indirect quotations.

Later History of the Language.—From the time of Alexander (330 B. C.) on, literary and political influences gave the Attic dialect ascendency over all others; it became the language of the whole Greek world. The other dialects gradually disappeared, first in public life and educated circles, last of all among the masses. The new universal speech took the name of *common* (κοινή) *dialect*. It was a slightly modified Attic; thus for οἶσθα, ἴσμεν, δείκνυμι were said οἶδας, οἴδαμεν, δεικνύω. Outside of Greece, in Syria, Macedonia, Alexandria, the language was spoken with less purity, and many corruptions crept in, the mistakes of foreigners using the Greek language, Ἑλληνισταί. The language of the New Testament and the Septuagint is tinctured with such peculiarities. The pronunciation altered even more than the form of words. Among the earliest changes was that of ει to that of simple ι, and of ζ from *dz* or *zd* to simple *z*. In the first centuries of the Christian era the same influences were yet more actively at work. Β is softened to our *v*, and η yields to the prevailing *itacism*, and takes the sound of ι. The diphthong οι came to coincide in sound with υ; much later both were attenuated to ι. Αι took the simple sound of ε. The diphthongs with υ modify or lose their second vowel. Δ and γ are softened in sound. Some of these phonetic corruptions had taken place in the Bœotian language long before. The quantity of vowels is confused. Inscriptions of the fifth century A. D. and later periods abound in singular misspellings—ἦτος (ἔτος), Εἶσις (Ἴσις), ἐπύησεν (ἐποίησεν), πρεσβοίτεροι (πρεσβύτεροι), κῖτε (κεῖται), καταδουλιζμός (-ισμός), ἀτός (αὐτός), ἐπισκεάζειν (-σκευάζειν). The process of decay went rapidly on after Byzantium was made the head of the Hellenic world. The cleft between the vulgar tongue and the language of the *literati* widens. Roman words are largely adopted—δοσπίτιον, πρίνκιψ, παλάτιον. The written language, though clinging stoutly to ancient models, can not hold its own, and the spoken tongue verges gradually toward the Romaic or modern Greek. The use of diminutives for primitives, of the accusative for the dative, of ἵνα and subjunctive for infinitive, of εἰς for ἐν, of auxiliary verbs θέλω, ἔχω, are among the characteristics of this transitional stage. Long and short vowels are no longer distinguished, and word-accent is made the basis of versification. Inscriptions of the ninth century show the wildest confusion in orthography, as παναγήα Θεοτώκε = παναγία Θεοτόκε, ἐπὴ τὸν ὑκιακὸν = ἐπὶ τῶν οἰκειακῶν.

The completest Greek grammar is that of Kühner (*Ausführliche Grammatik*, 2 vols.; 3d edition revised by Blass, 1891 ff.). The works of Krüger, Madvig, and Goodwin are important for the syntax. On dialects the standard work is Meister's *Die Griechischen Dialekte* (2 vols., 1882–89, uncompleted). An outline of Greek historical grammar is G. Meyer's *Griechische Grammatik* (2d ed. Leipzig, 1886). The best defining lexicon is Liddell and Scott's (7th edition, Oxford, 1889).

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Modern Greek.

Modern Greek is the language of modern Greece, and to a large extent the language of commercial intercourse, as well as the common speech, of large masses of the population along the entire coast of the Eastern Mediterranean and on the islands, in Constantinople, Thrace, and Macedonia, in large districts of Asia Minor, and in parts of Southern Italy. The spoken language abounds in variety of dialects, as might be expected from the mutual isolation of most of the districts where it is spoken. These dialects have been classified by Hatzidakis (Kuhn's *Zeitschrift*, xxx., 387 ff.) into two main groups, a northern and a southern. The thirty-eighth parallel of latitude—i. e. the parallel of Athens—forms an approximate boundary, and the tendency to drop the unaccented vowels *i* and *u* and reduce unaccented *o* and *e* to *u* and *i* is the characteristic which distinguishes the northern group from the southern; thus northern *μνῶν* to southern *μηνῶν*, so *θμός* to *θυμός*, *ἀλφή* to *ἀλοιφή*, *γυναῖκες* to *γναῖκες* or *ναῖκες*, *κιρός* to *καιρός*, *ἄγγιλους* to *ἄγγελος*, *ἰγώ* to *ἐγώ*, *πουλίτκα* to *πολίτικα*, etc. North-Greek comprises the dialects of Thrace, Macedonia, Thessaly, Epirus, Locris, Ætolia and Acarnania, Eubœa, and the Northern Sporades; South-Greek those of the other Ægean islands, including Crete and Cyprus, of Attica and Megara, of the Peloponnesus, of the Ionian islands, and of Southern Italy. The dialects of Asia Minor (Pontus, Cappadocia, Cicilia) probably are to be classified on a like basis. The earlier school of modern Greek philologists (down to about 1880) sought to find in the peculiarities of these dialects traces of the ancient dialectal divisions, Æolic, Doric, etc. Individual sounds, inflectional forms, and words were freely identified as Æolic, Ionic, etc. The language was even accredited with the marvelous power of embalming isolated forms of an earlier type even than the records of ancient Greek. Thus as late as 1879 Georg Curtius (*Griech. Etymologie*, 5th edit., p. 391), in deriving the mod. Gr. *αὐγό*, egg, from anc. Gr. *ᾠόν* (Lat. *ōvum*), claims that *α* is the original Indo-European *a*-sound older than the *ω* of *ᾠόν*, and that *υ* is the digamma which had disappeared in *ᾠόν*. The mod. Gr. plur. *γλῶσσες*, tongues (for anc. *γλῶσσαι*), was commonly written *γλώσσαις*, and explained as the Æolic accusative ending (*-αις* < *-ανς*), though the termination is really borrowed from the consonant stems as *γυναῖκες*; cf. G. Meyer, *Bezzenb. Beitr.*, i., 230. The 2d sing. midd. *λέγεσαι* was explained as older than Homeric *-εαι*, Attic *-ῃ*. Femin. forms like *ἄσπρη* were called Ionic, and those like *κεφάλα* Doric. Abundant illustration of this method of treatment can be found for example in Mullach's *Grammatik der griech. Vulgärsprache* (1856); Maurophrydis, Kuhn's *Zeitschr.*, vii., 137 ff. (1858); Chalkiopulos, *Curtius's Studien*, v., 339 ff. (1872); Deffner. *Archiv für mittel- und neugriech. philologie* (1880). Since 1880, however, the application of strict scientific method particularly in the hands of Hatzidakis, G. Meyer, Foy, Krumbacher, Psichari, W. Meyer, and Thumb has demonstrated beyond a question that, with the sole exception of the Zakonian, a descendant of the Laconian dialect, all the present known dialects are natural successors of the "Common Greek," or Κοινή. (See in particular the admirable summary of the evidence in Hatzidakis, *Einleitung in die neugriech. Grammatik*, pp. 10–171, 1892.)

The *Common Greek*, or Κοινή, was peculiarly the language of that Greek cosmopolitanism which arose out of the ruin of the old city-states after the campaigns of Alexander. It was the Attic Greek readapted from a provincial idiom to become the universal medium of intercourse for the newly organized civilization and life of Alexander's empire. It took its shape chiefly in non-Greek countries under the demands of trade, intercourse, and diplomacy, and had many types, according to the people adopting it. In Greece proper, the local dialects yielded to it more slowly, but the influence of the schools, of literature, and finally of the Church was added to that of usage in the greater world of commerce and intercourse, and gradually they sank back into the position of *patois*, and after the second Christian century disappeared from view. Individual words, like proper names, etc., survived, but that within the period from 300 B. C. to 600 A. D. the old dialects as types of speech became entirely swallowed up in the Attic Common Greek is amply proven by the absolutely new lines of distribution which the later dialects follow. Only the old Doric speech of Sparta has left itself a witness in the Zakonian, which is still spoken on the eastern slopes of Parnon in Northeastern Laconia. (Cf. Deffner, *Zakonische Grammatik*, 1881.) The Doric characteristics of this dialect include such points as: (1) The retention of the old *ā*—e. g. in *μάτη(ρ)*, *φωνά*; (2) the retention of the old *u* for *ŭ*—e. g. in *γουναῖκα*, *σοῦκο* (*σῦκον*); (3) sigma for theta—e. g. *κρίσα* (*κριθή*), *σέρι* (*θερος*); (4) loss of intervocalic sigma—e. g. in *χαλάω* (*χαλάσω*); (5) final rho for sigma—e. g. in *καλὲρ ἔνι* (*καλὸς ἐστι*), *καοῦρ* (*καλῶς*); (6) retention of digamma—e. g. in *βάννε* (*Ϝαρνός*), *δαβελέ* (*δαΕελός* > *δαλός*); (7) iota for epsilon before *e*, *o*, *u*—e. g. in *χρίε* (*χρέος*), *ἐλία* (*ἐλαία*). The characteristics of modern Greek which distinguish it from the ancient classical language are largely present in the Κοινή, and are indeed essentially due to the conditions under which the Κοινή developed. (For a characterization of the Κοινή, see Steinthal, *Geschichte der Sprachwissenschaft bei den Griechen und Römern*, ²ii., 25.) Dislodgments in the habitat or in the constituency of a language involve the commonest occasion for decisive alterations in its materials and structure. The Attic Greek of the fourth century B. C., with its fineness of structure, its marvelous adaptation to both variety and clearness of expression, its firmly organized inflectional system, its established norms of syntactical usage, its moderate vocabulary, and its fullness and clearness of articulation, reflected the life of a comparatively small, well-defined, permanent community possessed of a high degree of culture. The rapid extension of the language which followed the campaigns of Alexander carried it to peoples of various speech—Egyptians, Macedonians, Syrians, Jews, etc., as well as to non-Attic Greeks. Tradesmen and soldiers, not scholars, were its missionaries. The practical necessities of communication rather than the purposes of moral and artistic effect determined form and usage. The inflectional system becomes simplified. Irregular forms are dropped. Finer syntactical distinctions become confused. New words are formed on old analogies, and new types of formation appear. The language tends toward an analytic structure. The puristic reaction toward Attic standards, introduced by the "Atticists" of the second century A. D., was little more than a hopeless protest of pedantry, and while it shows its effects in the diction of Dion Chrysostomos, Ælius Aristides, Lucian, and others of the time, it offered no real check upon the natural development of the language. (Cf. Schmid, W., *Der Atticismus in seinen Hauptvertretern.*)

Changes in Pronunciation.—It is a well-recognized fact that the most of those changes in pronunciation which distinguish the modern from the ancient Greek had already taken place before 600 A. D. Thus *ει* had become *ī* by 100 B. C., *αι* had become *ē* by the second century A. D., and by about the same time *αυ*, *ευ* had become *av*, *ev*. A pronunciation of gamma as spirant appears as early as 300 B. C., and of beta in the first century A. D.; phi changed to *f* by the second century A. D. The distinction between *ο* and *ω* had become obscured by the beginning of our era, and between that time and 400 A. D. the predominance of stress over pitch in the accent asserted itself. That the folk-dialects of modern Greece are direct successors of the common Greek, of which the Byzantine Greek represents the mediæval type, there can therefore remain not the slightest doubt. Only concerning the question of race-descent can doubt exist. This question was vigorously opened in the well-known works of Fallmerayer, especially in his *Geschichte der Halbinsel Morea* (1830), who denied the existence of any pure Greek blood among the present population of Greece. It is now generally recognized as historical fact that Slavic immigrations have occurred at different times, especially in the eighth century, and that large tracts in the Peloponnesus were permanently occupied by them. The original population remained large enough, however, to absorb the intruders and impress its language upon them. Other districts were also, though to a less extent, invaded by them. Many were later expelled. The rest were absorbed. Their language has left traces only in occasional place-names and loan-words. The cities, Attica, and the islands remained free from intermixture. The greater part of the population of the Peloponnesus is, however, probably of mixed blood. Large masses of Albanians also entered the country in the fourteenth and again in the eighteenth century. Twelve per cent. of the present population of the Peloponnesus and 11 per cent. of the population of entire Greece are Albanian. Many of these, in isolated districts, still preserve their own language, but the most have become entirely assimilated, both in language and in national feeling. Despite, then, the undoubted fact that large portions of the modern population are of mixed race, it is reasonably sure that the Greek blood as well as the Greek influence has always predominated, and it is cer-

tain that the modern Greek tongue represents a continuous existence on Greek soil, and not, as has been often claimed, a reimportation from Byzantium. Valuable investigations on this subject are contained in the articles of Philippson, *Zur Ethnographie des Peloponnes*, Petermann's *Mittheilungen* (1890), and *Reise durch Mittel- und Nordgriechenland*, *Zeitschr. der Gesellsch. für Erdkunde zu Berlin*, vol. xxv. (1890); see also Hertzberg, *Geschichte Griechenlands seit dem Absterben des antiken Lebens*. The intimate connection of the Greeks with so many peoples, and their successive subjection to Romans—the Roman empire of Byzantium—Venetians (1204–1456), and Turks (1456–1830), have left traces in the language, notably in the form of loan-words; thus Latin πριγκιπᾶτον, σπίτι (*hospitium*); Italian ἄτζιο (*agio*), μπαγκιέρης (*banchiere*), βαπόρι (*vapore*), σοῦπα (*zuppa*); Turkish ἀσκέρι (army), κουμπούρι (pistol); Slavic ζαπόνι (sail), σαμψῆς (officer), πίβα (beer); Albanian κουρύτα (boat), βάλτη (swamp), etc. The loan-element never became at any time, however, so extensive as to give the language the character of a mixed language, nor was its specifically Greek character ever endangered. There is now a strong tendency to replace loan-words with native words.

Modern Standard.—With the re-emergence of Greek nationality after 1830, the need of a standard language as a medium of national intercourse and an expression of the national life became strongly felt. There existed only the local dialects of the spoken language. These were little more than *patois*. No one was pre-eminent. Athens was a petty village of 300 houses, and its population chiefly Albanian. There was therefore no dialect which could claim to be that of the capital city. In this juncture recourse was naturally had to the ancient language. This was made to furnish the means of raising the local *patois* to the position of a standard literary language. Respect for the ancient classical speech as a standard of correctness had in the whole history of the Greeks never failed. The use for literary purposes of a mediæval form of κοινή had, thanks to the influence of the Church, never been entirely discontinued. The respect for the ancient models had preserved through all periods of Greek literary history down through the Byzantine period the ancient orthography. The Church had preserved in its service, even in its preaching, the ancient standard of form throughout. The step was an easy and natural one to take. The leader in the work of establishing a standard speech was the patriotic scholar Adamantios Koraës, commonly known as Koray. (Cf. Thereianos, D., Ἀδαμάντιος Κοραῆς, 3 vols., 1889–90.) The question of the extent to which ancient standards shall be used in establishing the norm for modern usage is still actively discussed among the Greeks, often with polemical bitterness. Historical grammar is brought to bear here on a serious practical question. It is not the only time that philology has been "in politics." Though the principle of making the ancient language in general the basis for the standard literary language seems to be universally recognized, the tendency is, on the whole, toward a freer recognition of the popular speech. (Cf. Hatzidakis, Περὶ τοῦ γλωσσικοῦ ζητήματος ἐν Ἑλλάδι (1890), and the various writings of Kontos, Psichari, and Bernardakis.) With this question is closely connected in the Greek mind the defense of the present pronunciation as essentially identical with the ancient, and this defense is conducted with genuine patriotic zeal and no slight exhibition of acrimony toward the scholars of other countries who persist in pronouncing ancient Greek either according to the analogies of their own languages or on the "Erasmian" basis of a scientific reconstruction of the ancient sounds. (Cf. Rangabé, A. R., *Die Aussprache des griechischen*, 2d ed. 1882; Papadimitrakopulos, Βάσανος τῶν περὶ τῆς ἑλληνικῆς προφορᾶς ἐρασμικῶν ἀποδείξεων, 1889; Radis, Ὁ ἐν Γαλλίᾳ περὶ τῆς ἑλληνικῆς γλώσσης ἀγών, 1890.) To what an extent patriotism can blind itself to scientific conclusions may be judged by comparing these works with Blass, *Pronunciation of Ancient Greek* (English transl. of 3d ed. 1890).

The pronunciation is in substance as follows: **α** as *a* in *father*; **ε**, **αι**, and **ι** as *e* in *met*; **ο**, **ω** generally as open Ital. *o*; **η**, **ι**, **υ**, **ει**, **οι**, **υι** as *i* in *pique*; **ου** as *oo* in *boot*; **αυ** as *av* before voiced and *af* before voiceless sounds; **ευ** as *ev*, *ef*; **β** as *v*; **γ** before *e* and *i* vowels as a voiced palatal spirant—i. e. the voiced form of Germ. *ch* in *ich*, and nearly the same as *g* in Centr. Germ. *liege*; before other sounds it is the voiced guttural spirant—i. e. the voiced form of Germ. *ch* in *ach*, and nearly the same as in Centr. Germ. *tage*; **γγ** as *ng* in *sing*; **δ** as *th* in *then*; **θ** as *th* in *thin*; **ζ** as *z* in *zeal*; **ξ** as *ks*; **π** as *p* in *pen*, but **μπ** as *b* in *bed*; **σ** as *s* in *sit* (always voiceless); **τ** as *t* in *ten*, but **ντ** as *d* in *den*; **φ** as *f* in *fed*; **χ** before *e* and *i* vowels as a voiceless palatal spirant, like Germ. *ch* in *ich*; before other sounds it is the voiceless guttural spirant, like Germ. *ch* in *ach*; **ψ** as *ps* in *tipsy*. A strong stress accent rests upon the syllable bearing the written accent. This syllable is prolonged and pronounced with a force and distinctness that tend to belittle and obscure the other syllables. The rough breathing is rarely distinguished from the smooth. For the inflections and syntax, reference must be made to the text-books enumerated below.

Bibliography.—1. Text-books for learners: Vincent and Dickson, *Handbook to Modern Greek* (2d ed. 1887), an excellently arranged book, following, however, somewhat too closely the literary language; Mitsodakis, *Praktische Grammatik der neugriech. Sprache* (1891), offers the best available introduction to the spoken language; Gardner (Mrs.), *A Modern Greek Grammar* (1892, a transl. of Wied.); Jannaris, *Wie spricht man in Athen?* (1891), based on the spoken language; Stedman, *Modern Greek Mastery* (1896).

2. Dictionaries: Kontopulos, *Greek-English and English-Greek Lexicon* (4th ed. 1889); Jannarakis, *Deutsch-griechisch Handwörterbuch* (1883); Legrand, Λεξικὸν νεοελληνικὸν καὶ γαλλικόν; Sophocles, *Greek Lexicon of the Roman and Byzantine Periods* (new ed. 1888); Ducange, *Glossarium ad Scriptores mediæ et infimæ græcitatis* (2 vols., reprint 1891); Jannaris, *Dict. of English and Mod. Greek* (1895).

3. Grammatical treatises: Hatzidakis, *Einleitung in die neugriechische Grammatik* (1892); this work serves to clear the ground and lay the foundations for a scientific treatment of mediæval and modern Greek; Psichari, *Essais de Grammaire Historique Néo-grecque* (2 vols., 1886–89); Meyer, W., *Portius's Grammatica linguæ græcæ vulgaris* (1889); a new edition of the oldest modern Greek grammar, that of Simon Portius (1638), accompanied by a valuable commentary; Muller, *Historische Grammatik der hellenischen Sprache* (1890); Foy, *Lautsystem der griech. Vulgärsprache* (1879); Mullach, *Grammatik der griech. Vulgärsprache* (1856), usefulness past; Thumb, *Die neugriech. Sprache—eine Skizze* (1892): an address delivered on entering professorship at Freiburg, accompanied by valuable notes; and *Handbuch der neugriech. Volkssprache* (1895); Boltz, *Die hellenische oder neugriech. Sprache* (1881); Krumbacher, *Ein irrationaler Spirans im Griech.* (1886). Benj. Ide Wheeler.

Greek Literature, Ancient: The literature of the Greeks is distinguished above all for freshness, originality, and perfection of form. Itself a spontaneous national outgrowth, independent of outside influences, it furnished an intellectual impulse which spread to other people, the force of which has never spent itself, and of which modern European literature is the result. There are four periods: (1) The ancient or classical literature, ending with Aristotle at the time of Alexander the Great; (2) the Alexandrian period, till the subjection of Egypt to Rome, 30 B. C.; (3) the Roman period, till the division of the empire, 330 A. D.; (4) the Byzantine period, till the capture of Constantinople, 1453. The last three are of subordinate importance.

I. The National Classical Literature.—1. *Epic Poetry.*—Before Homer, the Greeks must have had popular poetry and poets, for in the *Iliad* and *Odyssey* the bard and his art are no strangers. The hymn, the epic song, the dirge, the bridal song must have all existed in these early days. In this pre-Homeric period the oldest national poetical measure, the dactylic hexameter, gradually formed itself out of a ruder meter, and multitudes of epithets and poetical phrases fixed themselves in use as part of the stock of the professional bard. But of this period there is no direct knowledge; even the names (Orpheus, etc.) referred to it are certainly mythical. Greek literature begins with the Homeric poems, the *Iliad* and *Odyssey*, in which are found the vividest word-painting, most musical flow of language, great wealth of expression, with an inimitable child-like simplicity. The *Iliad*, Achilles its central figure, describes portions of the siege of Troy; the *Odyssey*, the adventures of Odysseus on his return home from the siege. The origin of these poems has been in recent times the subject of much controversy. In 1795 appeared Wolf's *Prolegomena ad Homerum*, in which, maintaining that the poems were not reduced to writing before 600 B. C., he denied the possibility that compositions of such length, composed for oral recitation, could have previously existed as a whole, and thus opened the way for disbelief in the personality of any Homer. Since then much investigation has been directed to the subject. Wolf's line of argument was carried further

by Lachmann and others. According to their doctrine, the poems are aggregations of ballads which came into form in the hands of a guild of professional singers (*Homeridæ*), to whom Homer was a mythical *heros eponymos*, and were thus handed down from generation to generation; the present form of the poems, with the unity of plan which they show, was given them at the time of Pisistratus (about 550 B. C.) by men employed by him to collect the scattered portions, and they were first reduced to writing then or shortly before that time. There is a tendency to modify this extreme view, and rather to divide the *Iliad* (and similarly the *Odyssey*) into two or three poems of considerable extent—a nucleus and continuations. Few, if any, scholars hold to the old view of absolute unity of authorship. The question of Homer's personality is as far from settled as ever, but this question is, after all, of minor importance. The poems have in any case passed through different phases, and the personal Homer, if there was one, is only one of several factors. The traditions of the ancients respecting the person of the poet are in every respect contradictory, and rest apparently on nothing but conjecture. Nor is it apparent when the poems were first committed to writing. We know, however, that they were for a long time propagated by a class of men called *rhapsodes*, professional declaimers who recited epic poetry at public festivals. Their activity was at its greatest height about 550–500 B. C., and this period probably marks the final stage in the growth of the *Iliad* and *Odyssey*. The beginnings must be placed at least three centuries further back. As to the place of origin, it is evident, from their language, that the poems came directly from the Ionians of the Asiatic coast. A recent theory, yet on its probation, asserts, however, Æolic origin for the oldest parts. It should not be overlooked that doubts respecting the Homeric poetry existed even in antiquity; some of the Alexandrines referred the *Iliad* and *Odyssey* to different authors. The hymns and epigrams which have been handed down under the name of Homer are certainly of later origin. The *Batrachomyomachia*, or Battle of the Frogs and Mice, a burlesque, is the product of an uncertain but very late age. Besides the *Iliad* and *Odyssey* there were several other ancient epic poems, treating of the Trojan war and other subjects. Though these works are lost, they were only inferior to the *Iliad* and *Odyssey* in merit and popularity, and exercised great influence on subsequent literature, furnishing materials for the dramatists, Vergil, etc. The *Cypria* formed an introduction to the *Iliad*, while the *Æthiopis*, the *Sack of Troy*, and the *Little Iliad* continued it; the *Nosti* and *Telegonia* were connected with the *Odyssey*. Besides these there were the *Œdipodea*, *Thebais*, and others. The name Epic Cyclus was afterward given to this group. All these were in the earlier times ascribed to Homer. The later ancients assign them in part to other authors.

2. Hesiod, author of *Works and Days*, a didactic poem on husbandry and the calendar, is a less indistinct personality; he is said to have lived at Ascra in Bœotia, at what time is uncertain. The tone, subdued and of sententious brevity, differs greatly from the Homeric; the dialect is substantially the same. The *Theogony* ascribed to Hesiod is probably of different authorship, though of the same school.

3. *Elegiac and Iambic Poetry.*—These two forms of verse took their rise among the Ionians. From about 680 to 500 B. C. is their flourishing period. The elegy is of a serious, reflective, but by no means always mournful tone, the didactic and moralizing element prevailing; its range of subjects was great; its meter is a modification of the epic hexameter. It stands in connection with the spirit of the times, the age of the "Seven Wise Men," and of the first beginnings of philosophic thought. The iambic verse, at first the medium of personal invective, is lively and epigrammatic. Of all these poems only scanty fragments have been preserved. Archilochus of Paros (about 650) was at once the inventor and the most famous author of iambi; some represent him as the earliest elegiac poet, while others assign that honor to Callinus the Ephesian. Distinguished as author of elegies were Tyrtæus the Athenian and adopted Spartan (the lame schoolmaster of the popular fable), Mimnermus of Colophon, the famous Solon, and Theognis the Megarian. Of the last there has come down a collection of extracts, in all some 1,700 verses. As iambic poets, besides Archilochus, Simonides of Amorgus and Hipponax were prominent. The latter was the inventor of the choliamb or *limping* iambic verse, in which a humorous effect was produced by an unexpected rhythmic turn at the end.

4. *The Single-voice Lyric*—Hitherto every fresh impulse in literature had come from the Ionians of Asia Minor. Now the Æolians of Lesbos took the initiative in the cultivation of the *melos*, or song expressly composed for and inseparable from music. The former styles of poetry, though perhaps originally chanted in musical tones, had early freed themselves from such connection. The lyric poem, on the other hand, was always essentially musical. In Alcæus and the poetess Sappho, both Lesbians (about 600), the expression of individual thought and passion is predominant. The song is for a single voice with cithara accompaniment; the form, that of the short stanza, mostly of four lines; the subjects, erotic, convivial, even political; the dialect, their native Lesbian. The Rhegian Ibycus and Anacreon of Teos later continued this style of composition; the latter, known as an erotic poet, had a playful vein unknown to the earlier lyric poets; he lived in Samos and Athens in the sixth century. Little besides fragments of these has survived; the extant ditties bearing the name of Anacreon are spurious compositions of many centuries later.

5. *The Choral Lyric* was first developed among the Dorians, who hitherto had taken no creative share in literature. Hence the dialect of choral poetry was always Doric. The first impulses came even here from Æolians—Terpander, who came to Sparta about 680, and Arion, who flourished at Corinth somewhat later. Both were Lesbian musicians and poets. Choral poetry existed in a great variety of forms, most of which combined voices with instrumental music and orchestic action, and were often exceedingly complicated in their metrical and melodic structure. Important among the many forms was the dithyramb, a feature of Bacchic worship, performed by fifty singers round an altar, and containing a mimetic element which was the germ of the future tragedy. Arion is named as the perfecter of this style. Other sorts were pæans, hyporchemata or ballets, various marching songs for religious and military occasions, marriage songs, dirges, and the like. Most of these took the character of a public spectacle. The subject-matter was varied; they were often narrative, sometimes responsive or in dialogue form. The earliest names of importance are Alcman and Stesichorus; the former was an adoptive Spartan of the seventh century; the latter, of Sicilian birth, flourished about 600. Stesichorus was especially fond of mythical subjects, as the titles of his compositions show. Later (556–468) Simonides of Ceos attained the highest distinction in choral composition; his life was passed mainly in Athens. Outside the limits of choral poetry he became famous for elegies and epigrams. Passing over names of less note, the list of famous choral poets closes with Pindar, the only one from whom any complete poems have come down. He was about thirty-five years younger than Simonides, and a native of Thebes. Forty-five *epinicia*, or poems celebrating victors at the four national festivals, have come down entire. Loftiness of diction is Pindar's chief characteristic; he is deeply religious, always of a dignified earnestness; often obscure, yet abounding in poetical beauties. His compositions embraced other species, but nothing of them is preserved but fragments.

6. *Tragedy.*—The dithyramb contained, as has been seen, a mimetic trait, and this was little by little developed, first by introducing a disguised personage apart from the chorus, who personated a character (at first doubtless Dionysus himself), and sustained a dialogue with the chorus; then by introducing this action at intervals in the performances (episodes), by extending the representations to other than Bacchic myths, by erecting at first a platform, and then a regular theater for the spectacles, and improving the costumes and masks; lastly, by increasing the number of actors to two, and then to three, so that more than one character could appear at once. The chorus was, in consequence, diminished in numbers (to twelve or fifteen) and importance. This took place at Athens, and Athens remained the home of the tragedy; it was exotic elsewhere. Tragedy remained essentially a Bacchic solemnity, and was performed only at the Dionysiac festivals; it was sustained at the public expense, and partook of the nature of a contest, three poets contending together (each with four pieces) for the prize. The theater was of great size and uncovered; it consisted of a circular dancing-place (*orchestra*) and semicircular tiers of seats. Behind the orchestra a scene wall was erected. Chorus and actors moved in the orchestra. There was, in the classical period, no stage; at most, only a low platform. Machinery and scenery, at first rude, had by the end of the fifth century reached a certain degree of perfection.

The chorus was an essential part, though its office became less and less important. The lyrical parts were sung with instrumental accompaniment and orchestic action, the dialogue partly recited and partly intoned or chanted. The materials of plays were taken almost without exception from the national myths. The fifth century B. C. is the flourishing period of tragedy, marked by the three great names of Æschylus, Sophocles, and Euripides. Æschylus (525–456), after his predecessors, Thespis, Phrynichus, and others had made many advances, first gave the tragedy its complete form. A man of stern and serious nature, thoroughly penetrated with religious feeling, his plays abound in lofty ethical conceptions and powerful but sometimes turgid diction. Seven of them are preserved, the *Prometheus* and *Agamemnon* the best. Sophocles (496–406) has finer feeling for human nature, more dramatic life, greater versatility and power of affecting the sympathies. Modern critics rank him highest of the three. Seven of his plays are extant, of which the most powerful are the *Antigone*, *Œdipus Tyrannus*, and *Electra*. A decline from this high standard is seen in Euripides (484–406), who, though a poet of great talent, has grave faults—too little ideality, want of symmetry and unity in plot, a reliance on single passages of brilliancy for effect. The sophistical tendencies of the age were unfavorable to poetry, and a falling off in poetic taste begins from this time. Euripides was very popular in subsequent ages, and eighteen plays of his have been preserved, besides many fragments; a nineteenth, *Rhesus*, is spurious. No plays of the lesser tragedians exist.

7. *Comedy* arose, like tragedy, from the Bacchic festivities; not, however, from the dithyramb, but from the *comus* or procession of licensed revelers at the country Dionysia, which mingled invocations of the deity with gibes at the bystanders. Its early history is obscure. At Athens it was adopted by the state, as part of the public Dionysiac festival, about 460. Three phases of the Attic comedy are commonly distinguished, the Old, Middle, and New Comedy. Old Comedy flourished from 450 to 400; the chief poets were Cratinus, Crates, Eupolis, and Aristophanes. Eleven plays of Aristophanes have been preserved. Farcical extravagance and the utmost license in personal satire are the characteristics of the Old Comedy; with this the most brilliant though often the coarsest wit. In the *Parabasis*, a part where the action stopped and the chorus addressed the audience directly, the Old Comedy preserved the image of the original *comus*. With the end of the Peloponnesian war the spirit of comedy changes; its farcical merriment is given up; political satire is now less its motive than the delineation of types of character and scenes of daily life. The Middle Comedy (400–338) was a transitional stage. The latest piece of Aristophanes, *Plutus*, properly belongs to it. The chief poet was Antiphanes. The New Comedy belongs chronologically in the next period. It had no chorus, its characters were types of everyday society; it stood very near the modern comedy. Menander (342–290) had the first place among the sixty-four authors of New Comedy; his works must have been masterpieces of their class. Others were Philemon, Diphilus, Posidippus. Literature has suffered a great loss in that no plays of these have been preserved. Some judgment of their merit can be formed from the imitations of the Roman poets Plautus and Terence. Separate from the Athenian comedy was the Sicilian, which attained some eminence in the hands of Epicharmus about 475, and Sophron somewhat later.

8. *History.*—Among the Greeks prose began long after poetry. The crude beginnings of historical composition were made by the Asiatic Ionians—attempts merely at preserving current reminiscences, without as yet any idea of investigation or criticism. They were confined at first to local traditions, then took a wider range. The language had still a poetical coloring, and much fable was mixed with facts. Such early prose-writers were Hecatæus of Miletus, Pherecydes of Leros, and others. All used the Ionic dialect. The chief of these Ionic historians, and the only one whose works have come down, is Herodotus of Halicarnassus (b. 484), who undertook extensive journeys, and embodied the results of his inquiries in nine books of history, our chief source of information of the Persian wars and preceding periods, treating of almost all the known nations of the earth, and giving geographical and ethnological information, as well as historical. The style is of charming simplicity and the utmost vividness. Respecting Herodotus's credibility, it must be conceded that, although he sincerely aims at truth and exercises more criticism than any of his predecessors, his superstition and love of the marvelous have influenced his work in many ways. Especially is he untrustworthy in the past history of foreign nations. An unaffected piety pervades his work; his conception of the Persian invasions and their causes is a religious and ethical one. Thucydides, the greatest historian of Greece, was an Athenian (d. about 400), and, discarding the traditional use of Ionic, wrote in his native dialect. His work in eight books, treating of the Peloponnesian war down to 410, is a model of impartiality and conscientious research. He aims at the utmost brevity, and writes in a style obscure and crabbed, but full of a singular force. Speeches, partly imaginary, form an important part of the work, serving to set forth motives and the inner connection of events. The military career of Thucydides was unfortunate, and his work was written in banishment. A continuation of Thucydides's history is furnished by Xenophon of Athens (about 434–355), whose seven books of Grecian history (*Hellenica*) extend to 362 B. C. Superior to this work in interest is his *Anabasis*, a simple and graphic account of the adventures of the body of Greek mercenaries who joined the ill-fated expedition of the younger Cyrus against Artaxerxes—adventures in which Xenophon himself had an important share. Xenophon was a soldierly and straightforward man, fond of the practical, but lacking in the intellectual grasp needful for a historian. Much of his life was spent abroad, partly in banishment. His literary labors were not confined to history, as is shown by the *Cyropædia* (a life of the elder Cyrus, a sort of historical romance) and the *Memorabilia* of Socrates, a collection of personal reminiscences of the great teacher, besides several smaller works, some of doubtful genuineness. Historians of this time whose works are lost are Ctesias, a Cnidian physician long employed at the Persian court, and the author of Persian annals, and Philistus, the historian of Sicily, both contemporary with Xenophon. Later were Ephorus and Theopompus, pupils of Isocrates, the former the first writer of general history.

9. *Philosophy.*—No philosophical writings before Plato have been preserved, though the two preceding centuries had produced many such. The first beginnings of philosophy are contemporary with those of history, and the Ionians, as in history, took the initiative. The Ionic philosophers occupied themselves with speculations on the physical universe; Thales, Anaximander, Anaximenes were the earliest of these. A little apart from these stood Heraclitus (500), and later Anaxagoras of Clazomenæ (450), the most advanced philosophic thinker before Socrates, long a resident of Athens, and exercising a powerful influence on the great men of that day. Special schools, offshoots of the Ionic, were formed by Pythagoras, a Samian who emigrated to Croton in Italy, and Xenophanes of Colophon, the founder of the Eleatic school in Elea; both of the sixth century. Pythagoras himself wrote nothing, but his followers, Philolaus, Archytas, and others, expounded his doctrines in books. The Eleatics reverted to the poetical form in their writings; so Xenophanes, Parmenides, and Empedocles. Entirely new ground for philosophic thought was obtained by the fearless thinker and uncompromising moralist Socrates (d. 399), who, though he wrote nothing, gave a direction to speculation which resulted in the establishment of several schools. The first of these, the Academy, was founded by the celebrated Plato (429–347) of Athens, an enthusiastic, imaginative, almost visionary nature, educated by extensive travel. His works are in the dialogue form, with Socrates as chief speaker. As works of art they are unsurpassed; though ranging over the whole field of ethics, politics, and metaphysics, they possess a dramatic vivacity which never flags and a constant freshness of thought. Probably all are preserved; besides the longer works, *Republic* (10 books) and *Laws* (12 books), there are some forty shorter compositions, many of doubtful genuineness. The numerous works of Heraclides Ponticus, the scholar of Plato, are lost. The founders of the other Socratic schools, Euclid (Megarian school), Aristippus (Cyrenian school), and Antisthenes (Cynic school), wrote but little. Aristotle (384–322), the founder of the Peripatetic school in the Lyceum, was a pupil of Plato, but very unlike him. He was pre-eminently a man of facts; his eagerness for knowledge extended into every part of the physical and metaphysical universe. Recognition of the importance of inductive research, as opposed to mere speculation, exactness of method and completeness of system, the introduction of accurate technical terms, are among his merits. About half of his numerous writings are preserved, com-

posed in a clear, pragmatic style, devoid of all ornament, often bald and compendious. Among the completest of these are the *Nicomachean Ethics*, the *Politics*, the *Logic*; besides these, his extant writings extend over literature, rhetoric, psychology, zoölogy, botany, mathematics, physics, and other departments. The greater part of his *Athenian Republic*, supposed to be lost, was discovered in 1891 in an Egyptian papyrus. It may be said of Aristotle that he embraced in himself all the science of his age. Though contemporary with Demosthenes, he stands on the border of two periods, and in spirit belongs rather to the latter.

10. *Rhetoric and Oratory.*—The nursery of Grecian eloquence was Athens, and its flourishing period the fourth century, though the study of rhetoric as an art had been previously pursued during the period of the Peloponnesian war, especially under the influence of the class of men called Sophists. The Sophists were a peculiar product of that age, rhetoricians rather than philosophers, loose thinkers, though professedly teachers of philosophy and morals. Athens was their chief field, though most of them were from abroad. The principal Sophists were Gorgias, a Sicilian, Hippias of Elis, Protagoras of Abdera, Polus of Agrigentum, and Prodicus of Ceos. Under the instructions of these men the art of oratory grew to maturity. The famous Attic orators are ten in number. The first department cultivated was the judicial; in this field Antiphon (d. 411) and Andocides distinguished themselves. Of the former fifteen orations have been preserved, of the latter four, many of these written for others to speak. To a somewhat later period belong Lysias and Isocrates; their style shows more freedom and elegance. The latter brought to perfection the epideictic style, or speech of display. Of the one thirty-four speeches have been preserved, of the other twenty-one. A little later flourished Isæus, eleven of whose orations are extant. With Demosthenes (384–322) is reached the highest point in oratory. This consummate orator attained his eminence, without great natural endowments, by the most unremitting diligence. His style is extremely forcible, and, though bearing marks of the utmost elaboration, is free from rhetorical artifice. Sixty orations bearing his name are preserved. His contemporaries, Lycurgus, Æschines, Hyperides, and Dinarchus, though able orators, are his inferiors in power. Speeches of all of these have been preserved. The famous contest on the Crown between Æschines and Demosthenes (330 B. C.) gave occasion for the masterpieces of the two orators.

11. *Medicine.*—The only works of a technical professional nature which have come down from this period are the writings of Hippocrates of Cos (b. 460), the founder of the science of medicine. They are in the Ionic dialect, brief and plain in language; parts are of doubtful authenticity.

II. Alexandrian Period (330–30 B. C.).—Its characteristics are great diminution of originality, the cultivation of science at the expense of literature, the study and dissemination of previous works. The boundaries of the Hellenic world were greatly enlarged, and foreign influences made themselves felt. The two centers of literary activity were Alexandria and Athens.

1. *Poetry* became secondary to prose. Besides the New Comedy, already described, the only new type produced is the bucolic, the germ of which existed among the Sicilian peasantry; it was artistically developed by Theocritus, a Syracusan, about 270. These poems, called *idyls* (a word of uncertain meaning), were primarily pictures of rural life. Most of them are in dialogue form, in Doric dialect and in dactylic verse; their prevailing tone is humorous, and a feeling for nature not very common among the ancients pervades them. We have, besides thirty pieces of Theocritus, several by Bion and Moschus of a similar sort. Not unlike these, though in iambic meter, are the *mimiambi* of Herondas, brief dramatic sketches from common life, published in 1891 from a papyrus. The remaining poetry of this period is artificial in the extreme. The epic compositions are labored imitations of Homer: the *Argonautica* of Apollonius, a grammarian of Alexandria (220), is preserved, but has little merit. Still less interesting are the didactic poems on astronomy and medicine of Aratus and Nicander; the latter wrote *Georgics* and *Metamorphoses* (now lost), imitated afterward by Vergil and Ovid. The epigram is cultivated with more success; the *Anthology* contains many of this period. Callimachus, the first Alexandrine librarian, distinguished himself in this style and wrote also hymns of some little merit. Both the elegy and the tragedy received some attention, but all productions are lost. The *sillos*, or satiric poem, also came into vogue.

2. *Philosophy* was chiefly pursued at Athens, where, besides the Academy and the Lyceum, the Epicurean and Stoic schools (outgrowths of the Cyrenian and Cynic schools respectively) flourished, attracting pupils from all parts of the civilized world. Of the teachers the most important in a literary point of view are Theophrastus, pupil and successor of Aristotle, a man of most varied learning, from among whose many works a book on botany and an essay on types of character have come down, and Chrysippus and Panætius the Stoics, both prolific writers on ethics.

3. *Grammar*, in its widest sense, including the study of literature, was ardently pursued, especially at Alexandria under the Ptolemies. The famous libraries there collected, and the Museum, a kind of academy of sciences, were important means. The collection, cataloguing, criticism, and annotation of the literary relics of the classical period was the chief task; later came the systematic treatment of grammar. Scanty as are the remnants of these grammarians' works, whatever of the classic literature has been saved has passed through their hands, and modern philology is greatly indebted to them. The greatest of these critics were Aristophanes of Byzantium (200) and Aristarchus (150); the former busied himself chiefly with the drama, the latter with Homer. A small grammatical text-book of Dionysius Thrax (110) has come down to us, also a short treatise on mythology by Apollodorus. A rival of the Alexandrine school was the Pergamenian, its representative scholar Crates.

4. *Other Sciences.*—The advances made, especially at Alexandria, in astronomy, mathematics, and geography were remarkable. In mathematics were distinguished Euclid, whose *Elements of Geometry* hold their place even yet, and who lived in Alexandria about 300 B. C.; and later Archimedes of Syracuse, and Apollonius. Of others, Eratosthenes, a man of universal learning, the first scientific geographer (d. 194), and Hipparchus, the astronomer, may be mentioned. In Athens the Peripatetics and other philosophers also cultivated the sciences.

5. *History* is singularly neglected in this period; the only name of importance is Polybius (204–122), of whose history of Roman conquests only five books (out of forty) are preserved complete.

III. Roman Period (30 B. C.–330 A. D.).—Literature centers at Rome, the ancient seats of learning losing their importance. The scientific spirit decreases, but there is returning taste for rhetoric and regard for form and style in composition, which had been generally neglected in the preceding period; so results a remarkable revival of Attic prose, especially history. To the first century of this period belong Diodorus Siculus, only a small portion of whose *Universal History* is preserved, Plutarch the biographer and essayist, Flavius Josephus the Jewish historian, and Strabo the descriptive geographer. From Dionysius of Halicarnassus a history of early Rome has reached us, as well as works on rhetoric and literature. Later were Arrian, Appian, Herodian, and Dio Cassius (the last three writers of Roman history), and Pausanias, whose *Description of Greece* is invaluable. Of rhetoricians, Dio Chrysostom, and later Longinus, deserve mention, but especially the witty satirist Lucian, whose works are of the most varied character. Less valuable are the writings of the two Philostrati and those of Ælian, the latter a collection of anecdotes. The *Deipnosophistæ* of Athenæus consists of table conversation; though a tasteless *mélange*, it contains important material. The writing of imaginary letters ascribed to noted personages came into vogue, and was cultivated by Alciphron and others. The grammarians of this time are divided into Technicists and Atticists. Of the former were the Alexandrian Apollonius Dyscolus and his son Herodian, the last of the great ancient grammarians; of the latter, mere Attic purists, Phrynichus and Julius Pollux. The astronomer and geographer Ptolemy and the physician Galen are the chief names in physical science. The study of philosophy languished, and the Athenian schools died out; Epictetus the Stoic is the most eminent teacher. Philosophy degenerated on the one hand into the fantastic superstition of Neo-Platonism, whose chief apostle was Plotinus, on the other into the skepticism of Sextus Empiricus (about 200 A. D.). A history of philosophy from Diogenes Laertius (about 200) has been preserved. In poetry this period is utterly barren; Babrius, the author of Æsopian fables in choliambs, is the only name worth mentioning.

IV. Byzantine Period (330–1453 A. D.).—The literary cen-

ter is Constantinople. A brief renaissance of poetry and rhetoric is followed by a long decline, in which all originality dies out. Learning grows less and less; many works of antiquity are forgotten and lost; careless compilations and excerpts replace original works. The writers of this period have, for the most part, scant literary merit. It will suffice to mention a few: Nonnus (about 400), author of the voluminous *Dionysiaca*, not without originality, and Quintus Smyrnæus, are the best of a number of poets. Anthologies, or collections of epigrams of various ages, are compiled. Rhetoric flourished under Julian, and the works of Libanius are no mean specimens of eloquence. The romance was cultivated by Heliodorus and others. Stobæus's *Florilegium* and *Eclogæ*, collections of choice extracts, contain much that is valuable. In grammar and erudition, Chœroboscus, Eustathius, the commentator of Homer (Bishop of Thessalonica, 1160), Photius, and the lexicographers Hesychius and Suidas may be mentioned. Zosimus, Procopius, Zonaras are among the historians. Of ecclesiastical writers, the most eminent are Justin Martyr, Clement of Alexandria, Origen, Eusebius, Gregory, John Chrysostom: the first three belong chronologically to the preceding period.

The study of Greek literature was revived in the West during the fifteenth century, chiefly through the influence of the learned Greeks who fled in considerable numbers to Italy, and labored there, favored by such men as Lorenzo de' Medici; among these were Theodore Gaza, Constantine and Janus Lascaris, and Marcus Musurus. Since then these literary relics have been studied with ever-increasing zeal. Prominent among the many modern scholars whose labors in this field have been fruitful are Reuchlin, Casaubon (sixteenth century), and later (eighteenth century) Hemsterhuys and Valckenaer in Holland; in England, Bentley (d. 1742), and afterward Porson and Elmsley; in Germany during the present century, Heyne, Wolf, Hermann, Böckh, Bekker, Dindorf, and Welcker. The principal histories of Greek literature are, in English, Mahaffy's and Müller's (completed by Donaldson); in German, Bernhardy's, Bergk's, and Christ's; in French, Croiset's. F. D. Allen.

Greek Literature, Modern: To date its beginning from the fall of Constantinople (1453), when the last vestige of political independence distinctively Grecian was obliterated by the Ottoman conquest, conveniently separates modern Greek from Byzantine literature. But the date is arbitrary. For several centuries beyond it many writers, including the defenders of orthodoxy against the Latin heresy, were continuators of Byzantine literature; and the Church even now, in its ceremonial and official language, clings more or less closely to the same tradition. On the other hand, the earliest monuments of modern Greek literature belong to a period three or four centuries prior to 1453. Koray was the first to call attention to these monuments by the publication of the vernacular poems of Ptochoprodromos (Στίχοι Θεοδώρου τοῦ Πτωχοπροδρόμου, see Ἄτακτα, vol. i., Paris, 1828), which date from the twelfth century. Numerous collections of mediæval Greek poems have since been published, examples of which are Maurophridis's Ἐκλογὴ Μνημείων τῆς νεωτέρας ἑλληνικῆς γλώσσης, (Athens, 1866); W. Wagner's *Mediæval Greek Texts* (printed for the Philological Society of London, 1870); *Carmina Græca Medii Ævi* (1874); Ἀλφάβητος τῆς ἀγάπης, a collection of Rhodian love songs (1879); *Trois poèmes Grecs du Moyen Âge inédits* (1881); and S. Lambros's *Collection de Romans Grecs en langue vulgaire et en vers* (1880). E. Legrand has included a number of like poems, together with many of more recent date, in his *Collection des Monuments pour servir à l'étude de la langue néo-hellénique*, and in his *Bibliothèque Grecque vulgaire*. Many of these poems derive a special interest from their resemblance to congeneric Western poetry of the time. To what degree in the interaction of the East and the West, brought about by the crusades, the Western poets lent inspiration to the Greeks remains an unsettled question. Apart from its importance as the earliest monument (tenth century) of modern Greek literature, the *Exploits of Digenis Acritas* (unknown until its publication by C. Sathas and E. Legrand) is interesting because of the use of its incidents in many later poems, which form what might be called the Acritic cycle. The popular songs of Greece were first made known by Fauriel (*Chants populaires de la Grèce moderne*, Paris, 1824–25). Transmitted orally for many generations, the earlier of these songs are rare. The greater number celebrate the strife of the Klephts with the Turks in the eighteenth century; while others are legendary, historic, or amatory in character. Their beauty is undeniable.

They are, however, not the sole literary product of the time preceding the renaissance of Greece. From the fifteenth to the middle of the eighteenth century there was an unbroken line of Greek authors, but they were more numerous than brilliant. The Greeks were crushed beneath the foreign yoke. Learning was limited to the Church or to the few who had studied medicine in Italy. Medicine, the only liberal profession he was allowed to exercise, was to the Greek often the way to political preferment under the Turk. Up to the end of the eighteenth century nearly all Greek books were printed in Venice, where flourished a large and important Greek colony. Venice, indeed Italy in general, was long the intellectual refuge of the Greeks. The few Greek regions not yet enslaved by the Turks were ruled by the Venetians. The Morea was alternately lost and won by them up to the beginning of the eighteenth century. Crete was conquered only in 1669, and the Venetians held the Ionian islands until the annihilation of the republic by Napoleon I. They were not gentle masters, but their Greek subjects were far happier than their countrymen under the Turk. They could breathe; they could write other things than lamentations (Θρῆνοι), of which many specimens by their less fortunate compatriots exist. Most, if not all, of the poets of that time were natives of countries not yet subjugated by the Turk. Loukanos (sixteenth century), who made a popular version of the *Iliad*, was a Zantiote. Kornaros (seventeenth century), the author of the *Erotocritos*, a chivalric poem in the Italian style, but Hellenic in spirit, as its wide popularity attests; Chortakis, whose dramatic poem *Erophile* is hardly less esteemed than the *Erotocritos*; and Drimyticos (seventeenth century), the author of ἡ εὐμόρφη Βοσκοπούλα, were Cretans. The humble efforts of these earlier writers have their interest. They show the continuity of Greek life, both in their reverence for national traditions and in their dim reflection of the literary movements of civilized Europe, with whose peoples the Greeks have never ceased to claim solidarity.

Literary Renascence.—The real literary renascence of Greece began in the latter half of the eighteenth century. The revival of commerce enabled the Greeks to establish schools. Closer relations with Italy, Germany, and Hungary brought them into immediate contact with the West. Some Greek merchants were men of letters, who labored to acquaint their countrymen with the results of Western culture, and many books, scientific, historic, and even fictive, were translated by them. From the end of the eighteenth century the Greek press of Vienna rivaled that of Venice. Literary periodicals were issued, the most notable and influential of which was ὁ Λόγιος Ἑρμῆς. Of the men of letters who served as a medium between the East and the West the most brilliant was the Thessalian Rigas (b. 1760). Chiefly known as a writer of patriotic songs, he had no other aim than the political regeneration of Greece. Having failed in an attempt to organize a rising, he was delivered by the Austrians to the Turks, by whom he was murdered at Belgrade in 1798. Among the foremost writers of the eighteenth century were Eugenios Boulgaris (1716–1806) and Nicephoros Theotokis (1736–1800), whose sermons (Κυριακοδρόμια) are the best of earlier attempts to raise modern Greek to the dignity of a literary language.

The most significant symptom of the revival, however, was the cultivation of *belles-lettres* by the Phanariots in Constantinople at the beginning of the nineteenth century. To their standard flocked the flower of the nation. The presence of families enriched by office under the Porte, of the patriarch, and of the great bankers contributed to make the Phanar the seat of a real aristocracy, which, true to its racial instincts, found solace from oppression in the pursuit of intellectual culture. In that congenial atmosphere sprang up a literature, the growth of which was checked in but one direction. No songs of liberty were composed, and those of Rigas were sung with closed doors. Athanasius Christopoulos (1772–1847) wrote in the simple and elegant language of cultivated society songs of love and wine as perfect in form as charming in fancy. The masterpieces of the French theater were translated by Rizo Rangabé. Rizo Neroulos, besides two tragedies, wrote humorous poems not yet forgotten. The influence of the Phanariots extended to the courts of the Greek princes of Wallachia and Moldavia. Nor were letters neglected elsewhere. At Janina, in Epirus, flourished John Bilaras (1771–1823), a lyrical poet at once humorous and tender; and in Zante, Gouzelis, a writer of

comic and satiric verse and the translator of the *Jerusalem Delivered*. Of authors whose aim was the diffusion of knowledge it will suffice to mention Anthimos Gazis, Bardalachos, Koumas, the priests Bamvas and Konstantine Œconomos, and Moustoxidis of Corfù.

A greater name than any of these is that of Adamantios Coray (1748–1833), whose influence was due not only to his learning and patriotism, but also to the fact that, residing for fifty years in France, he addressed his countrymen from that distant home of letters and of civilization. Already influenced by translations of the masterpieces of French literature of the seventeenth century, and of the philosophic works of the eighteenth, the Greeks were easily attracted by the intellectual movement in France. They were electrified by the outbreak of the French Revolution, The expedition to Egypt, in which they saw but a conflict between Christian and Moslem, brought the Revolution nearer, and raised hopes which reached their highest point when the French in taking possession of the Ionian islands, promised by proclamation the emancipation of Greece. It was natural, then, that the Greeks should listen with redoubled attention to the voice of their learned countryman in Paris. The intellectual and moral advancement of the Greeks was the dream that Koray sought to realize; and to that end were published, at the cost of rich compatriots, his editions of many Greek classics, which established his reputation as a scholar throughout Europe, and enabled him by means of introductions to take the part of a national inspirer. Collected and separately printed in 1819, these *Prolegomena*, together with Koray's letters, were of powerful assistance in the regeneration of Greece. A complete edition of the letters was printed at Athens in 1885–86. The list of his publications is long, and besides works in Greek includes translations into French of Theophrastus, Strabo, Hippocrates, etc. To give a definite character to modern Greek by purging it of foreign elements and checking the pedantic efforts of classical reactionists was another aim of Koray; and to his lexicographic essays (contained in the Ἄτακτα, Paris, 1818–25) and to his own constant example is largely due the present state of literary Greek.

From the time of Koray, literary activity centers in Athens. Learning continues to be cultivated outside of the kingdom, but its manifestations take place mostly within it. The tranquil conditions favorable to the development of literature have thus far been in the main wanting in Greece, but her energetic advance in all its branches, as illustrated by the creditable and sometimes brilliant efforts of her poets and prose-writers, is full of promise.

Lyrical Poets.—The poets of the period beginning with the emancipation of Greece were chiefly lyrical. Madame Juliette Lamber was the first to classify them on historic and geographic lines. The most eminent representatives of the group formed in Constantinople and continued in Athens were Alexander Rangabé (1810–90) and the brothers Alexander (1803–63) and Panagiotis Soutsos (d. 1868). From these poets, whose works were its models, the Athenian school immediately derives, though its members, leading the life of Western Europe, were not unaffected thereby. Spiridion Basiliadis (1845–74), Angelos Blachos (b. 1838), Demetrios Paparrigopoulos (1843–73), John Karasoutsas (1824–73), and Achilles Paraschos (b. 1838) best express the tendencies both of their school and time.

The characteristics of the Ionian group were due to the failure of the Turks to secure a footing in the seven islands, which, governed in turn by Venice, France, Russia, and England, maintained closer and more permanent relations with Western Europe than did any other portion of Greece. Solomos (1798–1857), whose famous hymn to liberty is the national anthem of the Greeks, Andreas Kalbos (1796–1869), Julius Tupaldos (1814–83), Tertsetis (1806–74), and Gerasimos Markoras are the chief ornaments of this school.

Another group, called by Madame Lamber the Epirotic, drew inspiration from the popular national songs, of which it adopted the rhythm, and in a measure the language. To this school belonged Bilaras, and also Zalocostas (1805–57), at least in his lyrics, which are his real glory. Its most illustrious name, however, is that of Aristotelis Balaoritis (1824–79), by birth an Ionian, whose reputation is second only to that of Solomos, the greatest of modern Greek poets. His complete works have been translated into French by J. Blancard (Paris, 1883–86). Demetrios Bikélas, as poet, should be included in this group, which has exerted, chiefly through Balaoritis, a strong influence over the younger generation of poets. Indeed, most Greek poets have renounced the traditions of the Athenian school, write in the vernacular, and employ forms more or less popular.

Modern Poets.—The modern Greek poets were first stirred by the love of country, and for a time the main chord of their lyre was the patriotic. In the strains of Solomos, the Soutsos, Spiridion Tricoupis, Zalokostas, Rangabé, and Balaoritis, what was then the deepest feeling of the Greeks found voice. To the patriotic succeeded the consciously literary mood, when the verse of Basiliadis, Karasoutsas, Paparrigopoulos, and Paraschos felt the influence of the romanticists. The younger poets have sought and found inspiration in the daily life around them, and their verse is often the drapery of some philosophic thought. An annual poetic contest, instituted by rich and patriotic citizens, has largely increased the number of versifiers. Among modern poets, Aristomenes Probelegios (b. 1850), George Bizyénos (b. 1853), George Drosinis (b. 1859), Kostis Palamas (b. 1859), John Polemis, and Ephtaliotis are the most brilliant; but the most popular is the satirist George Souris (b. 1853). Other poets, Alexander Soutsos (in his warfare with Kapodistrias), Theodore Orphanidis (in his Τιρι-Λίρι), and Laskaratos of Cephalonia, have excelled in satiric verse, but Souris has surpassed them all. He is the editor of a weekly newspaper which from title to colophon is written wholly in verse. In this unique journal are passed in review the leading events, social and political. Narrative poetry has been written by Alexander Soutsos, Rangabé, Orphanidis, and by Zalokostas, whose poems dealing with Klephtic strifes or episodes of the war of independence are much in favor.

Dramatic Literature.—Though Greece can not yet boast a national theater, there is no lack of original plays. The Zantiotes Gouzelis and Matesis have written comedies. Twelve tragedies by the Ionian John Zambellios, ranging in subject from Greek antiquity to the war of independence, have been published. Panagiotis Soutsos's tragedies show more lyrical than dramatic talent; his brother Alexander has been more fortunate in comedy. Rangabé, too, has written for the stage, and his *Marriage of Coutroulis*, which wittily ridicules modern Greek politics, is also remarkable for the introduction of the chorus. A clever comedy, one of the motives of which is the confusion of Greek dialects, is ἡ Βαβυλωνία, by D. K. Byzantios. Conspicuous among recent dramatic writers are Kleon Rangabé, Angelos Blachos, Antoniades, Aristomenes Probelegios, Demetrios Koromilas, a prolific author, Basiliadis (whose *Galatea* has been translated into French by the Baron d'Estournelles), and Demetrios Bernardakis, the best known of whose plays are *Maria Doxapatri*, *Euphrosyne*, and *Fausta*. The Greek repertory has been further enriched by translations. Alexander Rangabé, whose father's versions of French masterpieces have been mentioned, has translated from the German Goethe's *Iphigenia*, Schiller's *Wilhelm Tell*, and Lessing's *Nathan der Weise*. A metrical translation of the first part of *Faust* has been made by Probelegios. Some attempts to translate Shakspeare had been made (*Hamlet* in verse by Perbanoglos, and *The Tempest* in prose by Polylas), when Bikélas undertook to popularize the great poet in Greece by metrically translating *Romeo and Juliet*, *Othello*, *King Lear*, *Hamlet*, *Macbeth*, and *The Merchant of Venice*. Both for intellectual quality and artistic execution his translations have won commendation from the highest critical authorities. The example of Bikélas was imitated. Two versions of *Hamlet* have been produced—one in verse by Polylas and another in prose by Damiralis, the latter of whom has also made prose translations of *Coriolanus*, *Antony and Cleopatra*, and *Julius Cæsar*. A translation of the latter play in the verse of Alexander Rangabé also exists.

Prose Fiction.—Prose fiction has been much cultivated by the Greeks since 1830, and before its liberation from foreign influence it had passed through as many phases as had their lyric poetry. The brothers Soutsos and Alexander Rangabé were the first to enter the field. The tales of the Soutsos display talent, but as regards plot or study of character are without interest. Those of Rangabé are better, but too many of them have foreign subjects, and describe foreign manners. *The Notary*, the scene of which is laid in the Ionian islands, is perhaps the best of his novels, if not so widely known as *The Lord of the Morea*, a tale of the crusades, which has been translated into both French and German. Spiridion Zampelios's Κρητικοὶ Γάμοι, which deals with the Venetian occupation of Crete, owes a special interest to the author's acquaintance with historic minutiæ. The tales of C. Ramphos contain some spirited dia-

logue. Kalligas, a jurist of great eminence, is the author of *Thanos Blechas*, in which the manners of the mountaineers are well described. Two novels by Paleologos (published in 1839 and 1842) are quite forgotten. Stephen Xenos, whose *Devil in Turkey* was published in English by himself, is also the author of *The Heroine of the Greek Revolution*. *Pope Joan*, an historical novel by the brilliant critic and publicist Roidis, has been translated into French. The first essay in fiction of Demetrios Bikélas (b. 1835) marks a new departure in that branch of literary art. Drawn wholly from Greek sources, his story of *Loukis Laras* owes little or nothing to foreign models. Immediately after its appearance in 1879 it was translated into French by the Marquis de Queux de Saint-Hilaire, and it has since been translated into ten other languages, including the English version by John Gennadius, former Greek envoy at the court of St. James. A collection of short stories of contemporaneous Grecian life by Bikélas was published in 1885, and at once turned into French by the same translator. Though the Zantiote Gregory Xenopoulos, who inclines to naturalism, still writes novels, the short story is now the favorite form of fiction, and has been adopted by George Drosinis, the poet (a few of whose tales have been translated into English and German), Palamas, Probelegios, Bizyénos, Polylas, Karkabitza, Ephtaliotis, Psicharis, etc.

Some of these tales are written in the vernacular of which previously only poetic use had been made. The fight between the purists who would have literary Greek conform to ancient, at least in the choice of words and the connection of grammatical forms, and the vulgarists, who contend for its assimilation to the language as traditionally formed and spoken by the people, has been a long one, and it is not yet over. The present leader of the vulgarists is M. John Psichari, a Frenchman by naturalization, whose position as a professor in Paris and whose rank as a linguist have enabled him to put new life into the controversy. To whatever extreme partisanship may lead either school, both are working out the problem of literary Greek. Whether the vulgarists will surmount all the obstacles to the establishment of the popular language, in so far at least as grammar and phonetics go, or will only succeed in neutralizing the efforts of the classical extremists, is a question for time to resolve. At any rate, there is a current literary language, which is employed in the administration of public affairs of every description, and is the instrument not only of the press and pulpit, but of all prose-writers outside of the domain of fiction.

Before passing to the historians, a word of commendation should be given to the jurists Peter Paparrigopoulos, Paul Kalligas, and N. Saripolos; the philosophers Brailas-Armeni and John Skalzuni (an opponent of the Darwinian theory); and the theologians Kontogonis, Diomedes Kyriakos, and the Archbishops Nikephoros Kalogeras and Dionysius Latas.

History.—Even before the Revolution the Greeks had given much attention to history. Koumas, the author of a universal history, has been mentioned. Dionysius Photinos, a Danubian dignitary, has written a *History of Ancient Dacia and of the Actual Transylvania, Wallachia, and Moldavia* (Vienna, 1819), which is especially valuable for the later period. The histories of Souli and of Parga (Venice, 1815), by Christopher Perraibos are much prized. The Greek revolution, though even yet too near for philosophic treatment, has naturally been attractive to many writers, the most noteworthy of whom is Spiridion Trikoupis, whose history of that period (London, 1857) is by far the best, though John Philemon's *Essay toward a History of the Greek Revolution* is worthy of mention, as are also the *Memoirs* of N. Dragoumis and the interesting *Recollections* of Theodore Kolokotronis dictated to his secretary, the poet Terzetis (recently translated into English by Mrs. Edmonds). *A History of the Hellenic Nation*, from the earliest times to the accession of King Otho, by Constantine Paparrigopoulos, is the most successful attempt yet made to show the historic continuity of the Greek nation. The mediæval and modern portions are particularly well done, and indicate much original research. A similar history by Spiridion Lambros, a prolific writer on history and philology, has reached the third volume. Karolides is publishing a *General History of the Nineteenth Century*, of which the portion touching Greece is praiseworthy. Maurogianni's *History of the Ionian Islands* in modern times, and a history of the same islands under the Venetians by the Zantiote Lunzi, may also be mentioned. Spiridion Zambellios is the author of Βυζαντιναὶ Μελέται; Alexander Paspati has written a *History of the Capture of Constantinople* and several works on the topography of the Byzantine capital. Besides various valuable historical works, Constantine Sathas has published *Monuments*, to serve for a history of Greece from the Middle Ages to our own time. Of the numerous historical contributions to periodical literature of Demetrios Bikélas, several have been collected by the Marquis of Bute, and translated by him into English under the title of *Seven Essays on Christian Greece* (London, 1890).

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H. A. Huntington.

Greeley: city (founded in 1870); capital of Weld co., Col. (for location of county, see map of Colorado, ref. 1–E); on the Cache la Poudre river, 5 miles above its junction with the Platte, and on the U. P. Railway; 30 miles E. of the Rocky Mountains, 52 miles N. by E. of Denver, 54 miles S. S. E. of Cheyenne. It is in an agricultural and stock-raising region, with rich coal-fields near by. It contains the State Normal School, located here in 1889, building cost $300,000; high school, building cost $30,000; and 4 ward schools; water-works system that cost $80,000; electric-light plant; manufactures of vacuum pumps, elevators, brick and tile, etc.; and 3 weekly newspapers. Pop. (1880) 1,297; (1890) 2,395.

Editor of "Sun."

Greeley, Horace, LL. D.: journalist; b. at Amherst, N. H., Feb. 3, 1811. His father was a farmer in humble circumstances, and while yet a child Horace took an active part in the labors of the farm. He early learnt to read, and before he was ten he had devoured every book that he could borrow. His third winter was spent at the house of his maternal grandfather in Londonderry, where he attended a district school for the first time. When he was about ten years old his father removed with the family to Westhaven, Vt., where for about five years he was assisted by Horace in clearing up wild land and other severe manual labor. At the end of that time, in the spring of 1826, he became an apprentice to the printer of a weekly newspaper in East Poultney, Vt. This was a position which he had long coveted. He soon learned the art of setting type, and even before the first week was over his skill was superior to that of many an apprentice who had been in practice a month. After remaining in this situation about four years he had become master of the trade, and rendered valuable assistance in conducting the newspaper. In June, 1830, the paper was discontinued, and young Greeley joined his parents, who had removed to Erie co., Pa. He obtained employment in some of the printing-offices in the vicinity of the town of Erie, but the work was hard and the pay poor, and he at length made up his mind to seek his fortune in New York. He arrived in that city on Aug. 17, 1831, with only ten dollars in his pocket, and a scanty stock of clothing in his bundle. After much difficulty he found employment as a journeyman printer. In this capacity he worked in different offices until Jan. 1, 1833, when he entered into a partnership with Francis Story, and began the publication of *The Morning Post*, the first daily penny paper ever printed. The paper failed in about three weeks, and the enterprise was succeeded by the establishment of *The New Yorker*, a weekly journal devoted to literature, politics, and news. Though this was regarded as an excellent newspaper, it never gained financial success, and Mr. Greeley was obliged to engage in other labors. While editing *The New Yorker* he wrote leading articles for *The Daily Whig*, *The Jeffersonian*, and *The Log Cabin*. In the autumn of 1841 *The New Yorker* and *The Log Cabin* were merged in *The Tribune*, with which Mr. Greeley's name was henceforth identified.

The first number of this journal was issued on Apr. 10, 1841. It was a small sheet, retailing for one cent. The paper had no presses, no capital, and only 500 subscribers. For the first week the expenses exceeded the income, but in the course of six months it was established on a sound financial basis, when Mr. Thomas McElrath became a partner and undertook the sole charge of the business of publication, leaving Mr. Greeley the exclusive care of the editorial department. In 1848 Mr. Greeley was elected to fill a vacancy as a member of the House of Representatives in the national Congress, and served in that body from Dec. 1 of that year to Mar. 4, 1849. He took an active part against the abuses of the mileage system and in favor of the establishment of homesteads in the public lands. In 1851 he visited Europe, and served as one of the jurors of the World's Fair in the Crystal Palace in London. He also appeared before the parliamentary committee on newspaper taxes, and gave full and important details concerning the newspaper press of the U. S. His letters during his absence are among his most interesting productions. In 1855 he made a second visit to Europe, chiefly for the purpose of attending the French exhibition, and remained abroad about three months. In 1859 he made a journey across the plains to California, and was honored with a public reception at Sacramento and San Francisco. After having exerted himself for the prevention of civil war between the South and the North at the national Republican convention which met in Chicago in May, 1860, he took a decided stand in favor of its vigorous prosecution subsequent to the actual commencement of hostilities. In 1864 he made an attempt at reconciliation on a plan of adjustment proposed to President Lincoln, which proved unsuccessful. In the same year Mr. Greeley was a presidential elector for the State of New York, and a delegate to the Loyalist convention at Philadelphia.

Upon the close of the war in the spring of 1865, Mr. Greeley became a strenuous advocate of complete pacification based on the conditions of impartial suffrage and universal amnesty. In pursuance of this end he consented to be one of the bondsmen for Mr. Jefferson Davis, the President of the Confederacy, who was imprisoned by the Federal Government on the charge of treason.

The Liberal convention for the nomination of a candidate for the presidency, which met in Cincinnati on May 1, 1872, after the fifth ballot gave a majority of votes for Mr. Greeley. He accepted the nomination, and in the month of July following was nominated for the same office by the Democratic convention at Baltimore. He was thus presented to the country as the candidate of two great parties for the highest office in the Government, and an impassioned contest ensued. He lost the election by a large majority. During the canvass Mr. Greeley performed an incredible amount of mental and physical labor. He spoke constantly, and in all parts of the country, to numerous and eager audiences, frankly discussing the great question at issue, and expressing his convictions with equal boldness and candor. His strong constitution at length became impaired by excessive toil and intense excitement. The loss of his wife, who had been a hopeless invalid for many years, served to complete the fatal work. He was attacked with inflammation of the brain, and died on Nov. 29, 1872, at the residence of his physician, 2 or 3 miles from his home at Chappaqua, N. Y.

In addition to his labors as a journalist and public speaker, Mr. Greeley was the author of several works, the principal of which are *Hints toward Reforms* (1850); *Glances at Europe* (1851); *History of the Struggle for Slavery Extension* (1856); *Overland Journey to San Francisco* (1860); *The American Conflict* (1864); *Recollections of a Busy Life* (1869).

Revised by C. K. Adams.

Greely, Adolphus Washington: explorer; b. at Newburyport, Mass., Mar. 27, 1844; fitted for college in the public schools, graduating from the Brown High School in 1860; enlisted in Company B, Nineteenth Massachusetts Infantry, July 26, 1861; served through the civil war first as second lieutenant and afterward as captain of a regiment of colored infantry; was honorably mustered out Mar. 22, 1867; was appointed second lieutenant of Thirty-sixth U. S. Infantry Mar. 7, 1867; assigned to Fifth Cavalry July 14, 1869; became first lieutenant of Fifth U. S. Cavalry May 27, 1873; captain June 11, 1886. Soon after the civil war he was detailed for duty in U. S. Signal Service. He commanded the expedition sent into the Arctic regions by the U. S. Government, in accordance with the plan of the International Geographical Congress held at Hamburg in 1879, to establish a series of circumpolar stations for scientific observations. He landed with his party, twenty-five in all, at Discovery Harbor, lat. 81° 44′ N., lon. 64° 45′ W., Aug. 12, 1881 (see Polar Research), and was rescued June 22, 1884, at Cape Sabine with six of his party by the officers of the relief ships under Commander Schley. Two of Greely's party, Lieut. Lockwood and Sergt. Brainard, had reached 83° 24′ N. lat. (44° 5′ W. lon.), the highest northerly point yet attained. Greely abandoned Fort Conger Aug. 9, 1883, and reached Baird Inlet Sept. 29, with entire party well; abandoned all his boats, and was adrift thirty days on a floe of ice in Smith's Sound. His permanent camp was established Oct. 21, 1883, at Cape Sabine, the point where he was found. Here eighteen perished. Had the relief ships been delayed forty-eight hours, not one of the party would have been found alive. (See *The Rescue of Greely*, 1885; *Report on United States Expedition to Lady Franklin Bay*, 2 vols., 1888; and Greely's *Three Years of Arctic Service*, 1886.) He was captain of Fifth U. S. Cavalry June 11, 1886. On Dec. 11, 1887, he was detailed as acting chief signal officer of the army, and thus served until he was regularly commissioned as chief signal officer, with the rank of brigadier-general, Mar. 3, 1887. This placed him *ex officio* in charge of the meteorological work of the U. S., and he retained charge of this work until July 1, 1892, when the civilian duties of the Signal Office were transferred to the new Weather Bureau under the Department of Agriculture. In 1888 he published a work entitled *American Weather*. Massachusetts, through legislative action, extended to him its formal thanks for his service in war, in science, and in exploration. He received the thanks of the Government of Great Britain for returning a British ensign, official dispatches, and Arctic mail; also gold medals from the Royal Geographical Society of London and the Society of Geography of Paris.

Revised by Mark W. Harrington.

Green, Anna Katharine: See Rohlfs, Anna Katharine.

Green, Ashbel, D. D., LL. D.: author and educator; b. at Hanover, Morris co., N. J., July 6, 1762; entered the Revolutionary army 1778; graduated from New Jersey College in 1783 with the highest honors; was soon after appointed tutor, and held office for two years; was chosen Professor of Mathematics and Natural Philosophy in New Jersey College in 1785; began preaching in 1786; was elected a member of the American Philosophical Society in 1787; pastor of the Second Presbyterian church, Philadelphia, 1787–1812; became president of Princeton College in 1812, and soon after in the same year received the degree of LL. D. from the University of North Carolina. His degree of D. D. came from the University of Pennsylvania 1792. He held the presidency of Princeton College for ten years 1812–22. Author of *A History of Presbyterian Missions, Lectures on the Shorter Catechism, Discourse delivered in the College of New Jersey, with a History of the College* (Boston, 1822), and other works. Edited and largely wrote *The Christian Advocate* (1822–34); was an able orator, and one of the leaders of Old School Presbyterianism for many years. D. in Philadelphia, May 19, 1848. See his *Life* by J. H. Jones (New York, 1849).

Green, John Richard, LL. D.: historian; b. in Oxford, England, in 1837; studied at Magdalen College School, and at the age of eighteen obtained a scholarship in Jesus College, Oxford. He took holy orders in 1860, and was made curate of St. Barnabas's, London, where in addition to his parochial work he devoted much time to historical studies in the British Museum. Two years later he became vicar of St. Stephen's, Stepney, where he continued his parochial historical work till 1869, when he resigned his living and became librarian at Lambeth, where he wrote his famous *Short History of the English People* (1870). This was followed by a *History of the English People* (1877–80); *The Making of England* (1882); and *The Conquest of England* (posthumous, 1883). His health was always delicate, and for many years he spent his winters in southern lands. D. at Mentone, France, Mar. 9, 1883.

Green, Rufus Smith, D. D.: Presbyterian minister; b. in Sidney, N. Y., Apr. 1, 1848; educated at Gilbertsville Academy, Hamilton College (1867), the University of Berlin, Germany, and the Auburn Theological Seminary (1873). Pastor of Presbyterian churches in Westfield, N. Y., 1873–77; in Morristown, N. J., 1877–81; in Buffalo, N. Y., 1881–90; in Orange, N. J., 1890–93; president of the Elmira

(N. Y.) College for Women 1893. In Morristown he edited *The Record*, 1879–81; published *The History of Morristown, New Jersey*, a part of the *History of Morris County* (1881); in Buffalo he published *Our Church at Work* (1882–90); *Bath Sides, or Jonathan and Absalom* (Philadelphia, 1887). From 1891 he has been chairman of the General Assembly's committee on systematic beneficence, and has published *The Christian Steward*. WILLIS J. BEECHER.

Green, SETH: pisciculturist; b. in Rochester, N. Y., Mar. 19, 1817. He devoted his life to methods of improving the yield of fish from spawn, and in increasing the product of fisheries in the U. S. In 1868 he was appointed one of the fish commissioners of New York, but, shortly afterward resigning, was made superintendent of fisheries. The introduction of shad on the Pacific coast was due to his efforts. He was decorated with two gold medals by the Société d'Acclimatation of Paris. He published *Trout Culture* (Rochester, 1870) and *Fish-hatching and Fish-catching* (1879). D. in Rochester, N. Y., Aug. 20, 1888.

Green, THOMAS HILL, LL. D.: philosopher; b. at Birkin, Yorkshire, England, Apr. 7, 1836; son of Rev. Valentine Green, rector of Birkin. He was educated at Rugby and at Balliol College, Oxford, which he entered in 1855. In 1859 he took a first class in the school of *litteræ humaniores*, and later a third class in law and modern history. In Nov., 1860, he was elected a fellow of Balliol, and in 1862 gained the chancellor's prize for an essay on morals. On taking the degree of M. A. he subscribed to the Thirty-nine Articles, although changes in belief made him unwilling to take orders. In 1866 he was appointed to a vacancy in the teaching staff of Balliol, in 1870 became master of the college, and in 1872 was re-elected fellow. In 1878 he became Whyte Professor of Moral Philosophy. Meanwhile he had taken an active part in furthering popular education, temperance, and, as a Liberal, reforms in local politics. In 1871 he married a sister of John Addington Symonds. He died at Oxford, Mar. 15, 1882. His principal works are *Introduction to Hume* in Hume's *Treatise on Human Nature* (1874–75; new ed. 2 vols., 1886); posthumous works, *Collected Writings*, edited by Nettleship (3 vols., London and New York, 1885–88); *Prolegomena to Ethics* (London and New York, 1883). He was joint translator of Lotze's *Metaphysics* (Clarendon Press, Oxford, 1884). Green was the leading representative of the so-called Neo-Hegelian movement. His influence was the chief one in English idealistic thought until his work came to be supplemented and recast in the writings of Principal Edward Caird. The University of Oxford is still dominated in its philosophical instruction by the works of Green. His character and personal qualities gave his opinions extraordinary weight with young men. He was the original of "Mr. Gray" in the romance *Robert Elsmere*.
J. MARK BALDWIN.

Green, WILLIAM HENRY, D. D., LL. D.: scholar and clergyman; b. at Groveville, Burlington co., N. J., Jan. 27, 1825; graduated at Lafayette College 1840; studied at the Princeton Theological Seminary; became teacher of Hebrew there 1846; was ordained Presbyterian minister 1848; became pastor of the Central Presbyterian church, Philadelphia, 1849; has held the professorship of Hebrew and Old Testament Literature in Princeton Seminary since 1851; took part in the work of revising the Authorized Version of the Bible, being chairman of the Old Testament Company, one of the two sections of the American committee of revision; was moderator of General Assembly in 1891. He published a *Hebrew Grammar* in 1861, which has passed through several editions; a *Chrestomathy* in 1863; an elementary Hebrew grammar in 1866; *The Pentateuch Vindicated from the Aspersions of Bishop Colenso* (1863); *The Argument of the Book of Job Unfolded* (1874); *Moses and the Prophets* (1883); *The Hebrew Feasts in their Relation to Recent Critical Hypotheses* (1885); and many articles theological and controversial. Revised by WILLIS J. BEECHER.

Green, WILLIAM MERCER, D. D., LL. D.: bishop; b. in Wilmington, N. C., May 2, 1798; graduated at the university of that State June 3, 1818; was ordained deacon in the Protestant Episcopal Church in 1820, and priest in 1821, by the Rt. Rev. Richard Channing Moore, of Virginia. He was the first pastor of St. John's church, Williamsborough, N. C., 1821, and of St. Matthew's church, Hillsborough, 1825. In 1837 he was called to the chair of English Literature in his *alma mater*, and in 1849 was elected the first Bishop of Mississippi. He was one of the founders of the University of the South at Sewanee, Tenn. His published works comprise little more than a brief *Memoir of Bishop Ravenscroft* (New York, 1870), a *Life of the Right Rev. Bishop Otey* (1885), and a few sermons, chiefly on the subject of ministerial authority and baptismal regeneration. D. in Sewanee, Tenn., Feb. 13, 1887.

Greenbacks: the name applied during the U. S. civil war (1861–65) to notes, bonds, and forms of paper currency issued by the Government, and printed in green ink. Since then, however, the term has been limited in meaning to U. S. legal-tender notes, especially those issued in 1862 and 1863. Their issue was due to the exigencies of the war, and to the expectation that relief would be thus afforded to the business of the country. It has been defended on grounds of necessity, although criticised by some financial writers as premature. Issues of $150,000,000 each were authorized by the laws of Feb. 25, 1862, July 11, 1862, and Mar. 3, 1863, respectively, with the result of inflating the currency to such an extent that gold rose to 285 in 1864, and did not touch par till Dec. 17, 1878, the date of the first gold sale at par in the U. S. for sixteen years. On Mar. 31, 1866, the amount of legal-tender notes outstanding was $422,424,007, which by Dec. 31, 1868, had been reduced to $356,000,000. The constitutionality of the legal-tender laws was called in question, but appeals to the courts finally established their validity. After many fluctuations in value the act of Jan. 14, 1875, enacted that on and after Jan. 1, 1879, all legal-tender notes should be redeemed in coin upon presentation at the office of the assistant treasurer in New York city. (See CURRENCY.) There had in the meantime arisen a strong opposition to the resumption of specie payments, and in 1874 it became a distinct party issue, on which the so-called Greenbackers went into the campaign of 1876, nominating Peter Cooper for President. They opposed the fixing of an arbitrary date for the resumption of specie payments as a measure destined to rob debtors, and advocated the retirement of all bank-notes and the issue by Government of greenbacks which should be exchangeable for interconvertible bonds, bearing interest sufficiently high to keep them at par with gold. In the election of 1876 their candidate received only 81,737 votes, but in the two succeeding campaigns they were somewhat better supported. In 1888 and 1892 they had no separate candidate and platform, but voted with the United Labor and People's parties. See POLITICAL PARTIES. F. M. COLBY.

Green Bay: an extension of the northwestern part of Lake Michigan, extending 140 miles from N. N. E. to S. S. W., and nearly 30 miles in average breadth. Its waters are about 500 feet deep, and of a green color. To the N. E. the Great and Little Bays de Noquet are its continuations.

Green Bay: city (first white settlement made by the French in 1639, permanently settled by them in 1745, incorporated in 1839, chartered in 1854); capital of Brown co., Wis. (for location of county, see map of Wisconsin, ref. 5–F); on the Fox river, at the head of Green Bay, and on the Chi. and N. W., the Chi., Mil. and St. P., and the G. B., Min. and St. P. Railways; 65 miles N. N. E. of Fond du Lac, 113 miles N. of Milwaukee. It is at the terminus of the projected navigable connection between Lake Michigan and the Mississippi river by means of the Fox and Wisconsin rivers and a canal to be 119 feet wide at the bottom and 19 feet deep. This work is being carried on by the U. S. Government under contracts aggregating more than $10,000,000. The city has an excellent harbor, accessible by the largest lake steamers, and is principally engaged in the lumber and fishery industries, shipping annually about 80,000,000 feet of lumber, 200,000,000 shingles, and 6,000,000 staves, and having a large trade in whitefish and trout. Its location and valuable mineral springs have made it a popular summer resort. Pop. (1880) 7,464; (1890) 9,069; (1895) 18,290 (including the city of Fort Howard). EDITOR OF "STATE GAZETTE."

Greenbrier: a river in West Virginia; rises in lat. 38° 40', and flows S. W. parallel to the main ridge of the Alleghanies, on the western slope of which its valley lies between that ridge and the secondary ridge of the Greenbrier Mountains. In about lat. 37° 40' it unites with New river, which, running nearly northward, unites with the Gauley and forms the Great Kanawha. These rivers and their valleys constitute the trans-Alleghany portion of the James river and Kanawha Canal route of a proposed connection between tide-water and the great valley of the Mississippi.

Green Brier Mountains: a ridge in West Virginia parallel to the main Alleghanies, and lying N. W. of them, con-

tinuous southward with the Great Flat Top, and northward with Shaver Mountains.

Greenbush: village; Rensselaer co., N. Y. (for location of county, see map of New York, ref. 5–J); on the Hudson river, and on the Boston and Albany and the N. Y. C. and H. R. Railroads; opposite Albany, with which it has bridge connection. It has a large railway station, machine and car shops and freight-yards, 7 churches, Roman Catholic convent, sawmills, tannery, cigar-factory, pork-packing establishments, and 2 weekly newspapers. Greenbush is sometimes called East Albany. Pop. (1880) 3,295; (1890) 7,301.

Greencastle: city; capital of Putnam co., Ind. (for location of county, see map of Indiana, ref. 7–C); near Big Walnut, a branch of Eel river; on the Cl., Cin., Chi. and St. L., the Louisv., New Alb. and Chi., and the Vandalia Railways; 39 miles W. of Indianapolis. It is within 8 miles of the celebrated block coal region of Indiana, and near by are valuable tracts of timber and beds of sandstone, limestone, and iron ore. It is the seat of De Pauw University (*q. v.*), and has important manufactures and five weekly newspapers. Pop. (1880) 3,644; (1890) 4,390, with suburbs 6,000.

Editor of "Banner and Times."

Greencastle: borough; Franklin co., Pa. (for location of county, see map of Pennsylvania, ref. 6–E); on the Cumberland Valley Railroad; 63 miles S. of Harrisburg. It is in an agricultural region, manufactures agricultural implements and woolen goods, and has two weekly newspapers. Pop. (1880) 1,735; (1890) 1,525.

Green Cove Springs: town; capital of Clay co., Fla. (for location of county, see map of Florida, ref. 3–J); on the St. Johns river and the Jack., Tampa and K. W. and the Southwestern Railways; 30 miles S. of Jacksonville, 45 miles N. of Palatka. It has a celebrated sulphur spring, much resorted to for the cure of rheumatic troubles, and believed by many to be the "fountain of youth" vainly sought by Ponce de Leon. Principal business, lumbering, fruit and vegetable shipping, brick and woodwork manufacturing, and railway-car building and repairing. It has two weekly newspapers. Pop. (1890) 1,106; (1895) 900.

Greene, Charles Ezra: civil engineer; b. in Cambridge, Mass., Feb. 12, 1842; graduated at the Massachusetts Institute of Technology in 1868. Since 1872 he has been Professor of Civil Engineering in the University of Michigan. He is the author of *Graphical Analysis of Roof Trusses* (1874); *Graphical Method for Bridge Trusses* (1875); *Trusses and Arches Analyzed by Graphical Methods* (1879); and *Notes on Rankine's Civil Engineering* (1891).

Greene, Charles Gordon: journalist; b. at Boscawen, N. H., July 1, 1804. At the age of nine he was assigned to the care of his brother Nathaniel, then manager of *The Patriot* at Haverhill, Mass., who sent him to the Bradford Academy near by, of which Benjamin Greenleaf was then the principal; subsequently he was apprenticed in his brother's printing-office, and continued his apprenticeship in Exeter, N. H.; in 1822 he removed to Boston, and entered the office of the Boston *Statesman*; in 1825 he undertook the management for a year of *The Free Press* at Taunton, and was for a portion of the time its editor. Returning to Boston, he published *The Spectator*, a literary journal, which, however, he soon abandoned, and resumed his place in *The Statesman* office; in 1827 he removed to Philadelphia and published *The National Palladium*, which advocated the election of Andrew Jackson to the presidency. In 1828 he went to Washington and was engaged upon *The United States Telegraph* until after Jackson was elected, when he returned to Boston and acquired a joint ownership in *The Statesman*, of which he became sole owner in a few years. In Nov., 1831, he established the Boston *Post*. He was a member of the Legislature, and Democratic candidate for various public offices. He became aide to Gov. Morton in 1840, and thus gained his title of colonel. President Pierce appointed him naval officer of Boston in 1853, and he was reappointed by Buchanan in 1857. He sold his interest in *The Post* in 1875. D. in Boston, Sept. 27, 1886.

Greene, Charles Warren, A. M., M. D.: journalist and author; b. at Belchertown, Mass., Aug. 17, 1840; educated at Phillips Academy, Andover, Waterville College (Maine), and Brown University; studied medicine at Harvard Medical School, Berkshire Medical College, Pittsfield, and the medical department of Dartmouth College, where he graduated M. D. in 1867; entered the U. S. volunteer service by enlistment July 19, 1862, and served in the army three years, attaining the rank of captain of volunteers, which he held one year; practiced his profession in Massachusetts 1868–72; in 1872 devoted himself to literary pursuits; edited editions of Lippincott's *Gazetteer*, and wrote *Animals, their Homes and Habits* (1886); *Birds, their Homes and Habits* (1886).

Greene, Edward Lee, Ph. B.: botanist; b. at Hopkinton, in Rhode Island, Aug. 20, 1843; educated at Albion, Wis.; entered the ministry in 1871; lecturer on botany (1883), and now Associate Professor of Botany in the University of California. He is editor of *Pittonia* (1887–), and has published *Illustrations of West American Oaks* (1889–90), *Flora Franciscana* (1891–), besides many papers on the botany of the western coast. Charles E. Bessey.

Greene, Francis Vinton: son of Gen. George Sears Greene; b. in Providence, R. I., June 27, 1850; graduated at West Point first in his class 1870; appointed second lieutenant of artillery; transferred to corps of engineers as second lieutenant June 10, 1872, first lieutenant Jan., 1874, captain Feb. 20, 1883; resigned Dec. 31, 1886; served in garrison 1870–72; as assistant astronomer on Northwest boundary survey 1872–76; on special duty in office of Secretary of War 1876–77; as military *attaché* to the U. S. legation in Russia 1877–78, being attached to the headquarters of the Russian army in the Russo-Turkish war; was present at the battles of Shipka Pass, Plevna, Philippopolis, passage of the Balkans, and various combats; received the Order of St. Anne (third class) and of St. Vladmir (fourth class) for bravery at Shipka Pass and Philippopolis. Author of *The Russian Army and its Campaigns in Turkey* (1879); *Army Life in Russia* (1880); *The Mississippi* (Campaign Series, Civil War, 1882); *Life of Nathanael Greene* (1893); and various military and scientific papers. Colonel Seventy-first Regiment, National Guard, State of New York.

James Mercur.

Greene, George Sears: soldier; b. at Warwick, R. I., May 6, 1803; graduated at the U. S. Military Academy second in his class, and entered the army as second lieutenant of artillery in 1823; from this date he was on duty at West Point, as Professor of Mathematics, in garrison, and on ordnance duty till 1836, when he resigned from the army and adopted the profession of civil engineer. As such he was employed on various public works in different parts of the U. S. till 1857, when he was appointed engineer of Croton water-works and of Croton reservoir. He resumed his sword on the outbreak of civil war; was appointed colonel Sixtieth New York Volunteers, and brigadier-general of volunteers in Apr., 1862, participating in the battles of Cedar Mountain and Antietam, the defense of Harper's Ferry, and the battles of Chancellorsville and Gettysburg; transferred to the Army of the Cumberland in 1863, he was severely wounded at Wauhatchie, and disabled from duty in the field till 1865, when he joined the army of Gen. Sherman, and was engaged at Kinston, Goldsboro, etc., N. C. In Apr., 1866, was mustered out of volunteer service; resumed charge of Croton water-works, and became engaged on other important public works; from 1875 till 1877 president of the American Society of Civil Engineers.

Greene, George Washington: historian; b. at East Greenwich, R. I., Apr. 8, 1811; a grandson of Gen. Nathanael Greene; was educated at Brown University; lived in Europe 1827–47; U. S. consul at Rome 1837–45; was instructor in Modern Languages in Brown University from 1848 to 1852; became in 1872 Professor of History (non-resident) at Cornell University. Author of *Historical Studies* (1850); *History and Geography of the Middle Ages* (1851); *Historical View of the American Revolution* (1865); *Biographical Studies* (1860); *Life of Nathanael Greene* (1867–71); and other works. D. at East Greenwich, Feb. 2, 1883.

Greene, Nathanael: soldier; b. at Warwick, R. I., of Quaker parents, July 27, 1742 (O. S.). In early youth, chiefly by his own perseverance, he acquired a more than ordinary knowledge of many branches of education, the perusal of military history occupying much of his attention. In 1770 he was chosen a member of the Assembly of Rhode Island, and from this date took an active part in the affairs of his country till the close of the war. The battle of Lexington excited his military ardor, and on receiving (in May, 1775) the appointment of brigadier-general and the command of the Rhode Island contingent army, he led them to Cambridge; for this he was formally excommunicated from the religious body of which he was a member. On the arrival

of Washington at Cambridge, Greene expressed to his commander his satisfaction in his appointment, and soon won his confidence and esteem. In Aug., 1776, he was appointed a major-general by Congress. In the battle of Trenton he led a division, and bore an equally important part in the following battle of Princeton. At the Brandywine, where he commanded a division, he distinguished himself, and contributed largely toward saving the army from destruction by a rapid march and the firm stand he made against the enemy. At the battle of Germantown he commanded the left wing of the army. In Mar., 1778, he was appointed quartermaster-general, and accepted the office at the urgent solicitation of Washington, on condition that his rank in the army should not be affected and that in time of action he should retain his command. This right he exercised at Monmouth, where he commanded the right wing, as also at the battle of Tiverton Heights. During Gen. Washington's visit to Hartford in 1780 Greene was in command of the army; was president of the court of inquiry upon Maj. André. After the disasters to the American arms in South Carolina he was assigned to the command of the Southern department, to supersede Gen. Gates. He found the army reduced by defeat and desertion, and greatly disorganized and in want. Having recruited his army and repaired its wants, he sent out a detachment under Gen. Morgan, which resulted in the victory of the Cowpens, Jan. 17, 1781. Greene effected a junction with Morgan Feb. 7, but finding his numbers altogether greatly inferior to the army of Cornwallis, he retreated with great skill to Virginia, where, being re-enforced, he returned to North Carolina, and the battle of Guilford was fought, in which, though Greene was defeated, the loss of the British was the greater, and in a few days Cornwallis began a retreat toward Wilmington, followed by Greene; but changing his plan, Greene marched directly to South Carolina, where on Apr. 28 he engaged Lord Rawdon at Camden, and was defeated, but again with the results of success; on May 22 he commenced the siege of Fort Ninety-six, which was raised by the approach of Lord Rawdon. To the suggestion now made, that he had better retire to Virginia, Greene replied, "I will recover South Carolina or die in the attempt." Awaiting a favorable opportunity, he in turn pursued the forces of Lord Rawdon, resulting in the battle of Eutaw Springs, the hardest fought battle of the war, and the advance upon Dorchester. For his conduct at Eutaw Springs Congress presented him with a gold medal and a British standard. During the remainder of his command he struggled successfully against the greatest difficulties in suppressing mutiny among his troops, who were insufficiently fed and clothed. North and South Carolina and Georgia made him valuable grants of property, and after spending a year in Rhode Island upon the return of peace, he sailed with his family to his estate at Mulberry Grove, near Savannah, where he died June 19, 1786, from inflammation of the brain, occasioned by sunstroke. See the *Life* by George W. Greene (3 vols., New York, 1868–71) and that by Francis V. Greene (1893).

Revised by F. V. Greene.

Greene, Nathaniel: journalist; b. at Boscawen, N. H., May 20, 1797. He edited various newspapers at Concord and Portsmouth, N. H., and Haverhill, Mass., and in 1821 established the Boston *Statesman*, at first a semi-weekly, but finally the leading Democratic daily in the State; in 1829 he was appointed postmaster of Boston, and held office until 1840, and again from 1845 to 1849. In 1836 he published a translation of Sforzosi's *History of Italy*, *Tales from the German* in 1837, and *Tales and Sketches from the German, Italian, and French* in 1843. D. in Boston, Nov. 29, 1877.

Revised by Henry A. Beers.

Greene, Robert: poet and dramatist; b. at Norwich, England, about 1560; studied at Cambridge, where he took his degree in 1578; traveled abroad several years, visiting France, Germany, Poland, and Denmark, and seems to have taken holy orders on his return in 1583. Soon after, however, he settled in London, engaged in literary pursuits, and entirely abandoned himself to licentiousness and debauchery. He left thirty-five prose-tracts and four dramas. The former are often of a polemical or satirical description, sometimes "love-pamphlets" or "vaine fantaisyes." They are generally written in the euphuistic style, but they interest by their materials, and form a not unworthy beginning of the English novel. Of greater interest, however, to our time are those tracts which more or less directly deal with the author's own life: *Never Too Late* and *Greene's Groat's Worth of Wit bought with a Million of Repentance.* Of his dramas *The History of Orlando Furioso* is the earliest. The next, a *Comical History of Alphonsus, King of Aragon*, was written in rivalry with Marlowe's *Tamburlaine.* The *Honorable History of Friar Bacon and Friar Bungay*, written in rivalry with Marlowe's *Dr. Faustus*, gives a charming dramatic picture of English life, and *The Scottish Historie of James IV.* contains some outbursts of genuine pathos. See Dyce, *The Dramatic and Poetical Works of Robert Greene* (1861); and Ingleby, *Shakespeare Allusion-books*, 1874 (Introduction). D. in London, Sept. 3, 1592.

Revised by Henry A. Beers.

Greene, Samuel Dana: commander U. S. navy; b. in Cumberland, Md., Feb. 11, 1840; graduated at the Naval Academy in 1859; served as midshipman on the Hartford of the China squadron; became a lieutenant in 1861; in Jan., 1862, volunteered to serve as the executive officer of the Monitor (the first of an untried type of vessels), which the majority of seamen, not without reason, as was afterward proved, believed to be utterly unseaworthy. On Mar. 9 the Monitor attacked the Confederate ram Merrimac in Hampton Roads, and in consequence of an accident to Capt. Worden was commanded by Lieut. Greene throughout the engagement. Lieut. Greene remained on the Monitor until she foundered in Dec., 1862; then served as executive officer of the Florida, the Iroquois, and other vessels 1863–69; became lieutenant-commander in 1866, and commander in 1872; commanded the Juniata in 1875, the Monongahela in 1876–77, and the Dispatch in 1882–84. He was Assistant Professor of Mathematics at the Naval Academy in 1865–68, of Astronomy in 1871–75, and as assistant to the superintendent in 1878–82. D. at Portsmouth, N. H., Dec. 11, 1884.

Green Ebony: a South American tree (*Jacaranda mimosifolia*) of the family *Bignoniaceæ*. Its wood is quite hard and is olive green in color. It is used by dyers, and gives yellows, browns, and greenish tints. It is also used in turnery and joiner-work to some extent. Other species of the genus yield medicinal agents.

Greenfield: city; Greene co., Ill. (for location of county, see map of Illinois, ref. 7–C); on the Chi., Bur. and Q. and the Jacksonville Southeastern Railways; 12 miles E. of Carrollton, 55 miles N. of St. Louis. It is in an agricultural and stock-raising region; contains 4 churches, a seminary, steam-flour mill, and 2 weekly newspapers, and exports cattle, swine, horses, grain, and other produce. Pop. (1880) 985; (1890) 1,131.

Editor of "Argus."

Greenfield: city; capital of Hancock co., Ind. (for location of county, see map of Indiana, ref. 6–F); on the Pitts., Cin., Chi. and St. L. Railway; 21 miles E. of Indianapolis. It is in an agricultural region and also in the natural gas-belt of Indiana, and has a supply of gas sufficient for its own needs and for those of Shelbyville, Ind., with which it is connected by a pipe line. There are 5 churches, high school (building cost $45,000), and 3 grammar schools, electric-light plant, manufactures of glass, school furniture, ice, stoves, nails, flour, butter and cheese, and rolling-mill, planing-mill, and machine-shop products; also 3 weekly and 2 monthly periodicals. Pop. (1880) 2,013; (1890) 3,100; (1893) about 4,500.

Editor of "Hancock Democrat."

Greenfield: town; capital of Adair co., Ia. (for location of county, see map of Iowa, ref. 6–F); on the Chi., Bur. and Q. Railroad; 65 miles S. W. of Des Moines. It is in the rich corn-belt of the State, and has a large trade in agricultural produce. There are 1 daily and 3 weekly newspapers. Pop. (1880) 684; (1890) 1,048; (1895) 1,244.

Greenfield: town; capital of Franklin co., Mass. (for location of county, see map of Massachusetts, ref. 2–E); on the Connecticut river, and the Connecticut River and the Fitchburg Railroads; 36 miles N. of Springfield. It derives its principal prosperity from the agricultural and dairy interests which surround it, and from its manufactures, being the main market for butter, cattle, sheep, etc., in the northwest section of the State, and having manufactures of cutlery, sterling and plated silverware, boots and shoes, children's carriages, bolt-cutting machines, machinists' and blacksmiths' tools, leather goods, wooden rakes and shovels. There are 3 national and 2 savings banks, high school, young ladies' seminary, public library, soldiers' monument, and a weekly newspaper. Pop. (1880) 3,903; (1890) 5,252; (1895) 6,229.

Editor of "Gazette and Courier."

Greenfield: village; Highland co., O. (for location of county, see map of Ohio, ref. 7–D); on Paint creek, and the

Balt. and O. Southwestern and Ohio S. Railroads; 75 miles N. by E. of Cincinnati. It is in an agricultural region, and has considerable general trade and a weekly and a semi-monthly newspaper. Pop. (1880) 2,104; (1890) 2,460.

Green Finch, or **Green Linnet**: a bird (*Coccothraustes chloris*) of the family *Fringillidæ*, found throughout a large part of the eastern hemisphere. It is often kept as a cage-bird, but is a poor songster. It is also called the green grosbeak. It feeds on both seeds and insects.

Greenheart: a tree (*Nectandra rodiæi*; family *Lauraceæ*) and its very valuable timber. It is the same tree which yields the bebeeru bark, a valuable medicine. Its seeds also yield starch, which is used as food by the natives. The timber is exported from Guiana. It is very heavy and durable, takes a high polish, and is used in turnery, and is also largely used for ship-building purposes.

Greenhouse: a glass structure designed to afford an artificial climate in which tender plants may be grown in countries or seasons too cold for their unprotected growth. The simplest structures of this kind are the cold-frames or hot-beds, used by market-gardeners for forcing the early maturity of vegetables. Cold graperies, conservatories, orchard-houses, bark-stoves, forcing-houses, etc., are among the varieties. Originally the name *greenhouse* was applied more especially to those whose winter temperature is just high enough to keep tender plants alive, or perhaps to produce from the flowering kinds some blossoms, but not enough to stimulate growth; but the term is usually applied indiscriminately to glass plant-houses, especially in the U. S. When a greater heat than this is kept up in winter the structure is called a stove or hothouse. The glass serves for the imprisonment of a portion of the solar heat, and currents of cold air are excluded; but in order equably to maintain this temperature, it is necessary to employ artificial heat in some form. For the ruder cold-frames the fermentation of horse-dung mixed with dead leaves or other suitable organic matter is sufficient; and in the old-fashioned stove very delicate plants may be forced by the fermentation of ground tan-bark and horse-dung, which affords not only a suitable heat, but a copious supply of moisture, which is another very favorable condition for plant-growth. In the best constructed greenhouses heat is supplied from iron pipes, through which steam or hot water is conducted. Wrought-iron or gas pipes are generally used, and the riser or flow-pipe is often carried through the top of the house, the returns coming back under the benches. Less piping is required for steam than for hot water. For ordinary conditions, a house 20 by 100 feet can be sufficiently heated by steam by one 2-inch pipe passing overhead the length of the house, and supplying from six to twelve 1-inch or 1¼-inch returns. Hot water demands about a half more pipe. There is much discussion as to the comparative merits of steam and hot water for greenhouse heating, but each has its special merits. For carrying long distances in runs with little fall and containing many angles, it is probable that steam will give the best results in most cases. The character of the heat from the two systems is the same, and plants will thrive equally under either method. One system is as easily manipulated as the other, with the improved automatic heaters now in use.

The modern tendency in greenhouse building is toward simplicity of construction. This is particularly true in the U. S., where the glass house has been the most simplified, and has produced the greatest results in the way of forcing vegetables and flowers. The framework of modern houses is either wood or iron; in either case, it is essential that the frame be very light, and that large glass be used. The details of building must be gleaned from the horticultural periodicals and a few books which contain chapters on greenhouse construction. Revised by L. H. Bailey.

Green Island: village; Albany co., N. Y. (for location of county, see map of New York, ref. 5-J); on an island of the same name in the Hudson river, between Troy and West Troy, with which it is connected by bridges; also connected with Troy and Cohoes by street railway. It contains car-shops of the Del. and Hudson Canal Company's Railway, iron-foundries, iron-works, machine-shops, stove-works, sash and blind factory, and large trade in marble and lumber. Pop. (1880) 4,160; (1890) 4,463.

Greenland (transl. of Dan. *Grönland*): a continental island, and the largest island in the known world; area about 500,000 sq. miles. Its insularity was established (July, 1892) by R. E. Peary, C. E., U. S. navy, who discovered that a strait, believed to be Nordenskiold Inlet, stretches from Lincoln Sea on the W., to the Arctic Ocean on the northeast coast of Greenland. The northern limit of the mainland extends only a little N. of the 82d parallel. North of the mainland is an archipelago of unknown extent. The greatest length of the island from Cape Farewell in the south to Nordenskiold Inlet in the north is about 1,400 miles. The broadest part, in North Greenland, is about 700 miles wide. The island is entirely under Arctic conditions. The only parts of its coast line still wholly unknown are the northeast coast, between Independence Bay (81° 37′ N. lat., 34° W. long.) and Cape Bismarck; the southeast coast, between the 67th and the 69th parallels; and the northwest coast along the shores of Melville Bay.

General Topography.—The interior is covered by the most enormous ice-cap known to exist, spreading over the whole island except along a narrow coast fringe. Deep fiords, some of them the outlets of great glaciers, fed by the ice masses of the interior, characterize most of the coasts. Cliffs and mountains of impressive aspect, from 1,500 to 7,000 feet in height, almost everywhere skirt the coasts. There are no rivers, but the greater part of the drainage reaches the sea through the melting of ice and snow, the muddy brooks and torrents thus formed flowing down and under the glaciers. A part of the precipitation also is removed by the glaciers, which, moving down the fiords, break off as icebergs at the sea-edge. Islands lie in large numbers along the west coast, but are less numerous on the east coast. The two distinctive features are the rugged and mountainous coast belt, extending from 2 or 3 to 20 miles inland, and the ice-cap, which covers all the rest of the country. The east coast is wilder and more desolate than the west, its mountains and cliffs are higher and more precipitous, and its vegetation is more scanty. The highest known summit is Mt. Petermann, at the head of Franz Josef fiord (10,725 feet). The altitude of the west coast mountains, S. of the Arctic Circle, is about 1,600 to 2,000 feet, with a few black and jagged summits that rise 5,000 feet above the sea; between the Arctic Circle and the latitude of Disco Bay the slopes are less precipitous, and the mean altitude is not so great. This is the region of the deepest fiords and the mightiest glaciers. N. of Disco Bay the mountains are again steeper and higher, some of them rising 7,000 feet. The hills and mountains N. of Melville Bay are, for the most part, less bold and impressive than along the coast of Danish Greenland, and the hill features rarely exceed 3,000 to 4,500 feet in height, though N. of Smith Sound there are some loftier summits.

Geology.—Gneiss, granite, and other crystalline formations form by far the greater portion of the rocks uncovered by snow and ice, and therefore accessible for study. On Disco island, and here and there along the west coast, towering masses of columnar basalt, some of them shaped into fantastic forms by wave action, are a conspicuous feature. Sandstone is also found; coal has been discovered on Disco island and on Lady Franklin Bay; the mineral cryolite is in paying quantities at Ivigtut, in Southwestern Greenland, and is extensively mined; and the mineral eudialite, near the south end of the island, is also commercially profitable. Though the island is largely the result of ancient plutonic activity, no active volcano is known to exist. The fossil flora found in sedimentary beds of the Carboniferous, Triassic, and Jurassic periods show types of vegetable life akin to some now found within the tropics. The Upper Cretaceous strata are very rich in fossil flora that must have existed under conditions of climate ranging from temperate to sub-tropical. More than 600 fossil plants afford undoubted evidence that Greenland has experienced all the various phases of climate.

The Inland Ice.—As late as 1885 some geologists and explorers, most notably Nordenskiold, held that the interior of Greenland was not entirely covered with snow and ice. It was left for Nansen (1888) and Peary (1892) to prove that the interior is an unbroken ice-sheet covered with snow and rising by gentle gradients from both east and west coasts to the culminating plateau or main axis, over 8,000 feet above the sea. The configuration of the land can not be studied, for mountains and valleys have completely disappeared under this tremendous ice-sheet. It is only near the outer edges that the moving mass has crept around instead of overwhelming the hill features, leaving here and there protuberances of rock known as nunataks. These rocky islands in the ice sea are more numerous in South

than in North Greenland. Peary saw a few birds from 50 to 75 miles inland, but otherwise the only signs of life in the interior are on these nunataks, where flies, butterflies, a species of poppy and mosses have been found. These little centers of animal and vegetable life amid the ice wastes are among the curiosities of Greenland. Once out of sight of the nunataks, nothing has yet been seen throughout the vast interior except the comparatively smooth and snow-covered ice-field, sloping gently from the narrow plateau of greatest elevation toward the east and west coasts. The area covered by the inland ice is over 400,000 sq. miles. The land surface on which it rests is probably diversified by lofty hills and deep valleys, but the plastic ice moves over the obstructions, and, impelled by its great weight and the law of gravitation, slowly makes its way toward the sea. The tremendous weight of the moving ice mass, which probably covers the valleys to a depth of 5,000 to 6,000 feet, must exercise a strong molding influence upon the land. An active melting process evidently goes on at the bottom of the ice, and large streams pour into the sea from under the ice in winter as well as in summer. These streams are powerful eroding agents and are turbid with the detritus they carry. In the glacial basins where the ice masses are pushed and torn by the enormous pressure that is thrusting them to the outlets, the surface is rent by wide and deep crevasses, very difficult and dangerous to cross. It was this phenomenon that gave the idea that the inland ice was impassable. When, however, these glacial basins are crossed the ice surface is unbroken, and offers not the slightest impediment to explorers who are properly equipped for snow traveling. From the upper portion of many a coast mountain it is possible to gain this safe inland highway without meeting crevasses. The summit or main axis of the ice-cap, extending N. and S., is a plateau of no great width, from 8,000 to 9,000 feet above the sea, nearly bisecting the island in its southern portion, but nearer the east coast in its northern part. At that immense elevation Peary was shrouded for two weeks in almost incessant fog and mist. The Danes, who have examined (1893) a stretch of about 1,500 sea miles of coast, have found that, measured on a line drawn through the inner extremities of the fiords, the edge of the inland ice is everywhere continuous. This edge of the ice sea is often 1,000 feet thick, and tends constantly to approach the sea, but in some parts its progress toward the coast is stopped by the mountainous barriers. As a rule the ice movement seaward is only sufficient to make good the loss caused by the thawing of the ice edge under the summer sun.

The Glaciers.—Hundreds of glaciers approach the sea, but comparatively few of them reach it or are of first-class magnitude. Garde counted 170 along the southeast coast, but there are perhaps less than 100 in all Greenland that reach the sea and produce icebergs, and less than fifty of them are of the first importance. The east coast glaciers are mostly of inferior size, due to the smaller drainage area of the east coast, and few of their icebergs ever reach Cape Farewell, many of them being blocked in the fiord entrances by islands at their mouths. The birthplace of most of the icebergs which drift down into the Northern Atlantic, and are met by steamers, is along the short strip of west coast between 68° 30′ and 75° N. lat. It is in some of these fiords that the marvelous phenomenon may be witnessed of ice masses, about 1,000 feet thick and 14,000 feet wide, moving seaward at the average rate of 2 feet an hour. The average rate of five of these glaciers has been found to be about 50 feet a day. The great glacier near Upernivik moves 90 feet a day. The frozen mass yearly discharged as icebergs would make a mountain 14,000 feet long, 13,000 feet broad, and about 900 feet high. The front of some glaciers has advanced in recent years. In 1889 the great glacier of Jakobshavn was nearly 2 miles beyond the point that marked its limit in 1878. In Inglefield Gulf glaciers have been discovered (Peary, 1892) that are almost as large as those of South Greenland. When a glacier front reaches the sea it is pushed out over the water until its weight causes a mass of greater or less extent to break off, and, if the sea is of sufficient depth or other impediments do not intervene, the iceberg thus created floats away.

Climate—Greenland is one of the coldest parts of the world. The isothermal line indicating the freezing-point crosses the island near its southern end. It is shrouded in darkness and twilight for several months in the year. The winters are of very unequal severity, and settlements not far from one another report considerable differences in average temperature in the same season. Warm and föhn winds from the south now and then raise the temperature many degrees during the last months of winter. Temperatures of −60° to −70° F. have been experienced in Northwest Greenland. The mean winter temperature at settlements in South Greenland has been recorded as varying between −7° and 20° F. At Upernivik the mean temperature for the three summer months is 38°, and further south, at Julianehaab, it is 48°. The temperature of the east coast is higher than that of the west coast. More snow falls in the south than in the north. The branch of the Gulf Stream flowing N. along the west coast increases the habitability of that region.

Flora.—The island has a considerable variety of mosses, herbs, and shrubs. Minute flowerless plants of the class *Algæ* are found even on the ice. In sheltered spots the summer sun shines with much intensity and vegetation develops rapidly. In fiords in the extreme southwest birches and alders attain the height of a man. Few of the shrubs are more than a foot high and their branches touch the ground. Dwarf alder and mountain-ash are found as far north as the 65th parallel, the juniper two degrees higher, and the willow and birch, often half hidden in moss, as far north as the 72d parallel. The flora embraces about 400 flowering plants and several hundred varieties of lichens. Botanists find the flora more like that of Europe than America, and Hooker and Brown say its character is that of the mountains and lake regions of Northern Europe. The fauna also is nearly allied with that of North Europe, and these facts have led to the conclusion that at one time Greenland was connected by land with the Old World. Some vegetables are cultivated, not with much success, in the Danish settlements.

Fauna.—The musk ox is the only animal of distinctly American origin, and it is now found only in the extreme north beyond the reach of the natives. The reindeer, white bear, wolf, fox, hare, weasel, and lemming are European mammals. Most of these animals have been practically exterminated in Danish Greenland. Reindeer, once found in great herds in the south, are now met with in numbers only in the northern and eastern parts of the island. The Danes have introduced cattle, sheep, goats, and swine in very small numbers. Among the 125 varieties of birds the eider duck, ptarmigan, and auk are the most useful. There are few species of butterflies or of terrestrial mollusks. The neighboring seas swarm with life. Seven species of seals, sixteen of the whale family, many fishes and mollusks, and numerous lesser organisms people the waters. The Greenland seas were once among the best whaling-grounds, but the right whale and less valuable species were long ago exterminated, and for years whalers have passed north only to reach other whaling-grounds through Lancaster Sound, which they have nearly exhausted. The seal is the great food reliance of the natives, the walrus coming next, while the reindeer, still numerous in the Smith Sound region, is little hunted. The ivory of the walrus and narwhal is of important service to the natives, and the Danes export large quantities of seal oil and skins.

Inhabitants.—The Danish census of 1888 showed a population of 10,221, of whom 300 were Danes. This did not include the east coast Eskimos, who were found (Holm, 1885) to number about 500 souls, nor the northwest coast natives, who number (Peary, 1892) 243 persons. The East Greenland Eskimos are gradually emigrating to the west coast, where they may have the benefit of trade with white men. The natives are grouped in about 200 settlements, many of them containing only one or two huts. Their most northern settlement is Peteravik in Robinson Bay, under 78° N. lat., about 40 miles S. of their most northern habitat when Kane and Hayes met them. There is evidence that they formerly hunted and lived much farther N. The only pure Eskimos are those of the Smith Sound and east coast regions. All the others have a large admixture of European blood, are nominally Christians, and live chiefly by collecting skins and oil for the Danish trade. They have schools, a newspaper and books in their own language; missionary teachers are devoted to their welfare, and the Danish Government protects them in large measure from vices introduced by white men. Their settlements, built in the shelter of bays and fiords, communicate with one another only by sea. Isolated as these native communities are, their habits and dialects are almost identical. The Smith Sound Eskimos and those of South Greenland are separated by the impassable barrier of the Melville Bay ice, and have been brought into con-

tact only to a limited extent by the whites, and yet their language shows only slight dialectic differences. The east coast dialect, however, differs considerably from that of the west coast, chiefly because the words applied to persons as proper names are not spoken after the death of the person and other words are invented to convey the idea. The language is therefore in a state of gradual transition. The Danes are all in the Government service, and a number of them with their wives and children have lived in Greenland for many years. Their most northern settlement is Tessuisak (73° 24′), and this place, where a Danish trading-agent and his family reside, is the most northern abode of civilized man.

Government.—The southwest coast is divided into the inspectorates of North and South Greenland, each having its own governor, and each divided into districts in charge of lesser officials. The governors and agents are responsible to a Government board at Copenhagen, which is charged with the control of all Greenland affairs. The policy is to pay the natives small prices for their skins and oil, and to sell them commodities at a small advance on prices in Denmark, and some articles are sold to them at first cost.

History.—The island was first seen by the Norman rover Gunnbjorn, and afterward (about 982 A. D.) Erik the Red, a banished Icelander, landed there and called it Greenland, with the idea that an attractive name would draw colonists. (See Erik the Red.) Over 600 years later Baffin called it, more appropriately, the Land of Desolation. A century after Erik landed a considerable population from Iceland had settled on the west coast, forming the communities of Westerbygd and Oesterbygd, both undoubtedly lying on some of the western fiords. For four centuries these people had intercourse with Europe, and they also discovered and visited America. European wars distracted attention from them, and meanwhile they were almost annihilated by Eskimos and finally were nearly forgotten. They perished, leaving some monuments in the shape of stones covered with Runic inscriptions, and the ruins of a church and houses. They had become nominally Christians, and maintained a republican form of government, but shortly before the troubles that blotted them out they swore allegiance to the King of Norway. The history of Greenland is then a blank for 200 years, until Davis, Hudson, and Baffin (1585–1616) began their explorations. Davis discovered the great strait that bears his name, Hudson saw the east coast at 73° N. lat., and Baffin (1616) skirted the west coast to Smith Sound, making, in a little sailing vessel, one of the most successful voyages ever made to that region. The country has been under Danish control for two centuries, but it was not till the missionary Hans Egede (1721) debarked on the west coast that permanent settlements were established. Egede founded Godthaab (Good Hope), and sought in vain for evidence that descendants of the Norsemen were still living there.

Exploration.—The exploration of Greenland is the work of the nineteenth century. Graah, one of the most tireless of explorers, surveyed the west coast between Cape Farewell and Upernivik (1821–23). Undaunted by difficulty he forced his way through the ice along the east coast (1828–30) to 65° 18′ N. lat. Discovery on the southeast coast was renewed (1883–85), when Holm remapped the coast and found at Sermalik (65° N. lat.) the most northern natives known to exist on that coast. Farther north the whaler Scoresby (1822) skirted the coast for 400 miles, and added many facts to the maps. His detail of the coast line was altered in some respects by the studies of Clavering (1823) and Koldeway (1869–70). Denmark's explorers have systematically studied the west coast as far north as Upernivik since 1876. The explorers who have helped to outline the northwest shore line are Inglefield (1852), Kane (1853–55), Hayes (1860–61), Hall (1871–73), Nares (1875–76), and Greely (1881–83), during whose expedition a point within 386 miles of the north pole was attained, about 4 miles beyond the highest latitude hitherto reached. The Danes and Germans have studied the border regions of the ice-cap and are investigating glacial phenomena. Hayes, Whymper, Nordenskiold, Jensen, and Peary made short journeys on the ice-cap before Nansen (1888) crossed it S. of the Arctic Circle, sledging 260 miles; and Peary (1892) crossed it in North Greenland, sledging 1,300 miles to and from his winter camp. See Peary, Robert E.

Further information may be found in *Danish Greenland*, by Dr. H. Rink (London, 1877); in the series *Meddelelser om Grönland* (Danish Government, Copenhagen, vols. i.–xiii., 1879–90, with French paraphrases in each volume); and in the reports and books of the explorers above mentioned. Robert E. Peary.

Greenleaf, Simon, LL. D.: jurist; b. at Newburyport, Mass., Dec. 5, 1783; studied law, and, after being admitted to the bar, began practice at Standish, Me., in 1806, removing to Gray soon after, and in 1818 to Portland. From 1820 to 1832 he was reporter of the Supreme Court in Maine, and published nine volumes of reports. In 1833 he was appointed Royall Professor of Law at Harvard University, through the influence of Judge Story, whom he succeeded as Dane Professor of Law in 1846. Having resigned in 1848 his professorship, he was made emeritus professor. He was for many years president of the Massachusetts Bible Society. His most important work was a *Treatise on the Law of Evidence*, in 3 vols. (1842–53; 14th ed., with additions by Simon Greenleaf Croswell, 1883). A volume of *Overruled, Denied, and Doubted Decisions and Dicta* was published in 1840, and subsequently expanded to three volumes. In 1849 he edited Cruise's *Digest of the Laws of England respecting Real Property*. He also published an *Examination of the Testimony of the Four Evangelists by the Rules of Evidence as administered in Courts of Justice, with an Account of the Trial of Jesus* (1846), and *Remarks on the Exclusion of Atheists as Witnesses*. D. at Cambridge, Mass., Oct. 6, 1853.

Green Mountains: a part of the Appalachian chain, constituting an important range in Vermont and Massachusetts, and continued southward in the hills of Western Connecticut and the Highlands of New York. The Taconic range of Massachusetts, New York, and Connecticut is an outlying western parallel range. Northeastward the Green Mountains pass into the Notre Dame Hills of Canada, and are traceable at least as far as the Gulf of St. Lawrence. The highest points are Mt. Mansfield, 4,389 feet, Camel's Hump, 4,188 feet, and Killington Peak, 4,380 feet in height. The range contains marble, iron, slate, and some copper and gold. The country is generally a rich pastoral region, with valuable water-power and abundant forests, consisting of pine, hemlock, fir, spruce, etc. The summits of the mountains are rounded and grassy. Revised by G. K. Gilbert.

Greenock: town of Scotland; in Renfrewshire, on the Frith of Clyde; 22½ miles by rail W. N. W. of Glasgow (see map of Scotland, ref. 11–F). It has excellent harbors and docks, extensive establishments for sugar-refining, ship-building, and the manufacture of ironwork, ropes, paper, wool and worsted, and a very brisk trade with North America and the West and East Indies. It has several parks, fine water-works, a custom-house, county buildings, several asylums, a temperance institute, and the Watt Institution. The west end of the town is handsomely built. The tonnage of vessels belonging to the port in 1888 was 229,912 tons. James Watt, the inventor of the steam-engine, was born here. Pop. (1891) 63,498.

Greenough, green′ō, Horatio: sculptor; b. in Boston, Mass., Sept. 6, 1805. At the age of sixteen he entered Harvard College. At Cambridge he found in Washington Allston a stimulating and wise friend; his gratitude to Allston never diminished. His sonnets, written while an undergraduate, sketches with the pencil, plaster casts, models, and designs—particularly one for a monument on Bunker's Hill—attest a remarkable creative power. Before the day of graduation Greenough went to Italy for serious study of the ancient masterpieces, repairing at once to Rome, where Thorwaldsen was his friend and instructor. His studies impaired his health, and he spent a few months at home executing portrait-busts of J. Q. Adams, Chief Justice Marshall, and others. Already he had a reputation for talent. At Paris, whither he went for the purpose, he made the bust of La Fayette, by none admired more than by La Fayette himself. Returning to Italy, Greenough took up his residence in Florence as a sculptor. Among his first patrons was Cooper the novelist, who gave him a commission which proved to be the beginning of his larger renown. The group, nude cherubs, was sent to Boston, and excited great admiration in influential quarters just at the time when the Government was thinking of a statue to George Washington. He secured the commission, but the work was not designed for the open air, and the placing of it was a disappointment to the artist.

One of his earliest works was a statue of Abel. One of his latest, *The Rescue*, representing an American settler grappling an Indian, was executed between 1837 and 1851

on an order from the Government. The disturbed state of Italy made his home there disagreeable, and he left in the autumn of 1851 on the pretext of erecting his group of *The Rescue* in Washington. D. in Somerville, Mass., Dec. 18, 1852. Among his best-known works are the *Venus Victrix*, the *Angel Abdiel*, and the *Medora*.

Revised by RUSSELL STURGIS.

Greenough, RICHARD SALTONSTALL: sculptor; brother of Horatio; b. at Jamaica Plain, Mass., Apr. 27, 1819; has spent most of his life in Europe. Among his works are a portrait-bust of William H. Prescott, executed in 1843, a head of Christ, *Moses and the Daughter of Pharaoh*, *Cupid Warming an Icicle*, *The Shepherd Boy and the Eagle*, now in the Boston Athenæum, the bronze statue of Franklin in School Street, Boston, executed in 1853, the marble statue of Gov. Winthrop in the chapel at Mt. Auburn Cemetery, and a colossal statue of Gov. Winthrop, ordered by the State of Massachusetts for the Capitol at Washington.

Revised by RUSSELL STURGIS.

Green Pigments: those pigments which directly afford green colors, rendering unnecessary the mixture of yellow and blue pigments to obtain certain shades. Among the most prominent of the green pigments is *chrome green*, the sesquioxide of chromium, made by firing the chromate of mercury, and affording a very permanent and full-bodied opaque green paint. *Terre verte*, or green earth, a native mineral, affords a neutral green, permanent and delicate, much used by artists. *Scheele's green*, the arsenite of copper, is a cheap and good green paint. *Schweinfurth's green* is the double arsenite and acetate of copper; it affords a very handsome color. *Sap green*, prepared from buck-thorn-berries, is employed by artists. Many of the salts of copper are employed as green pigments. See PAINTS and PIGMENTS.

Greenport: village; Suffolk co., N. Y. (for location of county, see map of New York, ref. 8–K); on Shelter Island Sound and the Long Island Railroad; 95 miles E. by N. of Brooklyn. It has an excellent harbor, which has been improved by a breakwater, a bank, 7 churches, 2 weekly newspapers, and several summer hotels and boarding-houses, and is principally engaged in ship-building, coasting, and fishing. Pop. (1880) 2,370; (1890) estimated, 3,000.

Green River: a river in Kentucky; rises in Lincoln County, and pursues a devious northwesterly course, uniting with the Ohio 6 miles above Evansville, Ind. It is navigable at high water 200 miles by means of locks and dams. The mouth of the Mammoth Cave, at an elevation of 225 feet above, is about a quarter of a mile from this river, a subterranean communication from which constitutes the famous "river" of that cave.

Green River: a river of Massachusetts; rises in Windham co., Vt., and joins the Deerfield river at Greenfield. It affords good water-power, and there is fine scenery on its banks.—Another Green river flows from Hancock, Mass., through Williamstown, into the Hoosac.—Still a third rises on the borders of Massachusetts and New York, flows southward through West Stockbridge, Alford, and Great Barrington, and joins the Housatonic river near the northern boundary of Sheffield. It is this which forms the theme of the poet Bryant in his lines *To Green River* (written when he was a resident of Great Barrington).

Green River: a river of Utah; rises in Western Wyoming, and flows in a generally southward course into Utah. With Grand river it constitutes the Rio Colorado of the West. It drains a large portion of Utah E. of the Wahsatch Mountains, and a large area in Northwestern Colorado.

Greensand [named from the greenish hue imparted by certain of its grains]: a sandstone or sand containing a large amount of the green mineral glauconite, a hydrous silicate of iron and potassium. The word has also been used as the proper name of several formations of Cretaceous age. In England the Upper Greensand and Lower Greensand, separated by the Gault formation, fall in separate divisions of the Cretaceous, the Cenomanian, and Neocomian. In New Jersey the upper marl beds of the Cretaceous are sometimes called the Greensand. G. K. G.

Greensboro: town; capital of Hale co., Ala. (for location of county, see map of Alabama, ref. 4–B); on the E. Tenn., Va. and Ga. Railway; 38 miles S. of Tuscaloosa, 50 miles W. N. W. of Selma. It is in a cotton-growing region, a few miles N. of the canebrake region, formerly famous for its productiveness; is the seat of the Southern University, founded by the Alabama Conference of the Methodist Episcopal Church in 1859; and has the Tullibody Academy and a non-sectarian female college, carriage-factory, and 1 monthly and 2 weekly periodicals. Pop. (1880) 1,833; (1890) 1,759.

Greensboro: city; capital of Greene co., Ga. (for location of county, see map of Georgia, ref. 3–H); on the Ga. Railroad; 83 miles W. of Augusta, 87 miles E. by S. of Atlanta. It is in a cotton, corn, and hay region, and has several schools, the Thomas Stocks Institute, Fuller Academy, 1 bank, and 2 weekly newspapers. Pop. (1880) 1,621; (1890) 1,313; with suburbs, about 2,500.

EDITOR OF "HERALD-JOURNAL."

Greensboro: city; capital of Guilford co., N. C. (for location of county, see map of North Carolina, ref. 2–F); on the Richmond and Danville and the Cape Fear and Yad. Valley Railways; 48 miles S. S. W. of Danville, 81 miles W. N. W. of Raleigh; named in honor of Gen. Greene, who commanded the Continental army in the battle of Guilford Court-house, fought 5 miles N. W. of Greensboro on Mar. 15, 1781. It is in a tobacco, wheat, corn, oats, and fruit region, with gold, copper, and iron mines; contains the only blast furnaces for the manufacture of Bessemer steel in the State, and has roller flour, planing, hosiery, and cotton mills, brick, tile, and terra-cotta works, foundries and machine-shops, etc. The educational institutions include the Greensboro Female College for white girls (Methodist Episcopal Church South); Bennett College for colored youth of both sexes; Guilford College (Friends'); and the State Agricultural and Mechanical College for colored students. Pop. (1880) 2,105; (1890) 3,317; (1891) by extension of corporate limits, about 6,000.

LOCAL EDITOR OF "DAILY WORKMAN."

Greensburg: city; capital of Decatur co., Ind. (for location of county, see map of Indiana, ref. 8–F); on the Cleve., Cin., Chi. and St. L. Railway; 47 miles S. E. of Indianapolis, 68 miles W. N. W. of Cincinnati. It has natural gas-wells, a furniture-factory, a pork-packing establishment, several flouring-mills, carriage-factories, a woolen-mill, a foundry and machine-shop, fine stone quarries, and extensive shipments of stone for business purposes are made. There are three weekly newspapers. Pop. (1880) 3,138; (1890) 3,596.

Greensburg: borough; capital of Westmoreland co., Pa. (for location of county, see map of Pennsylvania, ref. 5–B); on the Penn. Railroad; 31 miles E. of Pittsburg. It is an important coal and grain shipping-point, and has natural-gas wells and manufactures of steam-heating apparatus, iron, brass, steel, glass, nuts, bolts, etc. There are several churches, banks, Greensburg Seminary (Lutheran), and 2 daily and 6 weekly newspapers. Pop. (1880) 2,500; (1890) 4,202; with suburbs, about 10,000. EDITOR OF "PRESS."

Greenshank: the *Totanus glottis*; a wading bird of the group known as tatlers; is remarkable for its wide geographic range, being found in Asia, Europe, and North America, but rather rare in the U. S. It is as large as a woodcock, and has a much longer bill and legs.

Green Sickness: See CHLOROSIS.

Green Snake: a name applied to several harmless serpents of the U. S. *Cyclophis vernalis* is the little green or grass snake, very common throughout a large part of the U. S. *Cyclophis æstivus* is a long, slender tree-snake, of the Southern States, golden green above, whitish yellow beneath; the genus to which these belong is rather closely related to *Coluber*.

Greenspond: a port of entry; on an island of the same name N. of the entrance to Bonavista Bay, on the northeast coast of Newfoundland. The island is utterly barren, and soil for gardens has been brought from the mainland. The harbor is small but safe, and the town is important as a fishing and sealing station. Pop. about 1,000.

Greenstone: a name at one time much used for massive rocks of intermediate composition and greenish color. This latter characteristic they owe principally to the presence of green hornblende, largely of secondary origin. Chlorite and epidote are also common constituents which add to the green color of the rock. Recent studies have shown the term greenstone to be petrographically a loose and inaccurate one, since the rocks to which it was applied are more or less altered forms of syenite, diorite, gabbro, or diabase, but it is nevertheless still a convenient field designation.

GEORGE H. WILLIAMS.

Green Turtle: a large sea turtle (*Chelone midas*), probably so called from the brownish-olive color of the upper parts. The head is small, the feet, as in other marine turtles, modified into flippers. It is found in the tropical or warm seas of both hemispheres, and is particularly abundant in the West Indies and at Ascension island. The green turtle attains a weight of from 300 to 500 lb., but those of this weight are not common. The females seek the shore at night in the West Indies from April to June, for the purpose of depositing their eggs in the sand above high-water, where they are left to be hatched by the sun. The animal feeds on seaweed, and the flesh, which is palatable, is the basis of the well-known turtle soup. Green turtles are brought to market in large numbers, and, as they live for a considerable time without food, are readily transported from Ascension or the West Indies to England. The Pacific green turtle has been called a distinct species (*Chelone virgata*), and two others are credited to Australasia, but it is doubtful if these are valid. See TESTUDINATA and TURTLE-FISHERY.
F. A. LUCAS.

Greenville: city; capital of Butler co., Ala. (for location of county, see map of Alabama, ref. 6–D); on the Louisville and Nashville Railroad; 45 miles S. S. W. of Montgomery. It has a large trade in cotton and lumber; sawmills, cotton-gins, a cedar-factory, an ice-factory; South Alabama Female Institute (Baptist), public-school building, street railway, improved system of water-works, and a weekly newspaper. Pop. (1880) 2,471; (1890) 2,806; (1893) estimated, 3,500.
EDITOR OF "ADVOCATE."

Greenville: city; capital of Bond co., Ill. (for location of county, see map of Illinois, ref. 8–D): on the East Fork of Big Shoal creek, and on the Jackson Southeastern and the Vandalia Railways; 50 miles E. N. E. of St. Louis. It is in a corn and wheat growing region, has extensive coal mines, and contains Greenville College for ladies, several banks, and two weekly newspapers. Pop. (1880) 1,886; (1890) 1,868.
EDITOR OF "ADVOCATE."

Greenville: city; Montcalm co., Mich. (for location of county, see map of Michigan, ref. 6–I); on the Flat river and on the Det., Lans. and North., and the Tol., Sag. and Musk. Railways; 28 miles N. E. of Grand Rapids, 59 miles N. W. of Lansing. It has excellent water-power, Flat river being dammed at two points within the city limits, large flouring-mills, severals sawmills and planing-mills, woolen-mill, machine-shops, tannery, shingle-mills, public library, and 1 daily and 3 weekly newspapers. It is surrounded by a good farming country, and is a base of supplies for the Flat river lumbering. Pop. (1880) 3,144; (1890) 3,056; (1894) 3,113.

Greenville: town; capital of Washington co., Miss. (for location of county, see map of Mississippi, ref. 6–E); on the Mississippi river and on the Richmond and Danville and the Yazoo and Miss. Valley Railroads; 100 miles N. N. W. of Jackson. It is the center of a large cotton-trade, and has 2 compresses and 2 oil-mills, saw and planing mills, handsome new court-house, excellent public schools, and 3 weekly newspapers. Pop. (1880) 2,191; (1890) 6,658.
EDITOR OF "TIMES."

Greenville: town; capital of Pitt co., N. C. (for location of county, see map of North Carolina, ref. 3–I); on the Tar river and on the Wilmington and Weldon Railroad; 90 miles E. by W. of Raleigh. It is in a region particularly adapted to cotton, tobacco, peanuts, grains of all kinds, vegetables, and fruit; contains 5 churches for white people and 4 for colored, an academy for boys, school for girls, 2 schools for both sexes, and 2 for colored children; and has 2 tobacco warehouses, machine-shops, foundries, carriage-factories, lumber-mills, and paint-factory. Pop. (1880) 912; (1890) 1,937; (1893) estimated, 2,300.
EDITOR OF "EASTERN REFLECTOR."

Greenville: city; capital of Darke co., O. (for location of county, see map of Ohio, ref. 5–C); on Greenville creek and on the Cin., Jack. and Mack., the Dayton and Union, and the Pitts., Cin., Chi. and St. L. Railways; 35 miles N. W. of Dayton. It is in an agricultural region; has 11 churches, 2 public schools, Roman Catholic school, improved system of water-works, natural-gas plant supplied from wells in Mercer County, 18 miles N., and 1 daily, 1 monthly, and 7 weekly periodicals. Gen. Wayne built a fort on the site of Greenville in 1793, and signed a treaty with the Indians there Aug. 3, 1795. Pop. (1880) 3,535; (1890) 5,473.
EDITOR OF "TRIBUNE."

Greenville: borough; Mercer co., Pa. (for location of county, see map of Pennsylvania, ref. 3–A); on both sides of the Shenango river, which affords abundant water-power, and on the Erie, the Penn., and the Pitts., Shen. and L. E. Railways; 85 miles N. of Pittsburg. It is at the head of the fertile Shenango valley; has several coal mines, iron-foundries, rolling-mills, woolen-mills, and minor manufactories, and is the seat of Thiel College, organized under the auspices of the Evangelical Lutheran Church in 1870. Pop. (1880) 3,007; (1890) 3,674.

Greenville: city; capital of Greenville co., S. C. (for location of county, see map of South Carolina, ref. 4–C); on the Car., Knox. and W., the Port Royal and W. Car., and the Richmond and Danville Railways; 141 miles N. W. of Columbia, 158 miles E. N. E. of Atlanta, Ga. It is the seat of Furman University and Greenville Female College, and, besides, has a good system of public schools. The U. S. court meets semi-annually in Greenville. The city is a great manufacturing center, has a large carriage and wagon manufactory, cotton-mills, etc., fine U. S. and county court-houses, opera-house, and street railway; is a popular summer resort, and handles over 20,000 bales of cotton annually. Pop. (1880) 6,160; (1890) 8,607.
EDITOR OF "BAPTIST COURIER."

Greenville: town; capital of Hunt co., Tex. (for location of county, see map of Texas, ref. 2–I); on the St. L., So. West., the Sher., Shrev. and So., and the Mo., Kan. and Tex. Railways; 50 miles N. E. of Dallas. It is in an agricultural region and has a large shipping-trade, several manufactures, and 1 daily and 4 weekly newspapers. Pop. (1890) 4,330.

Greenway, THOMAS: Premier of Manitoba; b. in Cornwall, England, in 1838; removed to Canada in 1844. He represented South Huron in the Dominion Parliament 1875–78; was elected to the Manitoba Legislature in 1880, and has been returned at each successive election. In Jan., 1888, he was called upon to form an administration, which he did, and took the offices of President of the Council and Minister of Agriculture.
NEIL MACDONALD.

Greenwich, grin'idj: parliamentary borough of England; in the counties of Kent and Surrey; on the right bank of the Thames (see map of England, ref. 12–J). It contains several establishments for the building of iron steamers and the manufacture of machinery. The two objects of greatest interest, however, are the Royal Observatory (see OBSERVATORY), in the fine park, from which the longitude is reckoned on all British charts, and the Royal Naval College, formerly known as the Greenwich Hospital, a splendid range of buildings. Behind the college is the Royal Hospital School, in which sons of petty officers and seamen are boarded. Among charitable institutions are the Norfolk or Trinity College, the Greencoat and Bluecoat schools, and the Jubilee almshouses. One member is sent to Parliament. Pop. (1891) 165,417.

Greenwich: town (founded in 1640); Fairfield co., Conn. (for location, see map of Connecticut, ref. 13–C); on Long Island Sound and the N. Y., N. H. and Hartford Railroad; 27 miles W. S. W. of Bridgeport, 28 miles N. E. of New York. It is a charming place and a popular summer resort, and many New York business men have country residences here. Gen. Putnam's daring horseback ride in 1779 took place at Horseneck in this town. Pop. (1880) 7,892; (1890) 10,131.
EDITOR OF "NEWS."

Greenwood, FRANCIS WILLIAM PITT, D. D.: Unitarian minister; b. in Boston, Mass., Feb. 5, 1797; brought up under the religious care and teaching of Dr. James Freeman, and on graduating at Harvard in 1814 studied theology with Dr. Henry Ware, Hollis professor in Cambridge. He began his ministry at the New South church in Boston in 1818, but remained in it but a single year, a pulmonary attack forcing him to resign. The year of 1820–21 was passed abroad, chiefly in Devonshire, England. Two years were passed in Baltimore, where he edited *The Unitarian Miscellany*. In 1824 he accepted an invitation to become colleague pastor with Dr. Freeman, of King's chapel, and in 1827 became sole pastor. In 1837 an attack of hæmorrhage compelled him to make a voyage to Cuba, and his strength was never restored. D. in Dorchester, Mass., Aug. 2, 1843. Dr. Greenwood had a strong love for the natural sciences, and was one of the earliest members of the Boston Society of Natural History. He was a frequent writer for the Unitarian magazines and a contributor to *The North American Review* and *The Journal of Natural History*. He wrote *Sermons of Consolation* (Boston, 1842); *Sermons to Children*

(1841); *Lives of the Twelve Apostles* (1827), less known; and a *History of King's Chapel* (1833). Two volumes of sermons, prefaced with a memoir by Hon. S. A. Eliot, were published in 1844, and a volume of *Miscellanies*, edited by his son, in 1846.

Greer, James Augustin: rear-admiral U. S. navy; b. in Cincinnati, O., Feb. 28, 1833; entered the navy as a midshipman Jan. 10, 1848. He commanded the Benton at the passage of the Vicksburg batteries on the night of Apr. 16, 1863; in the five hours' heavy engagement with the Grand Gulf batteries on Apr. 27 of the same year; and in the operations on the Mississippi river until the fall of Vicksburg, July 4, 1863. In many of the engagements the Benton carried the flag of Rear-Admiral Porter, which made her a conspicuous target; in 1873 he was chosen to command the Tigress in the search for the missing Polaris. From May 29, 1891, until his retirement, Feb., 1895, Admiral Greer was chairman of the lighthouse board.

Greg, William Rathbone: author; b. at Manchester, England, in 1809. He was educated at Edinburgh University; engaged in business and was appointed commissioner of customs in 1856 and controller of the Stationery Office in 1864. Among his publications, which are chiefly on economic and social topics, are *The Creed of Christendom* (1851); *Literary and Social Judgments* (1869); *Enigmas of Life* (1872); *Rocks Ahead* (1874). A posthumous volume of *Miscellaneous Essays* was published in 1884. D. Nov. 15, 1881. Henry A. Beers.

Gregarin'ida [Mod. Lat. deriv. of Lat. *grex, gregis*, herd; so called in allusion to the large numbers frequently found together]: a sub-class of *Protozoa* (class *Sporozoa*), the members of which live as internal parasites in other animals, mostly in annelids and arthropods. The single cell which makes up each of these animals is covered with a tough cell-wall, and external organs of locomotion are lacking. There is sometimes a hook-like means of attachment by which the parasite becomes fastened to the host. In some the cell is simple (*Monocystidea*), in others there is a partition cutting off a small anterior "head" (*Septata*). Nourishment is taken by absorption through the body-walls, and the small amount of locomotion is effected by slow contractions of the body. Two or more gregarines conjugate, joining themselves end to end. They then contract, surround themselves with a common coat or cyst, inside of which the cell protoplasm breaks up into a mass of spore-like bodies which change to spindle-like pseudo-navicellæ (so called from their resemblance to the diatom *Navicella*) or into rod-like spores. These develop amœba-like larvæ, which in turn change into the adult. Allied to the gregarines are the ovoid *Coccidia*, which occur in the intestinal epithelia and gall-duct of various vertebrates, including man. J. S. Kingsley.

Gregg, David McMurtrie: general; b. in Huntingdon, Pa., Apr. 10, 1833; graduated at the U. S. Military Academy, and entered the army as brevet second lieutenant of dragoons July, 1855, receiving his full appointment as second lieutenant in September following. After serving a brief time in Jefferson barracks, Mo., Gregg was ordered to New Mexico, and thence to California, marching there with his command, and continued on frontier duty against hostile Indians, being engaged in numerous actions, up to the outbreak of the civil war. In Mar., 1861, he was promoted to be first lieutenant, and in May following captain Sixth Cavalry. In Jan., 1862, he was appointed colonel Eighth Pennsylvania Cavalry, which command he led in the Virginia Peninsular campaign (1862), being engaged at Fair Oaks, Seven Pines, and the "Seven Days'" fight. Appointed brigadier-general U. S. volunteers Nov., 1862, he commanded a division of cavalry in the Rappahannock campaign in the raid toward Richmond under Gen. Stoneman; participated in the battle of Gettysburg and subsequent pursuit of Lee's army. In Gen. Grant's Richmond campaign (1864–65) he was actively engaged, and in command of the cavalry corps of that army from Aug., 1864, till Feb., 1865, when he resigned from the army, and was breveted major-general of volunteers for highly meritorious conduct. He was U. S. consul at Prague, Feb.–June, 1874, and became commander of the Pennsylvania order of the Loyal Legion in 1886.

Gregg, John Irvin: general; b. in Bellefonte, Pa., July 19, 1826; entered the U. S. army as first lieutenant Eleventh Infantry 1847; promoted to be captain, and served during the Mexican war; discharged Aug., 1848. On the outbreak of the civil war he was chosen colonel of the Fifth Pennsylvania Volunteers, which commission he resigned May, 1861, to accept a captaincy in the Sixth U. S. Cavalry; was engaged in various actions in the Virginia Peninsular campaign 1862; appointed colonel Sixteenth Pennsylvania Volunteers Oct., 1862, and in command of a cavalry brigade 1863–65, during which time he was engaged in the battles of Gettysburg, Cold Harbor, Deep Bottom (wounded), and the various actions of the Army of the Potomac up to the final surrender of Lee. Three days prior he was taken prisoner, and held till the surrender. He was breveted major, lieutenant-colonel, colonel, and brigadier-general U. S. army, and major-general of volunteers; promoted to be colonel Eighth U. S. Cavalry July, 1866. Retired Apr. 2, 1879. D. in Washington, D. C., Jan. 6, 1892.

Gregg, Maxcy: general C. S. army; b. at Columbia, S. C., 1814; studied law, and was admitted to the bar in 1839; obtained prominence in his profession; in the war with Mexico served as major Twelfth Infantry; was a member of the South Carolina State convention in 1860, and of the committee which was appointed to prepare the ordinance of secession. In the civil war he commanded the First Regiment of South Carolina Volunteers, which on the expiration of its term of service he reorganized and continued to command; subsequently was made brigadier-general, and was constantly and conspicuously in service. He was killed at the battle of Fredericksburg, Va., Dec. 13, 1862.

Gregg, William, D. D.: a minister and scholar of the Presbyterian Church of Canada; b. at Killycreen, near Ramelton, County Donegal, Ireland, July 5, 1817. After some years spent in business, he studied for the ministry at Glasgow College, Edinburgh College, and New College, Edinburgh. In 1846 he was sent by the Free Church as a missionary to Canada. He was minister at Belleville 1847–57, and at Cooke's church, Toronto, 1857–72. He was lecturer in Knox College from 1864, and in Montreal College from 1867. In 1872, he became Professor of Apologetics in Knox College, also teaching classes in Church History and in Mathematics. In 1890 at his own request, he was relieved from the work in apologetics. He edited *Book of Passages for Family Worship* (Toronto, 1878; 3d ed. 1885), and wrote *History of Presbyterian Church in Canada from the Earliest Times to 1834*, with sketch of subsequent leading events (1885), and *Short History of the Presbyterian Church in the Dominion of Canada* (1892).

Willis J. Beecher.

Grégoire, grā'gwăr', Henri: Bishop of Blois, prominent in the French Revolution; b. Dec. 4, 1750; studied for the priesthood and became curé of Embermesnil, whence he was chosen in 1789 to represent the Lorraine clergy in the States-General. He had already achieved a reputation for liberality of view in his *Essai sur la Régénération physique et morale des Juifs* (1788), which was crowned by the Academy at Metz, and in the States-General he at once allied himself to the third estate, taking an active part in bringing the clergy into union with that order. In the National Assembly he advocated the abolition of the privileges of the nobility, and supported the civil constitution of the clergy, under which he was afterward appointed bishop. He was a member of the Convention, where he was foremost in calling for the abolition of the kingship, supporting the motion by a speech in which occurred the famous sentence, "The history of kings is the martyrology of nations"; but while favoring the condemnation of Louis, he opposed the imposition of the death penalty. As member of the committee of public instruction under the Convention, he opposed the vandalism of the times, favored artists and men of letters, and promoted the education of the people. Though a fanatic, he was singularly free from religious intolerance, sparing no pains to secure for the Jews an admission to civil rights, and asserting in the face of the uncompromising worshipers of reason like Hébert the right of himself and others to liberty of conscience. The abolition of African slavery in the colonies by the Convention was due chiefly to his efforts. He was a member of the Council of Five Hundred, of the Corps Législatif, and in Dec., 1801, was elected to the senate, where he was one of the few who dared to oppose the proclamation of the empire. Although created a count of the empire, and an officer of the Legion of Honor, he continued in the opposition till Napoleon's downfall. Under Louis XVIII. he was dismissed from the Institute and his pension as ex-senator was suspended, but disgust with ultramontanism at length

led to his election as deputy from the department of Isère. This scandalized both liberals and ultra-royalists, and his election was annulled 1819. The last years of his life were spent in retirement, and devoted to literary work. D. at Paris, May 28, 1831. The last offices of the Church were denied him by the ecclesiastical authorities, who refused him the rites of Christian burial; but by permission of the Government mass was said over his body at the Abbaye aux Bois by a proscribed priest. Among his writings are *Essai historique sur les libertés de l'église gallicane* (1818); *De l'influence du Christianisme sur la condition des femmes* (1821); *Histoires des confesseurs, des empereurs, des rois, et d'autres princes* (1824); and *Histoire du mariage des prêtres en France* (1826). F. M. Colby.

Greg'oras Niceph'orus: author; b. at Heraclea, in Pontus, probably in 1295; became a priest in Constantinople; went in 1326 as ambassador to the kral (the King of Servia); proposed the reform of the calendar in a treatise (*Paschalium correctum*) still extant, and highly prized for its scientific accuracy; lost his estate on the accession of Andronicus III. (1328); pronounced the eloquent funeral oration of Andronicus I., 1332; opposed Barlaam's theories and Pope John XXII.'s plan of uniting the Eastern and Western Churches; and late in life was involved in serious troubles arising from the new doctrines taught by Barlaam. He was alive in 1359, but the time of his death is not known. He was the author of many treatises on many subjects, but the most important of his works is the *History of the Byzantine Empire* (1204–1359), written in a very diffuse style and in a strongly partisan spirit, but valued for the great number of facts it preserves. Some of his works have been printed.

Gregorian Calendar: See Calendar.

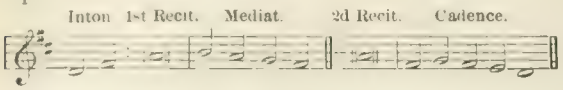
Gregorian Music: the customary designation of the ancient music of the Church as regulated and improved by St. Gregory the Great, Bishop of Rome, in the latter part of the sixth century and the beginning of the seventh. Information relative to the music of St. Gregory's times is not only scanty, but obscure and perplexing. The art was then in its infancy. Melody existed only in a rude and vague inflection of the voice through the range of a few intervals, while harmony was utterly undeveloped, and probably was confined to an irregular and unsystematic use of the octave, fifth, and third as occasion served. The ancients had no accurate and intelligible system of notation; and for that reason the fragments of their music extant are difficult to interpret. It has been thought by some that in the early days of the Church the Hebrew chant was brought in by the numerous Jewish converts, and that it became the basis or ruling form of the Church's songs. It is more probable, however, that, as the Church spread far and wide among other races and nations, this element gave way to the adoption of the musical system of the Greeks, as having more affinity with the languages of the Christian liturgies and the musical habits of a people largely composed of Gentiles. Whatever the system was, Jewish, Greek, or a blending of both, it is certain that St. Ambrose, Bishop of Milan in the fourth century, found it in so confused and disorderly a condition as to render his interference desirable in the capacity of a musical reformer. Ambrose appears to have entered upon this work with energy and good judgment, and soon molded into a more consistent shape the various and conflicting forms which music had assumed in the Church. In doing this he retained and made use of the four original Greek modes or scales—viz., the Dorian, or scale of D, the Phrygian, or scale of E, the Lydian, or scale of F, and the Myxolydian, or scale of G (all formed of the natural notes as they stand, without flats or sharps). These were known as the *authentic* modes, and the chant or ritual-song of the Church was based upon or composed of the elements forming these scales. The ecclesiastical music thus purified and systematized in the Church of Milan obtained the name of the "Ambrosian" chant, and was soon brought into extensive use.

Two centuries later St. Gregory, who then occupied the papal throne, entered upon a further reform in the music of the Church. The simplicity and plainness of the Ambrosian chants had been overlaid in the course of time with embellishments of too frivolous, ambitious, and fanciful a character to be congruous with the solemnity of divine worship. These innovations were promptly denounced by St. Gregory, who had little sympathy with the promoters of what was called figured song, or with the early experimenters in the florid style. He also collected and arranged in a methodical form such fragments of psalmody and ecclesiastical hymns as had been approved by former bishops in whose judgment he could confide. But the greatest improvement made by Gregory, or under his auspices, was the addition of four new modes or scales to those already in use. The old modes—viz., the Dorian, Phrygian, Lydian, and Myxolydian—were called the authentic modes, as already stated; and those now derived from or added to them received the name of *plagal*, relative, or collateral. Each plagal scale was formed by commencing on *the fourth degree below the lowest note* of the corresponding authentic. Thus as the first authentic mode or scale consisted of D, E, F, G, A, B, C, and D, the octave, its plagal mode would be formed of A, B, C, D, E, F, G, and A. The three other authentic modes were in like manner attended by their respective plagal derivatives—the fourth note of the plagal always corresponding with the first note of the authentic, thus:

These modes, composed of the natural intervals of the diatonic scale, without reference to the position of whole tones and semitones, are (with one exception) more or less imperfect, being neither major nor minor, but each having its own distinctive character as the result, indeed, of that imperfection. Thus the Dorian has neither F♯ and C♯ to render it a true *major* scale, nor B♭ to form the true *minor*. Melodies, therefore, written on such scales differ considerably in their fitness to express various shades of feeling and sentiment. The Phrygian, e. g., so far resembles the modern minor mode as to possess a certain plaintive and mournful character; the Dorian, though strongly minor in its general cast, is expressive of dignity, grandeur, and solemnity; the Myxolydian, closely approaching our G major, suggests peace, serenity, and joy; while the Lydian, with its irregular fourth occasionally corrected, has the gentle and soothing tranquillity of many modern pieces in F major. These various qualities may, however, be in part attributed to other causes. It has been thought very probable by several modern writers "that as these modes have their names from some Grecian nations, part of the very great effects ascribed to them may have depended on the particular melodies of those nations and their rhythms, more than on the mode in which they were composed; in the same manner as still the national dance-tunes of different countries—e. g. a Scotch reel, a polonaise, a Siciliano, etc.—are strongly characteristic merely by their rhythms." *Kollmann.*

The music of the Church, as thus modified and settled by St. Gregory, came into general use in the Western Church, and is commonly known as the "Gregorian." In each of the modes, scales, or gamuts (to which another has been added, under the name of irregular or peregrine) short chants or melodies for the psalms were prepared. These are commonly styled Gregorian *tones*, and are distinguished or spoken of as the first, second, or third tone, etc. These psalm-chants consist of two strains each; and the latter of these strains frequently has several terminations, called "endings." Of these endings, the first tone has six; the third tone, four; the fourth tone, four; the fifth tone, two; the seventh tone, six; and the eighth tone, two; while the second and sixth tones have each only one ending. Hence in designating a psalm-chant it is customary to say, e. g., "First tone, third ending," etc. In each of these tones or chants a certain note called the *dominant* is more frequently used than the others, and is the reciting note in chanting. Preceding the dominant are two or more short intro-

ductory notes called the *intonation*, to be sung by the minister or precentor with the first division of the first verse of a psalm or hymn. The other portions of each strain are the *recitation*, *mediation*, and *cadence*, as in the following example:



Gregorian music is still frequently written or printed in ancient character on the old stave of only four lines. Two clefs are used—viz., the F and the C. These are not permanently fixed on certain lines, like the clefs of modern music, but are placed on such lines as will bring the notes of the melody within the compass of the stave, and thus avoid the resort to ledger lines. The notes in use are chiefly three: 1, the long, a black square (or oblong figure) with a stem; 2, the breve, a black square without a stem; 3, the semibreve, a black diamond-shaped note. These notes do not express exact measures of duration, as the ratios of 4, 2, and 1, but are very much dependent for their times on the sentiment and accent of the words sung. In most cases they are simply signs to express in an indefinite way the relations of long, shorter, and shortest. From this it will be readily understood that *rhythm* (as now understood) has no place in Gregorian music. There is no division into bars or measures; nor can music of this kind be brought, without great difficulty, within the limits and form of any regular musical movement.

In an adapted form the psalm-chants or tones (with some other music of the Gregorian school) are in common use in the Anglican Church, modernized, however, so much by the addition of harmony and more or less of rhythmical order, as to be recognizable only by the crudeness of their melodic phrases and the quaintness of not a few of their cadences. Revised by DUDLEY BUCK.

Gregoro'vius, FERDINAND ADOLF: poet and historian; b. at Neidenburg, in East Prussia, Jan. 19, 1821: studied theology and philosophy at the University of Königsberg 1838; and began his public career as a literary critic with the romance *Werdomar und Wladislaw, aus der Wüste der Romantik* (1845), and *Goethe's Wilhelm Meister in seinen socialistichen Elementen* (1849). In 1848 and 1849 he published two minor works, reflecting his sympathy for Poland —*Die Idee des Polenthums* and *Polen- und Magyarenlieder*; and in 1851 his tragedy, *Der Tod des Tiberius*, and his first historical work, *Geschichte des Römischen Kaisers Hadrian und seiner Zeit*. In 1852 he went to Italy, of whose history, literature, and political and social circumstances he made a comprehensive and penetrating study, and on which he wrote several works of great merit—*Corsica* (2 vols., 1854); *Wanderjahre in Italien*, a collection of several minor works (4 vols., 1874); *Die Grabmäler der Römischen Päpste* (1857). His most important works are *Geschichte der Stadt Rom im Mittelalter* (8 vols., 1859–72); *Geschichte der Lucrezia Borgia* (2 vols., 1874); *Kleine Schriften zur Geschichte und Cultur* (2 vols., 1887–88); *Geschichte der Stadt Athen im Mittelalter* (1889). Worth noting also are his brief epic *Euphorion* (1858), and his translation of the poems of Giovanni Meli (1856). D. in Munich, May 1, 1891.
Revised by A. R. MARSH.

Gregory: the name of several of the popes. GREGORY I.: a saint and doctor of the Roman Catholic Church, called Gregory the Great; a great-grandson of Pope Felix II.; b. at Rome about 540; became a senator, and in 573 a prætor, and soon after entered a monastery and devoted his great wealth to the founding of religious establishments; went as nuncio to Constantinople, and reconciled the emperor to the pope, and in 590 became pope himself; sent missionaries to Sicily, Sardinia, Lombardy, England, etc.; attempted the union of the Eastern and Western Churches; strengthened and reformed the papal see; confirmed the celibacy of the clergy; extended greatly the monastic system; was confirmed in his primacy over the other patriarchs by the Emperor Phocas; and reformed the liturgy. He has been called the father of the mediæval Church. Author of numerous works, of which his *Magna Moralia*, his *Homilies*, his *Book of Pastoral Rule*, and the liturgical treatises are the most important. The best edition of his works is that by Dionysius Sammarthanus (Paris, 1705, 4 vols. fol.), reprinted in Migne, *Pat. Lat.* lxxv.–lxxvi. There is a partial edition of the *Letters*, by P. Ewald (Berlin, 1887). See Chevalier, *Répértoire des sources historiques du Moyen Âge*, for the literature; also Snow, *St. Gregory the Great* (London, 1892). D. Mar. 12, 604.—GREGORY II., Saint: a Roman of high birth; became a Benedictine, and in 715 became pope; sent Corbinian and Boniface as missionaries to Germany; assumed the government of Rome in 726, and did much to establish the temporal power of the popes; engaged in a famous contest with Leo the Isaurian and the Iconoclasts, whom he anathematized. D. Feb. 10, 731.—GREGORY III.: a Syrian; became pope in 731; opposed the Iconoclasts and the Byzantine emperors; encouraged the work of St. Boniface in Germany; appealed to Charles Martel for aid against the Saracens and the Lombards. D. Nov. 28, 741.—GREGORY IV.: a Roman; became pope in 827, succeeding Pope Valentine; attempted to reconcile Louis the Pious with his sons; fortified the mouth of the Tiber against the Saracens; made the feast of All Saints a general one. D. Jan. 27, 844.—GREGORY V.: a German, and nephew of King Otho III. His name was Bruno; became pope in 996, when twenty-four years old; was a virtuous and active man; held several important synods; obliged Robert, King of France, to give up his incestuous marriage with Bertha. As to his conduct toward the antipope John XVI., the contemporary chroniclers do not agree, and much of what they say sounds like the exaggeration of popular gossip (see the texts in Watterich, *Vitæ RR. Pontificum*, i., 67–68, and Duchesne, *Liber Pontificalis*, ii., 263). D. Feb. 18, 999.—GREGORY VI., Antipope: assumed the papal title in June, 1012; expelled Benedict VIII., and was himself expelled (Dec. 25, 1012) by the Emperor Henry II.—GREGORY VI. (*Johannes Gratianus*), Pope: arch-priest of the Lateran Church. With the best of intentions he purchased the abdication of the unworthy Benedict IX., but the latter revived his claim, and Sylvester III. and John XX. were also elected (1044); Henry III., the emperor, caused all to be deposed, and Clement II. to be elected, 1046. D. at Cologne in the summer of 1048.—GREGORY VII. (*Hildebrand*): b. at Soana, in Tuscany, probably before 1020; was a carpenter's son; became a monk at Cluny; was called to the priory of St. Paul, *extra muros*, at Rome, and was the chief adviser of Leo IX., who made him cardinal. Hildebrand assumed at once a commanding position in the affairs of Italy and the Church; repressed the interference of the laity and of the emperors in ecclesiastical affairs; punished simony and licentiousness, and stopped the marriage of the clergy; reformed the convents; restrained the progress of Berengarius's doctrine regarding the Eucharist, though the equivocations of the latter made it difficult to convict him of heresy; improved the manner of papal elections so as to prevent bribery (1058); in 1073 succeeded Alexander II. as pope, after which he still more actively engaged in his reforms; forbade in 1074 all marriage and concubinage in the clerical ranks; in 1075 summoned a council at Rome which prohibited all lay investitures, by which the bishops were brought into almost absolute dependence on the imperial or royal power. Thus Gregory, by one of the boldest strokes recorded in history, attempted to cut the Church free from the domination of the German emperors, which a few years before had been absolute and almost unquestioned. Henry IV. thereupon called a diet at Worms, and declared the pope deposed; and in 1076 Gregory retaliated by excommunicating and deposing Henry. The civil war, already brewing in Saxony for other reasons, was carried on with great vigor, and the pope was obliged to look for help to the Normans. Henry, everywhere overcome, humiliated himself to the earth, and received the papal absolution at Canossa (1077). But when the emperor had recovered sufficient strength, he besieged Rome and shut up the pope in the Castle of St. Angelo, whence he was released by Robert Guiscard; and Gregory, having for the fourth time excommunicated the emperor, retired to Salerno, where he died May 25, 1085. Gregory invented nothing new. He only took up and applied in all their logical consequences principles and views familiar to the Catholic world of the Middle Ages (see Lavisse-Rambaud, *Histoire Générale*, vol. ii., 1893). He was a man of excellent abilities. In its bearing on the destinies of Europe no pontificate was more important than that of Gregory. (See Voigt, *Hildebrand*, 1846, 2d ed.) Roman Catholic writers look on Gregory VII. as the liberator of the ecclesiastical authority from the usurped control of the civil power, and the restorer of the Church discipline to its former rigor and efficiency. (See O. Delarc, *Vie de Grégoire VII.*, 2 vols., Paris, 1891.)—GREGORY VIII., Antipope (*Maurice Bourdin*): a Frenchman, Bishop of Coimbra, Archbishop of Braga 1110; became papal legate to Henry V. of Germany 1111; was chosen by the emperor in

1118 as pope in opposition to Gelasius II., but was imprisoned, and died at Fumona in 1122.—Gregory VIII., Pope (*Alberto de Mora*): b. at Benevento; became a cardinal in 1135; as papal legate absolved Henry II. for the murder of Becket 1172; elected pope Oct. 21, 1187. D. at Pisa, Dec. 17, 1187.—Gregory IX. (*Count Ugolino*, of Segni): a relative of Innocent III., succeeded Honorius III. Mar. 20, 1227. His reign is remarkable for the long politico-religious struggle with Frederick II. of Germany, whom he four times excommunicated. His *Decretals*, published in 1234, are the basis of the canon law of the Roman Catholic Church. D. Aug. 21, 1241.—Gregory X. (*Tebaldo Visconti*, of Piacenza): chosen pope in 1271; promoted the crusades; convened the Council of Lyons (1274), and reformed the conclave. D. at Arezzo, Jan. 10, 1276.—Gregory XI. (*Pierre Roger de Montroux*): b. at Maumont, Limoges, in 1329, of a noble family; became cardinal in 1348, and pope at Avignon Dec. 30, 1370; removed to Rome in 1377. His death was the immediate cause of the Western schism. D. Mar. 28, 1378.—Gregory XII. (*Angelo Cornaro*): b. at Venice about 1325; became a cardinal-priest 1405; was elected pope, in opposition to Benedict XIII., Nov. 30, 1406; deposed by the Council of Pisa 1409; abdicated his claim at the Council of Constance 1415, and held the office of Cardinal-Bishop of Porto till his death Oct. 18, 1417.—Gregory XIII. (*Ugo Buoncompagno*): b. at Bologna, Feb. 7, 1502; was a learned doctor of the university, and instructed Alexander Farnese, St. Charles Borromeo, and other eminent men in the law; became cardinal-priest in 1565; succeeded Pius V. May 13, 1572. The great events of this pontificate were the reform of the calendar, the *Te Deum* sung and medal struck on the occasion of the massacre of St. Bartholomew, the efforts made to spread the Church by missionary operations, and the publication of a new edition of the *Decretum Gratiani*. D. Apr. 10, 1585.—Gregory XIV. (*Niccolò Sfondrate*): b. at Cremona, 1535; became a cardinal 1583; succeeded Urban VII. Dec. 5, 1590. D. Oct. 15, 1591.—Gregory XV. (*Alessandro Ludovisio*): b. at Bologna, Jan. 9, 1554; became a cardinal in 1616; succeeded Paul V. Feb. 9, 1621; reformed the conclave 1621; established the Propaganda 1622; and zealously pushed forward the missionary work. D. July 8, 1623.—Gregory XVI. (*Mauro Capellari*): b. at Belluno, Sept. 18, 1765; became in 1814 vicar-general of the Camaldules; cardinal-priest and prefect of the Propaganda 1826; succeeded Pius VIII. Feb. 2, 1831. D. at Rome, June 1, 1846.

Revised by J. J. Keane.

Gregory, Caspar René, Ph. D.: expert in biblical textcriticism; b. in Philadelphia, Pa., Nov. 6, 1846; graduated from the University of Pennsylvania (1864) and from Princeton Theological Seminary (1870), taking the degree of Ph. D. at Leipzig in 1876. He was pastor of the American chapel at Leipzig 1878–79, privat docent in the University of Leipzig from 1884, and honorary ordinary professor in that university from 1890. He assisted Dr. Charles Hodge in the publication of his *Systematic Theology* (1870–73), himself preparing the important separate index volume. He had charge of the bibliographical department of Schürer and Harnack's *Theologische Literaturzeitung* (1876–84). He published a translation of Luthardt's *St. John the Author of the Fourth Gospel* (Edinburgh, 1875; 2d ed. 1885), adding a critical account of the literature of the subject. He also translated Luthardt's *Commentary on St. John's Gospel* (1876–78). Besides important articles and pamphlets, notably on Tischendorf (1875) and *Les Cahiers des Manuscrits Grecs* (Paris, 1885), he is the author of the *Prolegomena* to Tischendorf's *Editio Octava Critica Major* of the New Testament, of which part i. appeared in 1884, part ii. in 1890, and part iii. in 1893. In these prolegomena he gives a description, from personal observation, of all the uncial MSS. of the New Testament. Willis J. Beecher.

Gregory, Edward John: portrait and genre painter; b. at Southampton, England, in 1850; pupil of Southampton and South Kensington Art Schools; member British Institute of Water-color Painters; associate Royal Academy, London; second-class medal, Paris Exposition, 1889; and first-class medal for water-colors. Among his principal works are *A Rehearsal* (1882), *The Swans of the Thames*, and *In Scotland*. Studio at Cookham Dean, Berkshire, England.

W. A. C.

Gregory, James, F. R. S.: mathematician; b. at Drumoak, Aberdeenshire, Scotland, in Nov., 1638; studied at Marischal College, Aberdeen; invented the Gregorian reflecting telescope (see Telescope) when twenty-four years old; published *Optica Promota* in 1663; studied at Padua, and while there published *Vera Circuli et Hyperbolæ Quadratura* (1667); *Geometriæ Pars Universalis* (1668); and *Exercitationes Geometricæ* (1668); was Professor of Mathematics at St. Andrews 1668–74, and at Edinburgh 1674–75, where he died Oct., 1675. He was the inventor of many important mathematical processes.—His grandson, Prof. John Gregory, M. D. (1724–73), was a brilliant author; and Prof. James Gregory, M. D. (1753–1821), son of the latter, was a professional writer of high authority.—David Gregory, M. D., F. R. S. (1661–1708), nephew of the first mentioned, was successively mathematical professor at Edinburgh and Savilian Professor of Astronomy at Oxford. He published able mathematical treatises, and was the friend and associate of Newton.

Gregory, Olinthus Gilbert, LL. D.: mathematician and miscellaneous writer; b. at Yaxley, Huntingdonshire, England, Jan. 29, 1774; became in 1798 a bookseller of Cambridge; in 1802 a master, and 1807–38 Professor of Mathematics at the Royal Military Academy, Woolwich. His *Lessons, Astronomical and Philosophical* (London, 1793), was published when he was but nineteen years old. He was also author of several mathematical text-books; *Letters on the Evidences of Christianity* (1810); *Lives* of J. M. Good (1828) and Robert Hall (1832). D. in Woolwich, Feb. 2, 1841.

Gregory Nazian'zen. Saint [Gr. **Ναζιανζηνός**, of or pertaining to Nazianzos]; one of the most eloquent of the Greek Church Fathers, a man of high culture and of great force and versatility of character, whose whole life was one of violent contrasts. His father's name also was Gregory, Bishop of Nazianzus, in Cappadocia. His mother was the saintly Nonna. He was born at Arianzus, a village close to Nazianzus, where his father owned an estate. A sister, Gorgonia, probably was older than he; his brother Cæsarius, afterward an eminent physician at the imperial court, apparently was younger. The dates, many of them, are uncertain, but he was born probably about the year 325, while his father was yet a presbyter. He studied first at Cæsarea, in Cappadocia, where he met Basil, then at Cæsarea in Palestine, and then in Alexandria. For ten or twelve years (ending in 356) he studied in Athens, where Basil and he were again together, and where Julian, afterward emperor, was also pursuing his studies. For two or three years after returning from Athens he lived in monastic retirement with his friend Basil in Pontus. At Christmas, 361, he was ordained presbyter by his father, whom he assisted in the discharge of his episcopal duties. In 372 he was consecrated bishop of the little market-town of Sasima, but apparently never resided there. From 375 to 379 he was in retirement again at Seleucia, in Isauria. Early in 379 he went to Constantinople as the champion of a depressed and persecuted orthodoxy. He was made Bishop of Constantinople by the œcumenical council which met there in 381, but his election was protested against, and he left Constantinople in June of that year. For a while he was occupied with ecclesiastical affairs at Nazianzus and Sasima, but in 383 he retired to his paternal estate in Arianzus, where he died about the year 390. His published works consist mainly of forty-five sermons (or orations), 243 letters, and many poems. The Benedictine edition, vol. i. by Clemencet (Paris, 1778) and vol. ii. by Cailleau (1842), remains the best (reprinted in Migne, *Pat. Gr.*, *xxxv.–xxxviii.*); Eng. trans. in vol. vii. of *Nicene and Post-Nicene Fathers* (New York, 1894). There are monographs by C. Ullmann (Gotha, 1825; 2d ed. 1867), A. Benoit (Paris, 1876; 2d ed. 1885, 2 vols.), and L. Montaut (Paris, 1878). Revised by S. M. Jackson.

Gregory of Nyssa, Saint: a younger brother of Basil the Great; b. probably at Cæsarea, in Cappadocia, about the year 335. His father was Basil, an eminent advocate and rhetorician. His mother, Emmelia, and his sister, Macrina, were eminently saintly. A feeble constitution predisposed him to a quiet literary career in his native city, and he was for a time an advocate. In 362 he yielded to the persuasions of Macrina and entered Basil's monastery in Pontus, on the river Iris. In 372 Basil became Metropolitan of Cæsarea, in Cappadocia, and obliged Gregory to become Bishop of Nyssa (now Nirse), an obscure town in Cappadocia. Bitterly persecuted by the Arians, he was deposed and banished in 376, but was restored in 378 to his see, where he died probably about the year 395. He wielded a powerful influence and was favored by the imperial court. He delivered the inaugural address at the Œcumenical Council of Constantinople 381. He was one of the clearest and

strongest champions of the Nicene Creed, but in eschatology was a restorationist. A good critical edition of his works is greatly needed. The best complete edition as yet is that of F. Morel (1638; reprinted in Migne's Series, *Pat. Gr.*, xliv.–xlvi.; Eng. trans., *Selected Writings and Letters*, vol. v. of *Nicene and Post-Nicene Fathers*, New York, 1893). There are monographs, not very satisfactory, by J. Rupp (Leipzig, 1834), E. W. Mohler (Halle, 1854), and G. Herrmann (Halle, 1875).

Revised by S. M. Jackson.

Gregory of Tours [originally *Georgius Florentius*], Saint: b. at Arverni (now Clermont), chief city of Auvergne, in 538. He was of a noble Roman family, and after his conversion took the name of Gregory out of regard for his mother's grandfather, the Bishop of Langres. About 573 he became Bishop of Tours, and died there Nov. 17, 593 (some say 594). His principal work is *A History of the Franks*, in ten books, which has earned for him the title of "Father of French history." Other works of his are *Miraculorum Libri Duo*, *Liber de Gloria Confessorum*, *Vita Patrum*, *De Miraculis S. Martini*, and *Fragmenta Commentarii in Psalmos*. His Latin is full of barbarisms, and his honesty is equaled only by his credulity. The best edition of his works is by Arndt and Krusch (2 vols., Hanover, 1884–85). Of monographs there are, in German, J. W. Löbell (Leipzig, 1839; 2d ed. 1869) and C. G. Kries (Breslau, 1838), and a very learned work by Max Bonnet, *Le Latin de Grégoire de Tours* (Paris, 1890).

Revised by M. Warren.

Gregory Thaumatur'gus [Gr., liter., wonder-worker; *θαῦμα, θαύματος*, a wonder + *-ουργός*, working], Saint: of heathen parentage, and originally called Theodore; b. at Neocæsarea, Pontus, Asia Minor, about 210 A. D.; when fourteen years of age lost his father, and became a Christian; in 233 fell under the influence of Origen at Cæsarea, in Palestine, and studied with him till 238; was made Bishop of Neocæsarea in 240, when there were only seventeen Christians in the place, and died there in 270, when, as it was said, there were only seventeen persons in the place who were *not* Christians. His biographer, Gregory of Nyssa, relates in a legendary way the miracles (chiefly of exorcism) which he was said to have performed. His principal literary work is *The Oration and Panegyric Addressed to Origen*, whose peculiar theological opinions he labored to establish in Pontus and Cappadocia. He also wrote *A Metaphrase of the Book of Ecclesiastes*, an important *Confession of Faith*, and some other pieces. The best edition of his works is in Migne's *Patrologiæ Græcæ*, vol. x.; there is an English translation by S. D. F. Salmond, *Ante-Nicene Fathers*, vol. xi. (New York, 1888). See his *Life* by Victor Ryssel (Leipzig, 1880).

Revised by S. M. Jackson.

Gregory the Illuminator (in Armenian, *Lusavoritch*), Saint: apostle of Armenia, in regard to whom the old authorities are hardly to be trusted. The story is that he belonged to the royal family of the Arsacidæ, who nominally ruled Armenia from 149 B. C. to 428 A. D.; that he was born about 258 A. D.; that his father, Anak, having assassinated the king, Chosroes I., was put to death with all his family except Gregory, who, when two years old, was taken to Cæsarea, in Cappadocia, where he was brought up in the Christian faith, and whence he returned as a missionary to Armenia about 286; that he baptized the king, Tiridates III., in 289; that in 302 Leontius of Cæsarea ordained him Patriarch of the Armenian Church; that in 331 he retired to a cave and lived till 332 A. D. His *Homilies* were published at Constantinople in 1737, and again by the Mechitarists of San Lazaro at Venice in 1837. Many *Prayers* in the Armenian liturgy and thirty *Canons* are also ascribed to him. See *History of Armenia*, by Moses Chorenensis, written about the middle of the fifth century; *Acta Sanctorum*, Sept. viii., pp. 292–413; and Rev. S. C. Malan's *Life and Times of S. Gregory the Illuminator, translated from the Armenian* [of the Vastabed Matthew] (London, 1868).

Revised by S. M. Jackson.

Greifswald, grīfs'vält: town of Prussia, in the province of Pomerania; on the Ryk, near its mouth; 25 miles by rail S. E. of Stralsund (see map of German Empire, ref. 2–G). It has a university, especially known for its medical department, and several other educational institutions, large salt-works, iron-foundries, manufactures of soap, oil, leather, and paper, and a shipping trade. Pop. (1890) 21,633.

Greiz, grīts: a town of Central Germany; the capital of the principality of Reuss-Greiz; on the White Elster; 47 miles S. S. W. of Leipzig (see map of German Empire, ref. 5–F). It is the residence of the sovereign prince, and has a fine palace surrounded by beautiful gardens. It has considerable manufactures of woolens, cottons, cashmeres, and shawls, and large breweries and distilleries. Pop. (1890) 20,141.

Grell, August Eduard: musician; b. in Berlin, Germany, Nov. 6, 1800; studied under Zelter, and early became a fine organist; was director of the Sing-Akademie for over twenty years; and was connected with that institution in various ways for nearly sixty years. His compositions are entirely vocal, and for the most part sacred. They include an oratorio, *Die Israeliten in der Wüste*, a *Te Deum*, psalms in eight and eleven parts, motets, cantatas, and a polyphonic mass in sixteen parts *a capella*, first produced by the Riedelscher Gesangverein in Leipzig about 1884 and afterward at Dresden. It was performed in New York by the Oratorio Society on Mar. 27, 1889. D. Aug. 10, 1886.

D. E. Hervey.

Grellet, Stephen (orig. *Étienne de Grellet de Mabillier*): preacher in the Society of Friends; b. of noble parentage at Limoges, France, Nov. 2, 1773; educated in the Roman Catholic faith; became one of the king's body-guard, but escaped sentence of death at the Revolution; emigrated to New York in 1795, and there joined the Society of Friends, and after 1800 made preaching journeys all over the U. S. and Europe. He addressed the Czar of Russia and the pope upon the subject of personal religion. He was also engaged in very successful mercantile pursuits. He died in Burlington, N. J., Nov. 16, 1855. See his biography by Benjamin Seebohm (Philadelphia, 1868).

Samuel Macauley Jackson.

Grenada, gre-nā'da (in Spanish, *Granada*): one of the British West Indian islands; the southernmost of the chain on the eastern side of the Caribbean Sea; 68 miles S. of St. Vincent and 96 miles N. N. W. of Trinidad; area, 133 sq. miles (see map of West Indies, ref. 9–M). More than three-fourths of the inhabitants are Negroes or mulattoes, and a large proportion of the whites are of French descent. The surface is mountainous, several peaks exceeding 2,300 feet, and one attaining 2,800 feet. The formation is mainly volcanic, but there is no active or recent crater. Formerly the island was covered with forest, and considerable tracts still remain. The damp and fertile valleys are especially adapted to the cultivation of cacao and nutmegs, which are largely supplanting sugar-cane; small plantations are numerous, and nearly all the Negroes cultivate their own ground; their condition is therefore much better than in most of the other islands. Cacao, nutmegs, and sugar are the principal exports. The climate is temperate and healthful; hurricanes rarely pass so far S. as this island. Pop. (1891) 54,062. Capital and principal town, St. George's (*q. v.*); it has an excellent harbor. Grenada was perhaps seen but not visited by Columbus in 1498. It was settled in 1651 by the French, who conquered the Carib inhabitants after a fierce war. It was taken by the British in 1762, retaken by the French 1779, and ceded to Great Britain by the peace of 1783; several subsequent revolts of the French inhabitants were put down with much bloodshed. Grenada forms part of the British colony of the Windward islands, and is the residence of the governor. Carriacou, the southernmost of the Grenadines (11 sq. miles; pop. 6,000), is attached to it.

Herbert H. Smith.

Grenada: town; capital of Grenada co., Miss. (for location of county, see map of Mississippi, ref. 5–G); on the Yallabusha river at the head of navigation, and on the Illinois Central Railroad; 100 miles S. of Memphis, 112 miles N. by E. of Jackson. It is an important business center in a cotton-growing region, and has flour, planing, lumber, and rolling mills, a collegiate institute of the Methodist Episcopal Church South, and a weekly newspaper. Pop. (1880) 1,914; (1890) 2,416.

Grenade, gre-nād' [from O. Fr. *grenade*, from Span. *granada*, grenade, a figurative use of *granada*, pomegranate < Lat. *grana'tum*]: a small shell, usually of iron, charged with powder and thrown into a mass of attacking troops by the garrison. They have a straight fuse, and are thrown by hand or rolled into the trench by a wooden trough or spout. When first used they were fired from a musketoon.

Grenadier' [= Fr. *grenadier*, deriv. of *grenade*, grenade, formed after analogy of Span. *granadero*, grenadier, deriv. of

granada, grenade. The grenadiers at first threw grenades]: in some armies a soldier of the first company of a battalion of foot-troops. Grenadiers are chosen for their tall stature and fine appearance. The first regiment of British foot-guards is called the Grenadier Guards.

Grenadines, gren-a-deenz', or (Span.) **Granadillos**, grăă-năă-deel'yōs: a group of small islands in the West Indies; between St. Vincent and Grenada (see map of West Indies, ref. 8–M). They appear to be the summits of a large submerged island, indicated by the shallow water which lies between them, while they are separated from St. Vincent and Grenada by deep channels. The largest are Becquia, Canauan, Mustique, Union, and Carriacou; the latter is politically attached to Granada, the others to St. Vincent, and all are included in the British colony of the Windward islands. Total area about 55 sq. miles; pop. about 8,000. Carriacou has 6,000 inhabitants, and is in a prosperous condition; most of the other islands are wretchedly poor, and owing to the lack of good water some of them are unhealthful. Sugar is the principal agricultural product; cattle and horses are raised on Mustique; and the whale-fisheries are of considerable importance. Admiralty Bay, in Becquia, is one of the best harbors in the West Indies.

HERBERT H. SMITH.

Grenoble, gre-nō'b'l [Fr. < Lat. *Gratiano'polis*, city of Gratian; Lat. *Gratia'nus*, a proper name + Gr. πόλις, city; anc. *Gratianopolis*]: town of France, in the department of Isère, on both sides of the Isère; 59 miles S. E. of Lyons (see map of France, ref. 7–H). The river is crossed by three beautiful bridges. Grenoble is fortified, and celebrated for its manufactures of gloves, hats, hardware, cement, liqueurs, brandies, and perfumes. It is a bishop's see, and contains a cathedral built in the fifteenth century. In the museum is a fine and extensive collection of works of art. The educational institutions include a university and a school of forestry. Pop. (1896) 64,002.

Grenville, GEORGE: English statesman; b. Oct. 14, 1712; entered Parliament in 1741; treasurer of the navy 1754; was a Secretary of State 1762; First Lord of the Admiralty 1762; First Lord of the Treasury and Chancellor of the Exchequer 1763–65. His administration is noted for the prosecution of Wilkes and the passing of the Stamp Act, which constituted one of the grievances of the American colonies. He was an able statesman, but, according to Whig authorities, was the head of the worst administration Great Britain ever knew, and his imperious temper and excessive ambition made him unpopular even with the Tories. He resigned in 1765. Author of *Considerations on Commerce and Finances* (1767) and other writings. D. Nov. 13, 1770.

Grenville, or **Granville**, Sir RICHARD: a relative of Sir Walter Raleigh; b. in 1540; went in 1556 to fight the Turks in Hungary; entered Parliament, was made high sheriff of Cornwall 1571, and knighted about 1577; assisted Raleigh in planting the Roanoke colony 1585; vice-admiral 1591; attacked a Spanish fleet of 53 vessels with only 6 ships (1591); sunk 4 ships, and after being twice wounded was taken prisoner, and died soon after.

Grenville, WILLIAM WYNDHAM, Lord: statesman; son of George Grenville; b. in England, Oct. 25, 1759; educated at Eton and Oxford; was elected to Parliament in 1783, and in 1789 was chosen Speaker of the House of Commons. He was soon afterward appointed Secretary of State for the Home Department, and in 1790, on being raised to the peerage, took his seat in the House of Lords. Appointed Foreign Secretary in 1791, he supported Pitt's policy toward France, and resigned with him in 1801 when the king opposed the project of Roman Catholic emancipation. In 1806 he was the head of the ministry of "all the talents," which, though inglorious in its military record, will be remembered on account of the act abolishing the slave-trade. The demand of the king that no steps should be taken toward Roman Catholic emancipation caused the resignation of the ministry, and after this Grenville never held office, though he continued to take an active part in politics, generally voting with the Whigs. D. at Dropmore, Buckinghamshire, Jan. 12, 1834. F. M. COLBY.

Gresham, WALTER QUINTON: cabinet officer; b. at Corydon, Ind., Mar. 17, 1832; educated at Bloomington University; studied law, was admitted to the bar in 1853, and practiced in his native place; elected to State Legislature 1860. At the outbreak of the civil war he joined the army as lieutenant-colonel of the Thirty-eighth Indiana Regiment; promoted colonel of Fifty-third Regiment Dec., 1863; brigadier-general Aug., 1863; served under Grant at Vicksburg, under Sherman before Atlanta; brevet major-general of volunteers Mar. 15, 1865; mustered out of service Apr. 30, 1866; settled at New Albany; appointed U. S. district judge for Indiana Dec., 1869; Postmaster-General Apr., 1882–84; U. S. judge for the seventh judicial district 1884; Secretary of the Treasury 1884; was a candidate for the Republican nomination in 1884 and 1888; declined the nomination for President tendered by the Populist party 1892; soon afterward identified himself with the Democratic party, and was appointed Secretary of State Mar. 4, 1893. D. May 28, 1895.

Gresham's Law: See CURRENCY.

Gresset, gres'sā' JEAN BAPTISTE LOUIS, de: poet; b. at Amiens, France, Aug. 29, 1709; admitted to the order of Jesuits as novice in his sixteenth year; completed his studies in Paris at the Collège Louis le Grand, and became a teacher. In 1734 he surprised and delighted the literary world by a masterly poem, *Vert-Vert*, which relates in musical verse with charming humor the story of a parrot trained in a convent and sent to another convent as a gift. On his way the parrot fell into bad company, and on his arrival shocked the sisters by evil language. The lines

> Désir de fille est un feu qui dévore,
> Désir de nonne est cent fois pis encore,

gave offense to an influential nun, who managed to have Gresset expelled from his order, whereupon Parisian society opened its doors and he became a social lion. His *Édouard III.* (1740) and *Sidney* (1745) were tedious, but *Le Méchant* (1747) was received with great favor, and in the following year he was admitted to the Academy, of which he afterward became a director. Meanwhile the influence of his early training was making itself felt, and he came to look on his work as sinful. Returning to Amiens in 1748, he renewed his religious affiliations, and ten years later issued an open letter solemnly abjuring the frivolities of his literary career. D. at Amiens, June 15, 1777.

Gretna: town (founded in 1835); capital of Jefferson parish, La. (for location of parish, see map of Louisiana, ref. 10–F); on the Mississippi river and the N. O., Ft. J. and Gr. Isle, the S. Pac., and the Tex. and Pac. Railways; directly opposite New Orleans. The principal industry is the manufacture of cotton-seed oil, the town having three of the largest mills in the U. S. There are eight churches, a graded public school for white children, with four departments, known as Gretna Academy, several private schools for white children and one for colored, and a weekly newspaper. The town suffered severely from crevasses in 1868, 1880, 1884, and 1891, though no breaks have ever occurred in front of the town itself. A protective embankment has been built in the rear of the town to insure it against damage from breaks above it. Pop. (1880) 2,396; (1890) 3,332; (1893) estimated, 3,600. EDITOR OF "COURIER."

Gretna Green: a village in Dumfriesshire, Scotland, near the English border (see map of Scotland, ref. 14–I). It had at one time a curious celebrity. The English law acknowledges the validity of a marriage if it is contracted in accordance with the laws of the country in which it has taken place, while the Scotch law simply demanded that a mutual declaration of marriage should be exchanged in presence of a witness, and thus it became fashionable for young couples in England, to whom it was not convenient to await the consent of their parents, the publication of banns, etc., to run away to Gretna Green, and declare their marriage in the presence of any convenient witness. In 1856 all irregular marriages were rendered invalid unless one of the parties had been residing in Scotland for three weeks previously.

Greuze, grös, JEAN BAPTISTE: painter; b. at Tournus, near Macon, France, in 1725. He showed such talent in drawing in his youth that the painter Grandin offered to teach him portraiture in his study at Lyons gratuitously. He followed this master to Paris, and lived for some time on his slender earnings. His picture of a father reading the Scriptures to his son first attracted attention to his great talents. Being accused of want of correct taste, he went to Rome with Gougenot, in order to improve his coloring and to acquire a nobler style of drawing, but he soon perceived he was losing his own qualities without gaining others more to be desired. He returned to Paris, achieved fresh successes, but his extreme vanity caused a quarrel with the Academy, so that he no longer exhibited at the annual Salon until the

Revolution. He was, however, admitted to the Academy of France in 1769. Many of his works have been engraved. D. at Paris, Mar. 21, 1805. His pictures are to be found in all the public galleries of Europe; there are many in the Louvre, at Montpelier, Versailles, St. Petersburg, London, Cambridge, and Edinburgh. W. J. Stillman.

Greville, Charles Cavendish Fulke: author; b. in England, Apr. 2, 1794; educated at Eton and Oxford; on leaving the university was appointed private secretary to Earl Bathurst; and in 1821 became clerk of the council in ordinary, a position which he held for nearly forty years. His fame rests for the most part on his *Journals of the Reigns of George IV. and William IV.*, which ran through many editions, both in Great Britain and America, and is a valuable source of historical information, owing to the author's sincerity and keenness of observation as well as to his exceptional opportunities for the study of his times. D. Jan. 18, 1865.

Gréville, Henry: pseudonym of Madame Alice Mary Céleste Durand (born Fleury); author. She was born in Paris, Oct. 12, 1842; educated at home; removed early to St. Petersburg, her father having received an appointment there as professor in French; married M. Durand, who was a professor in the law school, and returned in 1872 to Paris, where she soon after began to publish her sketches of Russian life. Author of *Dosia*, *L'Expiation de Savelli* (1876); *Les Koumiassine*, *Gabrielle*, *Sonia* (1877); *Dournof* (1878); *Le Violon Russe* (1879); *Le Moulin Frappier* (1880); *Perdue* (1881); *Rose Rozier* (1882); *L'Ingénue* (1883); *Un Crime* (1884); *Clairfontaine* (1885); *Chapitre*, *Le Comte Xavier* (1886); *La Fille de Dosia*, *Nicanor*, *Frankley* (1887); *Comédies de paravent*, *La Seconde Mère* (1888); *L'Avenir d'Aline* (1889); *Le Passé*, *Un Mystère* (1890); *Aurette*, *Péril*, *L'Héritière* (1891).

Grévy, grā vē', François Paul Jules: politician; b. at Mont-sous-Vaudrey, in the Jura, France, Aug. 15, 1807; was a student in law when he took an active part in the three days' fight of the Revolution in 1830. During the reign of Louis Philippe he often pleaded in political cases, especially for two friends of Barbès in 1839. Grévy was elected representative to the National Assembly in 1848, and, without acting with the ultra-radicals, still sat on the benches of the Montagne. Under the empire he was elected *bâtonnier*, or president, of the lawyers' corporation of Paris, and was sent as deputy to the Corps Législatif by the department of Jura. He acted there as a moderate republican, which character he maintained after the Revolution of 1870, when he was elected to the National Assembly. Having acted twice as president of the Chamber of Deputies and filled the position with uncommon dignity, firmness, and impartiality, he was elected President of France Jan. 30, 1879. His administration was marked by its conciliatory policy, both at home and abroad, and by the republican simplicity which the chief magistrate assumed in his mode of life and social relations. It was exceedingly popular, and Grévy was re-elected Dec. 28, 1885, but his second administration was unsuccessful. He surrendered himself to the influence of his son-in-law, M. Wilson, who guided the policy of the executive to suit his personal ends and soon involved Grévy in a scandal. The latter, trying to shield his son-in-law, clung to his presidential office until he was forced to resign Dec. 2, 1887, thus closing his political career in circumstances unfortunate for his reputation. D. at Mont-sous-Vaudrey, Sept. 9, 1891.

Grey, Charles, Second Earl: statesman; b. at Fallowden, Northumberland, England, Mar. 13, 1764; educated at King's College, Cambridge; entered Parliament as a Whig 1789; was one of the managers of the Hastings trial; was an early friend of parliamentary reform, for which he agitated both in and out of Parliament, and aided in forming the Society of the Friends of the People, whose petitions he presented in the House. He opposed the Irish union 1799; became (as Lord Howick) First Lord of the Admiralty 1806, and succeeded Fox as Secretary of Foreign Affairs in the Grenville cabinet; carried the bill for abolishing the slave-trade 1807; and went out of office on the downfall of the ministry on the question of Roman Catholic emancipation. He took the title of Earl Grey 1807; acted a most honorable part in opposing the persecution of Queen Caroline, but incurred thereby the anger of the king, which prevented his holding office during the king's life; long led the Reform party, and was Premier in 1830–32. Wellington's ministry had fallen on account of its opposition to reform, and when Grey was chosen to form a cabinet he was confronted with the difficult task of securing the passage of a moderate measure in the face of the excessive demands of the Radicals and the unreasonable opposition of the Tories. In the midst of formidable agitation outside of Parliament such a measure was at length carried in the House of Commons, but thrown out in the House of Lords in Oct., 1831. The crisis that followed constitutes one of the most important events in the history of England. For a moment civil war was threatened. Grey demanded the creation of new peers. This was refused and he resigned, but popular pressure was too great and Grey was recalled with authority to create as many peers as he chose. The threat of resorting to such a measure was enough to bring the House of Lords to terms, and the bill was passed June 4, 1832. Grey resigned in July, 1834, and spent the last years of his life in comparative retirement. D. at Howick, July 17, 1845.

Revised by F. M. Colby.

Grey, Sir George, D. C. L., LL. D., K. C. B.: governor of New Zealand; b. at Lisburn, Ireland, in 1812; educated at Sandhurst Military College, and entered the army, from which he soon after retired, and in 1839 accompanied an exploring expedition to Australia, receiving the appointment of governor of South Australia in 1841, and held the position till appointed governor of New Zealand in 1845, his abilities in this capacity being acknowledged in 1848 by the bestowal of the title of K. C. B., and in 1854 by his advancement to the governorship of the Cape of Good Hope, returning, however, at the request of his government, to New Zealand in 1861, where he contributed to the suppression of the insurrection. He returned to England in 1867; became superintendent of the province of West Auckland in 1875 and Premier of New Zealand in 1877, and retired in 1884. Among his published works are *Journals of Discovery in Australia* (1841); *Polynesian Mythology and Traditions of New Zealand* (1855); *Proverbial Sayings of the Ancestors of the New Zealand Race* (1858).

Grey, Henry, Earl: son of Charles, second earl; b. Dec. 28, 1802; educated at Trinity College, Cambridge; entered Parliament 1826 as Lord Howick, and in the same year was called to the bar; was Under Secretary for the Colonies 1830–33; Under Secretary for the Home Department 1834; became a privy councilor 1835; Secretary of War 1835–39; was returned for Sunderland 1841; came to his title 1845; Colonial Secretary 1846–52; became lord-lieutenant of Northumberland 1847; received the Garter in 1863, and the Grand Cross of SS. Michael and George 1869. Author of *Defense of the Colonial Policy of Lord Russell's Administration* (1853); *Essay on Parliamentary Government* (1858). D. Sept. 9, 1882.

Grey, Lady Jane: daughter of Henry Grey, Duke of Suffolk, and great-granddaughter of Henry VII. in the female line; b. at Bradgate, Leicestershire, 1537; under the tutelage of Ascham and Aylmer, Bishop of London, acquired a good knowledge of Greek, Latin, French, and Italian, and such proficiency in the Oriental languages as caused her to be regarded as a prodigy of learning, while her piety and excellence of disposition were equally remarkable. She married Lord Guildford Dudley, son of the Duke of Northumberland, in 1553. Edward VI., persuaded by Lady Jane's father and father-in-law, had set aside the claims of his sisters and declared Lady Jane his successor. Accordingly, after much persuasion, she reluctantly assented, and was proclaimed queen July 10, 1553. Ten days later Queen Mary was proclaimed, and Lady Jane and her husband were confined in the Tower. Nov. 30 she was tried for treason at the Guildhall, and pleaded guilty, and on Feb. 12, 1554, she and her husband were beheaded, chiefly, it is believed, on account of Suffolk's rash revolt against Queen Mary in his daughter's behalf, and the later and more formidable rising under Sir Thomas Wyatt.

Grey Friars: See Franciscans.

Greyhound: a variety, or group of varieties, of the domestic dog, distinguished chiefly by slender, graceful build, quick sight, and great speed in the chase. In other points there is much lack of uniformity. For example, in India there are long-haired and even shaggy greyhounds, while China and Turkey have breeds with no hair, or next to none. Scotland, Ireland, and Russia have stocks of the greyhound which are keen of scent, but most greyhounds are deficient in this respect, and follow the game by sight alone. Some strains are of very large size and treacherous disposition,

while the little Italian greyhound is a gentle household pet. The celebrated dog Gelert, a greyhound whose mythus is found in the folk-lore of several nations, was a most faithful servant, but with few exceptions his modern representatives are unintelligent, and do not attach themselves strongly to any master. Greyhounds are descendants of a long line of clearly marked ancestry. Celtic, Teutonic, Latin, Greek, Persian, Indian, Egyptian, and Chinese literature and tradition testify to the antiquity of the race. It has been much modified by crossing with other breeds. See Dogs.

Grey Nuns: See Charity, Sisters of.

Greytown, San Juan del Norte, or **San Juan de Nicaragua**: a seaport-town of Nicaragua; on the Caribbean Sea, at the mouth of the San Juan river; 190 miles E. S. E. of Managua (see map of Central America, ref. 7–J). It is built on a low, sandy point, backed by swampy lands; the situation is insalubrious, though less so than many other parts of the coast. The houses generally are of wood, whitewashed, and with the mingling of palms and fruit-trees are very picturesque. Greytown is the only port of importance on the Atlantic side of the republic. The harbor, protected by a sand-bar, formerly admitted large vessels, but, owing to the opening of a new mouth of the San Juan, it became obstructed; this has been partially remedied by the construction of jetties and a breakwater. The town was bombarded by Capt. Hollins, of the U. S. navy, July 13, 1854, and it was nearly destroyed by fire Jan. 1, 1890. Pop. about 2,500. A few miles to the N. W., on the coast, is the village of America, founded by the Government Jan. 1, 1890, at the entrance of the proposed Nicaragua interoceanic canal.

Herbert H. Smith.

Grieg, Edvard: composer and pianist; b. at Bergen, Norway, June 15, 1843. He went to Leipzig in 1858, having Hauptmann and Richter as masters in harmony and counterpoint, Rietz and Reinecke in composition, and Moscheles in piano-playing. After his return to his northern home Grieg's talent soon began to assume its characteristic national quality. He has published many works in various forms for piano solo, piano with orchestra, chamber music, large orchestral suites, such as *Peer Gynt*, and other works, all imbued with a keen originality and enjoying a wide popularity. Dudley Buck.

Grier, James Alexander, D. D.: a theologian of the United Presbyterian Church of North America; b. in Waltz's Mills, Pa., May 8, 1846, and educated at Monmouth College, Illinois, and the Newburg Theological Seminary, New York. He has been pastor at Locust Hill, Pa., and at Mercer, Pa. From 1886 he has been Professor of Systematic Theology in the Allegheny Theological Seminary. He published *Secret Societies* (1878); *Biography of Jeremiah Rankin Johnston, D. D.* (1892). W. J. B.

Grier, William Moffatt, D. D.: minister and educator in the Associate Reformed Presbyterian Church of the South; b. in York co., S. C., Feb. 11, 1843; graduated at Erskine College in 1860. After four years' pastoral labor he became president of Erskine College in 1871. He is also Professor of Mental and Moral Philosophy in the college; Professor of Greek Exegesis and Homiletics in the Erskine Theological Seminary; and editor of *The Associate Reformed Presbyterian*. Willis J. Beecher.

Griesbach, grees'baăkh, Johann Jakob: theologian; b. at Butzbach, Jan. 4, 1745; studied theology at the universities of Tübingen, Halle, and Leipzig; traveled in 1769 and 1770 through Holland, England, and France; became Professor Extraordinary in Theology at the University of Halle 1773; professor ordinary at Jena 1775, which office he held till his death there Mar. 24, 1812. After finishing the ordinary course of theology, he devoted himself almost exclusively for many years to critical researches concerning the original Greek text of the New Testament, the result of which was his edition of the Greek New Testament (Halle, 1775–77), which, properly speaking, was the first critical edition ever made, and which has been reprinted since in many editions. It is to him that we owe the division of the authorities for the text of the Greek New Testament into the three families—(1) the Alexandrian; (2) the Latin, or Western; and (3) the Byzantine, or Eastern—and the now familiar rules that a reading must be supported by ancient testimony; that the shorter reading is preferable to the longer, the more difficult to the easy, the unusual to the usual. His works on other theological subjects are of less importance, though his *Anleitung zum Studium der populären Dogmatik* (Jena, 1779; 4th ed. 1789) was once popular. See his *Life* by F. A. Köthe (Jena, 1813) and by J. C. G. Auguste (Breslau, 1813).

Samuel Macauley Jackson

Grif'fenfeld, Peter Schumacher, Count: b. at Copenhagen, Denmark, in 1635; the son of a wine-dealer. He early entered the service of Bishop Swane as private secretary; and as Swane played a very conspicuous part in the Danish revolution of 1660, by which the power of the nobility was broken and the constitution of the kingdom changed into an absolute monarchy, a way was thus opened for the talent and ambition of the young Schumacher. The bishop recommended him to the king, Frederick III., who employed him in several responsible positions in the Government offices. He was the author of *Lex Regia Danica*, promulgated Nov. 17, 1665. On his death-bed Frederick III. said to his son and successor, concerning Schumacher: "Give him power, but do it slowly"; but it was not in the character of Christian V. to do anything slowly. In 1670 Schumacher was ennobled under the name of Griffenfeld; in 1673 he was made a count and chancellor of the realm; in 1674 president of the Supreme Court and chancellor of the university. The king had great confidence in him, and his talents were noticed and respected at the courts of France and England. But his policy was in utter opposition to that of the court, and even to that of the king. In 1676 he fell out with the king, and the courtiers hastened to have him bereft of his honors and put in prison, and finally had him sent 1,000 miles away, to Munkholm, a lonely rock-fortress in the fiord of Trondhjem. The king soon forgot him, and he remained imprisoned for twenty-three years. D. May 11, 1699.

Griffin [from O. Fr. *griffon* : Ital. *grifone* : Span. *grifo* < Lat. *gryphus*, from Gr. γρύψ]: a fabulous animal, part lion and part eagle, and having the characteristics of both—strength, rapacity, courage, and swiftness. Its figure varies in different countries and eras. It was emblematic of vigilance, and as a symbol of divine power it originally attended upon any of the Greek gods, though in classical times it belonged first of all to Apollo, and then to Bacchus, Diana, and Nemesis. The home of the griffins was in the far north, between the Hyperboreans and the one-eyed Arimaspi. There, on Mt. Rhipæ, they guarded the gold of the north, which the Arimaspi, mounted on horses, tried to take from them. The Greeks really believed in the existence of the griffin, and the poet Aristeas of Proconnesus (Tournier, *De Aristea Proconnesio et Arimaspeo poemate*, Paris, 1863) says (according to Herodotus, iv., 13) that he visited the Issedones who lived beyond the Scythians and affirmed the existence of the Arimaspi and the griffin watch-dogs. (Cf. Æschylus's ὀξύστομοι Ζηνὸς ἀκλαγγεῖς κύνες.) Ctesias, the Greek physician of Artaxerxes, outdoes Aristeas in his wonderful story about the griffins in India. He says that their backs are black, their wings white, their necks dark blue, and that in other respects they are exactly as depicted in later Greek art; the grown animal can not be captured, but the young may be caught; the griffins dig the gold from the mountains and build their nests with a part of it, while the rest is taken from them by the Indians. The griffin was not an original creation of the Greek imagination, but was borrowed from the Orient, improved upon, and in Parthian and Sassanide times restored to the Orient. The griffin, obtained from the Hittites of Northern Syria, appears frequently as a decoration on the monuments of Egypt, though it was also used as a hieroglyph signifying *swiftness*. Unlike the sphinx, it had no sacred meaning or character in Egypt. From Egypt the griffin passed over to Mycenæ, where it appears (e. g. on the swords discovered by Schliemann) as a wild and swift beast of prey, and is depicted running at full speed. On the monuments of Chaldea and Assyria the griffin appears as a lion with the wings, hind legs, and tail of the eagle; it is usually depicted as rampant and in the act of attacking a god with his fore feet; it is the dragon-foe of the gods. In Persia it is figured precisely as in Chaldea and Assyria, but with goat-horns on its head and sometimes with a scorpion-tail. This is the evil demon Tiamat; he appears standing on his hind legs fighting the king, who disembowels him by a thrust of his sword. Among the Hittites the griffin is the symbol of divine power, and appears quietly seated dog-fashion on his hind legs, sometimes lifting one fore paw. It is found mostly on Hittite cylinder seals and other gems, and is quite like the griffin of Chaldea, but often has no comb. The griffin of Cyprus (on cylinder seals) is also a direct importation from the Hittites. The griffin of archaic

Greek art (non-Mycenean) came in the main from the Hittites, though it exhibits peculiarities of Greek origin; it has no comb, but has something like a top on its nose below the eyes. In the later period of Greek art the griffin has the body of the lion, an eagle's head, with long sharp ears, a quill mane, and large beautiful wings; he is swift and rapacious, preying on other animals. The belief in the griffin continued throughout the Middle Ages, and consequently it appears everywhere in heraldic coats-of-arms.

LITERATURE. — Furtwängler's learned article *Gryps* in Roscher's *Ausführliches Lexicon der Griechischen und Römischen Mythologie*; Seeburg, *Die Sage von dem Greifen* (Göttingen); Brown, *Gryphon* in *Archæologia* (1885).

J. R. S. STERRETT.

Griffin: city; capital of Spalding co., Ga. (for location of county, see map of Georgia, ref. 4–G); on the Central Ga., the Chatt., Rome and Col., and the Ga. Mid. and Gulf Railways; 43 miles S. of Atlanta. It is the center of a large cotton and fruit and wine trade, having a cotton-compress and two cotton-factories, and in its immediate vicinity 250,000 peach-trees and 500,000 grape-vines. Adjoining the city are the State agricultural experiment station and the permanent State military encampment. There are 11 churches, high school, public grammar schools, Y. M. C. A. building, and 1 monthly, 2 daily, and 3 weekly periodicals. Griffin has become a popular winter resort for people from the North, and a summer resort for South Georgians. Pop. (1880) 3,620; (1890) 4,503; (1893) estimated, with suburbs, 6,000. EDITOR OF "NEWS AND SUN."

Griffin, CHARLES: soldier; b. in Licking co., O., in 1826; graduated at West Point 1847; entered the army as brevet second lieutenant of artillery, and served in the war with Mexico 1847–48; became a second lieutenant in Oct., 1847, and first lieutenant June, 1849, serving on frontier duty and against hostile Indians. Appointed captain in 1861, he served during the civil war at the first battle of Bull Run, being breveted major for gallant conduct. Promoted to be brigadier-general of volunteers June, 1862, he commanded a brigade in the Virginia Peninsular campaign, and distinguished himself at Yorktown, Gaines's Mill, Malvern Hill, etc., and subsequently in the second battle of Bull Run and at Antietam. In the Rappahannock campaign he commanded a division at the battle of Fredericksburg, Dec., 1862, at Chancellorsville, May, 1864, Gettysburg, July 3, 1863, Wilderness, May 5 and 6, 1863, and at Spottsylvania, assault and siege of Petersburg, and the various battles of the final campaign 1864–65. For conspicuous gallantry in this latter campaign he was breveted major-general of volunteers. Appointed major-general of volunteers Apr. 2, 1865, he commanded the Fifth Army-corps until Jan. 28, 1865. He was appointed one of the commissioners to carry out the terms of the surrender of Gen. Lee at Appomattox Court-house Apr. 9, 1865. Being mustered out of the volunteer service, Jan., 1866, he was in July following appointed colonel Thirty-fifth Infantry, and commanded military districts in Texas and Louisiana. D. at Galveston, Tex., Sept. 5, 1867.

Revised by JAMES MERCUR.

Griffin, EDWARD DORR, D. D.: b. at East Haddam, Conn., Jan. 6, 1770; graduated at Yale 1790; was settled at New Hartford, Conn., from 1795 to 1801, at Newark, N. J., from 1801 to 1809; was Professor of Sacred Rhetoric in Andover Seminary from 1809 to 1811; was settled in Boston, Mass. (Park Street Congregational church), from 1811 to 1815; at Newark again from 1815 to 1821; was president of Williams College from 1821 to 1836. He published several works, the most noted of which is a *Course of Lectures in Park Street Church* (Boston, 1813). Sixty of his sermons, with a biography prefixed, were published in two vols. by Rev. Dr. William B. Sprague, in New York, in 1838. D. at Newark, N. J., Nov. 8, 1837. Revised by S. M. JACKSON.

Griffin, GERALD JOSEPH: author; b. at Limerick, Ireland, Dec. 12, 1803; went in 1823 to London with a view of becoming a dramatist, but the failure to dispose of his tragedies *Aguire* and *Gisippus* obliged him to become a writer for periodicals. His *Holland Tide* (1826); *Tales of the Munster Festivals* (1827); *The Colleen Bawn* (1828); *The Invasion*; *The Rivals*; *The Duke of Monmouth*, and other novels were successful. In 1838 he became a postulant of the Christian Brothers, and took the name of Brother Joseph. D. at the North Cork monastery, Ireland, June 12, 1840. His *Life* was written by his brother.

Griffis, WILLIAM ELLIOT, D. D.: b. in Philadelphia, Pa., Sept. 17, 1843; served in the Forty-fourth Pennsylvania Regiment in 1863; graduated at Rutgers College, New Brunswick, N. Y., 1869; studied in the New Brunswick (Reformed Dutch) Theological Seminary 1869–70; went to Japan in 1870 to organize schools under Government appointment; was superintendent of education in province of Echizen, Japan, 1871; Professor of Physics and Chemistry in the Imperial University of Tokio, Japan, 1872–74; studied in Union (Presbyterian) Theological Seminary in New York city 1875–77, and graduated; was pastor of the First Reformed Dutch church, Schenectady, N. Y., 1877–86; pastor of Shawmut Congregational church, Boston, 1886–92; of the Congregational church, Ithaca, N. Y., 1893. He is the author of *The Mikado's Empire* (New York, 1876; 7th ed. 1891); *Japanese Fairy World* (Schenectady, N. Y., 1880); *Corea, the Hermit Nation* (New York, 1882; 3d ed. 1889); *Corea, Without and Within* (Philadelphia, 1884; 2d ed. 1885); *Matthew Calbraith Perry* (Boston, 1887; 2d ed. 1890); *The Lily among Thorns: a Study of the Biblical Drama entitled the Song of Songs* (1889); *Honda the Samurai: a Story of Modern Japan* (1890); *Sir William Johnson and the Six Nations* (New York, 1891); *Japan in History, Folk-lore, and Art* (Boston, 1892). C. H. THURBER.

Griffon Vulture: a name applied to the large vulture (*Gyps fulvus*) of Europe and Asia. See VULTURE.

Griggsville: city; Pike co., Ill. (for location of county, see map of Illinois, ref. 7–B); on the Wabash Railroad; 4 miles W. of the Illinois river, 50 miles E. of Quincy. It has good public schools and churches, public library, one weekly newspaper, and manufactures of flour, agricultural implements, and carriages and wagons. Pop. (1880) 1,515; (1890) 1,400. EDITOR OF "INDEPENDENT PRESS."

Grigoriopol, grĕĕ-gō-rĕĕ-ō'pōl [Russ., from Gr. Γρηγοριόπολις, city of Gregory]: town of Russia; in the government of Kherson, on the Dniester; 82 miles N. W. of Odessa (see map of Russia, ref. 10–C); founded in 1793 by a colony of Armenian settlers, who are mostly engaged in the cultivation of tobacco, wine, and fruit, and manufacture of leather. Pop. 9,000.

Grijalva, grĕĕ-chaal'vaă (also called TABASCO, and in its upper course CHIAPA and MESCALAPA): a river of Guatemala and Mexico, rising in the mountains of Huehuetenango, making a great curve to the W., N. W., and N. E., through Chiapas, and then flowing N. through Tabasco to the Gulf of Mexico. Length, 265 miles. In its lower course it passes through wide flood-plains, where the channel was changed in 1765. Frontera, just above the mouth, is the principal port of Tabasco, and small steamers run up to San Juan Bautista, 50 miles. H. H. S.

Grijalva, JUAN, de: Spanish soldier; discoverer of Mexico; b. at Cuéllar, 1489 or 1490. He went to Española, and in 1511 joined his uncle, Diego Velasquez, in Cuba. When Córdoba returned to Cuba from the discovery of Yucatan (1517) Velasquez chose Grijalva to command an expedition to the same coasts. Grijalva left Santiago de Cuba with four caravels Apr. 8, 1518; sailing along the shores of Yucatan, he had an encounter with the Indians at Campeche. He entered the river which bears his name in Tabasco, had friendly intercourse there with the natives, obtained a considerable quantity of gold, and first heard of the rich empire of the Aztecs in the interior. Beyond this he followed the coast to Cape Rojo, or perhaps to Tampico, finally returning to Cuba about Nov. 1. Instead of evincing gratitude for this important discovery, Velasquez reproached Grijalva because he had not formed settlements, and he was dismissed in disgrace. He went to Santo Domingo and thence to Jamaica, and in 1523 accompanied Garay from that island to the shores of Northern Mexico. Later he took service with Pedrarias at Panama, and was sent to Nicaragua, where he died Jan. 21, 1527. HERBERT H. SMITH.

Grillage: a timber platform built on piles as the foundation for a masonry structure. See FOUNDATION.

Grillparzer, gril'paărt-ser, FRANZ: dramatist; b. in Vienna, Jan. 15, 1791; studied law at the University of Vienna, and in 1832 became director of the imperial archives. His first tragedy, *Die Ahnfrau*, which was successfully performed for the first time in 1816, and in which the romantic idea of "fate" (*Schicksal*) played a great *rôle*, caused the critics for a long time to underestimate Grillparzer's position in literature. His subsequent dramas, *Sappho*, *Das goldene Vliess*, *Des Meeres und der Liebe Wellen* (Hero and Leander), *König Ottokar's Glück und Ende*, and the witty comedy *Weh dem, der lügt*, have proved, however, be-

yond doubt that Grillparzer is one of the greatest German dramatists of the period following the classical era. He combines the dramatic power and pathos of Schiller with the repose and beauty of Goethe's verses, and displays, especially in lyrical passages, a command of expression and language which must be termed truly classical. For a long time his dramas were overlooked by the German stage, until Laube, the director of the Burgtheater in Vienna, had them performed with the utmost success. The poet now became very popular, and on the occasion of his eightieth birthday received a most brilliant ovation. See Heinrich Laube's biography of Grillparzer (Laube also published Grillparzer's works for the first time); W. Scherer, *Zum Gedächtniss Franz Grillparzers* (1872); Frankl, *Zur Biographie Franz Grillparzers* (1883); J. Volkelt, *Franz Grillparzer als Dichter des Tragischen* (1888); Lichtenheld, *Grillparzer-Studien* (1891); R. Mahrenholtz, *Franz Grillparzer, sein Leben und seine Schriften* (1890); E. Reich, *Grillparzers Kunstphilosophie* (1890). JULIUS GOEBEL.

Grilse: the young salmon on its first return to fresh water from the sea. See SALMON.

Grimaldi, greē-maal'deē: an old Guelphic family of Italy, whose principal seat was at Genoa. They traced their origin to one Grimoald (d. 714), major-domo to Childebert III. (683–711), Merovingian King of Neustria and Burgundy. The Grimaldi were long (980–1731) princes of Monaco, but on the extinction of the male line of the princely house the title passed to the Goyen-Matignon line; and the princes of Monaco still bear the name of Grimaldi, though not of the direct male line. The name became a common one in Italy, as well as France and Spain; and in the Middle Ages many poets, artists, scholars, churchmen, nobles, generals, and admirals bore this name.

Grimaldi, JOSEPH: pantomimist and actor; b. in London, Dec. 18, 1779; began to appear in pantomimes when a child, attending boarding-school in the intervals between his engagements at the theater, and while still very young had become one of the most successful pantomimists in London. As clown in the pantomime of *Mother Goose* he won his chief renown, and the piece was continually repeated. But from the year 1822 his health, which had suffered from overwork, grew steadily worse, and, as he had saved little from his former earnings, the last years of his life were passed in poverty. D. at Pentonville, May 31, 1837. In the species of drollery peculiar to the genuine pantomime, Grimaldi is said to have had no equal, and his name is often cited as that of the last and greatest representative of this form of comic acting. The chief authority for the facts of his life is the *Memoirs* edited by Boz, i. e. Charles Dickens (2 vols., 1838).

Grimes, JAMES WILSON, LL. D.: U. S. Senator; b. in Deering, Hillsboro co., N. H., Oct. 20, 1816; the youngest of eight children, and of Scotch-Irish extraction. He entered Dartmouth College Aug., 1832; settled at Burlington (now in Iowa, then in the "Black Hawk Purchase," which was attached to the Territory of Michigan) May, 1836, and engaged in the practice of law, in which he was highly successful. Reared among the Whigs, and sustaining their general principles, he earnestly opposed the repeal of the Missouri Compromise, and was one of the founders of the Republican party. On several occasions he canvassed nearly the whole of Iowa, and addressed the people upon public questions. He was chosen Governor Aug., 1854. He convened the general assembly in special session July, 1856, to act upon land grants made to the State by Congress for the purpose of aiding in the construction of railways, by which the material development of the State has been greatly promoted. By the effect of a new constitution his tenure of office terminated Jan., 1858, when he was chosen U. S. Senator for the term of six years from Mar. 4, 1859. In Jan., 1864, he was chosen for a second term. In the impeachment trial of President Johnson he regarded himself as acting, not in a representative capacity but as a judge, and gave his opinion that the President was not guilty of an impeachable offense by reason of anything alleged in the articles preferred against him. In common with those who acted with him in the final vote he incurred great temporary unpopularity, but he declared that "neither the wealth nor the honors of the world would have induced him to act otherwise." During that trial he was stricken down by an attack of paralysis, but went into the Senate chamber and recorded his vote. He died suddenly of heart disease at Burlington, Ia., Feb. 7, 1872. Revised by C. K. ADAMS.

Grimké, grim-kē', ANGELINA EMILY: reformer; sister of Frederick Grimké (1791–1863), judge of the Ohio Supreme Court 1836–41; b. in Charleston, S. C., Feb. 20, 1805; removed to Philadelphia in 1828, and joined the Society of Friends; in 1830 she published *An Appeal to the Christian Women of the South*, advocating anti-slavery measures. In 1836 she emancipated the slaves she had inherited from her father. In that same year in New York, in company with her sister Sarah, she addressed large audiences of women on the subject of slavery. At the invitation of the Massachusetts Anti-Slavery Society the sisters went to New England, and by their eloquent addresses did much to further the work of that society. In 1837 Angelina wrote several letters to Catharine Beecher in reply to an essay on slavery and abolitionism. May 14, 1838, she was married to Theodore Dwight Weld. See May, *Recollections of the Anti-Slavery Conflict* (1868). SUSAN B. ANTHONY.

Grimké, SARAH MOORE: reformer; b. in Charleston, S. C., Nov. 6, 1792; in 1821 made Philadelphia her place of residence, and published in 1827 *An Epistle to the Clergy of the Southern States*. This was considered one of the most efficient anti-slavery documents of the day. While lecturing in New England she wrote *Letters on the Condition of Woman and the Equality of Sexes*, published in a volume in 1838, and afterward made her home with the Weld family, and assisted as a teacher in their school, established in Belleville, N. J., in 1840. She also published a translation of Lamartine's *Biography of Joan of Arc* and other smaller works. D. at Hyde Park, N. Y., Dec. 23, 1873. SUSAN B. ANTHONY.

Grimm, FRIEDRICH MELCHIOR, Baron: a literary adventurer; b. at Ratisbon, Bavaria, Dec. 25, 1723; studied at the University of Leipzig. Having failed sadly with his tragedy *Banise*, he went to Paris as tutor in a noble family. Rousseau made him acquainted with Diderot, d'Alembert, d'Holbach, and other literary celebrities. Count Friesen, to whom he had become private secretary, introduced him in the most elegant salons. Voltaire made him famous by exclaiming, after reading his pamphlet *Le petit prophète de Boemischbroda* (1753): "De quoi s'avise donc ce Bohémien d'avoir plus d'esprit que nous?" He became the regular correspondent of Catharine II. of Russia, Gustavus III. of Sweden, Stanislas of Poland, and other sovereigns, and his letters give a minute chronicle of French literature from 1753 to 1790. In 1776 he was made a baron and ambassador from the Duke of Saxe-Gotha to the French court, but in 1792 he had to leave France with the rest of the foreign diplomats. He retired to Germany, where Catharine II. gave him a pension and some shadow of a diplomatic position. D. at Gotha, Dec. 19, 1807. A complete edition of his *Correspondance littéraire, philosophique, et critique* was published in 15 vols. in Paris in 1829; German abridgment in 2 vols., 1823. Rousseau gives an interesting description of Grimm in his *Confessions*, greatly exaggerated, but nevertheless strikingly true.

Grimm, JAKOB LUDWIG KARL: philologist and archæologist; b. at Hanau, Germany, Jan. 4, 1785; studied law at Marburg 1802; received in 1805 an office in the war department of Hesse; accompanied in 1814 the Hessian ambassador to the Congress of Vienna; went in 1815, under Prussian authority, to Paris to reclaim such manuscripts as Napoleon had carried away from German libraries; became in 1816 librarian at Cassel, and in 1830 professor at Göttingen. When in 1837 the Hanoverian king arbitrarily abolished the constitution, Grimm signed a protest against the measure, and was dismissed, but in 1841 received a chair at the University of Berlin, which he held for the rest of his life. He began his literary career in 1811 with *Ueber den altdeutschen Meistergesang*, followed in 1819 by his *Deutsche Grammatik* (unfinished), in 1828 by his *Deutsche Rechtsalterthümer*, in 1840 by his *Weisthümer*, and in 1844 by his *Deutsche Mythologie*. But besides these, and a great number of minor essays and archæological researches and collections undertaken in connection with his brother, his two principal works are *Geschichte der Deutschen Sprache* (1848) and *Deutsches Wörterbuch* (1852): the former a history of the German language, of paramount importance for all linguistical study on account of the brilliant discoveries it contains, by which some of the fundamental laws for the development of a language are established; the latter a dictionary of the German language, arranged on a broader plan than any other dictionary. Only the first volumes, to the word *Garten*, were finished. D. in Berlin, Sept. 20, 1863. See GRIMM'S LAW.

Grimm, Wilhelm Karl: philologist and archæologist; brother of Jakob Ludwig Karl Grimm; b. at Hanau, Feb. 24, 1786; studied law at Marburg, and followed his elder brother as librarian and professor at Cassel, Göttingen, and Berlin. Although he took part with his brother in all his studies, and divided the labor, he seems to have been more attracted to the poetical side of the questions which the two brothers raised and answered. The most important of his independent works are *Altdänische Heldenlieder, Balladen und Märchen* (1811); *Ueber die Deutschen Runen* (1821); *Die Deutschen Heldensage* (1829; 3d ed. 1889), his principal work; *Der Grosse Rosengarten* (1836); *Das Rolandslied* (1838); *Konrad von Würzburg* (1849); *Altdeutsche Gespräche* (1851). In connection with his brother he edited *Kinder- und Hausmärchen* (1812), a collection of fairy and other popular tales; *Altdeutsche Wälder* (1813-16); *Deutsche Sagen* (1816-18). D. in Berlin, Dec. 16, 1859.

Grimm's Law: Jakob Ludwig Karl Grimm's classification of the interchange of consonants in Teutonic words and their cognates. The Teutonic languages receive their impress of individuality in part from certain changes to which the explosives *k*, *t*, *p*, *g*, *d*, *b*, *gh*, *dh*, *bh* are subjected in passing from the Indo-European to the Teutonic form. The credit of first discovering the uniformity of these changes is largely due to a Danish scholar, Rasmus Kristian Rask (1787–1832), but the formulation of them in the shape of a general law, and the exhibition of the parallelism contained in the second or High German shifting, are the work of Jakob Grimm (1785–1863).

I. The Teutonic or first shifting.

(1) Indo-Europ. become Teuton.	gh (ʒ) g	dh (đ) d	bh (b) b
(2) Indo-Europ. become Teuton.	g k	d t	b p
(3) Indo-Europ. become Teuton.	k h	t þ (th)	p f

The regular correspondences in the cognate languages are as follows: (1) the Indo-European aspirates. See Aspirate.

I.-E.	Skr.	Gr.	Lat. Initial.	Lat. Medial	Teuton.
gh	h	χ	h	h (g)	g (ʒ)
gh	gh (jh)	φ, θ, χ	f	gu (v)	gw (ʒw)
dh	dh	θ	f	d	d (đ)
bh	bh	φ	f	b	b (b)

The symbol *gh* in the second line represents, as do *g* and *ǧ* (see the article Velars), the Indo-European series of velars or back-gutturals which show a tendency to labialization; *ʒ*, *đ*, *b* represent spirants which generally in the West Germanic dialects (i. e. all except Gothic and Scandinavian) pass secondarily into the voiced explosives or mediæ *g*, *d*, *b*, though in other than the High German dialects medial *ʒ* and *b* (*v*) are retained. Examples:

Skr	Gr	Lat	Eng.
haṁsá-, *goose*	χήν	(h)anser	goose
váhati, *convey*	ὄχος	veho	way
gharmá-, *warmth*	θερμός	formus	warm
vidhávā, *widow*	ἠίθεος	vidua	widow
bhárati, *bear*	φέρω	fero	bear

(2) The Indo-European mediæ:

Skr	Gr.	Lat	Eng
jānu-, *race*	γόνυ	genu	knee
gámati, *comes*	βαίνω	venio	come
dáśa, *ten*	δέκα	decem	ten
dubŭs, *deep* (Lith.)			deep

(3) The Indo-European tenues:

Skr	Gr.	Lat	Eng
cvan-, *dog*	κύων	canis	hound
ka-, *who*	πόθεν	quod	what
trávas, *three*	τρεῖς	trēs	three
pād-, *foot*	πούς	pēs	foot

The apparent exceptions to these laws may be chiefly summarized under the following heads:

(1) Dissimilation of Indo-European aspirates in Sanskrit and Greek. In Greek it occurred after the voiced aspirates had become voiceless; thus Indo-European *dh* — *dh* > Skr. *d* — *dh*, Gr. *t* — *th*, Teuton. *d* — *d*. Cf. Skr. *bŏdhati*, Gr. *πεύθομαι*, Goth. *anu-biudan* (Indo-European *bheudh-*); Skr. *bāhú-*, Gr. *πῆχυς*, O. H. G. *buog* (Indo-European *bhāghú-*). See Grassmann, *Kuhn's Zeitschr.* (xii., 81 ff.).

(2) Shifting of *k*, *t*, *p*, checked by preceding voiceless spirant in the combinations, Indo-European *sk*, *st*, *sp* and Teuton. *ht* (< Indo-European *kt*), *ft* (< Indo-European *pt*). Cf. Lat. *piscis* : Goth. *fisks*; Gr. ἔστι : Goth. *ist*; Lat. *rectus* : Goth. *raihts*; Lat. *captus* : Goth. *hafts*. See Brugmann, *Compar. Gramm.*, i., § 528.

(3) Interchange of mediæ and tenues and of mediæ and aspirates in Indo-European, especially at the end of roots. This dualism was probably originally due to the character of the following consonant. So are probably to be explained, e. g., Gr. ἀσταμφής in contrast with O. H. G. *stampfōn*, Goth. *táikns* in contr. to *teihan*, etc.

(4) The phenomena discussed under Verner's Law (*q. v.*).

II. The High German or second shifting. This affects only a portion of the West German dialects. It began in the fifth century A. D. at the extreme south, affecting most powerfully the dialects of the Lombards, Allemans, Bavarians, and South Franks, but losing its force as it spread toward the north. (Cf. Braune, *Paul-Braune's Beitr.*, i., 1 ff.) The frontier between the present High German and Low German dialects is formed without any reference to the older dialectal boundaries by the final halt in the shifting of the tenues, so that the dialects which change initial *t* to *ts* (*z*), medial and final *t* to *s*, medial *p*, *k*, to *f*, *ch* are High German, the others Low German. The course of this frontier is approximately indicated by a line drawn from Aix-la-Chapelle through Düsseldorf, Siegen, Cassel, Magdeburg, Lübben, Fürstenberg on the Oder, to the Slavic speech-frontier at Birnbaum. The most prominent features of the second shifting may be exhibited by a comparison of the sounds concerned as they now stand in English and German respectively. The Modern German is based upon dialects, however, which shifted less radically than those of the extreme south.

		Tenues			Mediæ			Spirants.		
Eng.		k	t	p	g (y)	d	b (v)	h	th (þ)	f
Germ.	Initial and after conson.	k	ts (z)	pf	g	t	b	h	d	f
	After vowel	ch	ss	f						

Examples: *cold* : *kalt*; *yoke* : *joch*; *ten* : *zehn*; *token* : *zeichen*; *heart* : *herz*; *bite* : *beissen*; *goat* : *geiss*; *path* : *pfad*; *sleep* : *schlafen*; *gird* : *gürten*; *day* : *tag*; *dead* : *tot*; *deed* : *tat*; *bread* : *brot*; *that* : *das*; *thorn* : *dorn*; *three* : *drei*; *earth* : *erde*, etc.

References.—Brugmann, *Elements of the Comparative Grammar of the Indo-Germanic Languages* (i., §§ 342–344, 374–376, 393–395, 439–444, 527–541; Wilmanns, *Deutsche Grammatik* (§§ 17 ff.); Kluge, *Paul's Grundriss der german. Philologie* (i., 324 ff.); Behaghel, *Paul's Grundriss* (i., 584 ff.); Brandt, *American Journal of Philology* (i., 146 ff.); Skeat, *Principles of English Etymology* (first series); Streitberg, *Urgermanische Grammatik* (1896). See Teutonic Languages and German Language. Benj. Ide Wheeler.

Grimsby: See Great Grimsby.

Grimshaw, Robert, M. E., Ph. D., B. C. L.: civil engineer; b. in Philadelphia, Pa., Jan. 25, 1850; educated at Wilmington, Del., Andalusia, Pa., and in Europe; Professor of Physics in Andalusia College; head master of St. Stephen's School, Milburn, N. J.; Lecturer on Physics in Franklin Institute, Philadelphia; member of jury of award at Universal Exposition 1878; editor of vol. vii. of *The Iconographic Encyclopædia*, and one of the editors of the *Standard Dictionary*; author of numerous works, including *Saws* (1880); *Steam-engine Catechism* (1885); *Hints on House-building* (1889); *Record of Scientific Progress* (1891); *Hints to Power-users* (1891); *Fifty Years Hence* (1892); and articles in various encyclopædias.

Grindelwald, grin'del-vaält [Germ., alderwood]: village of the canton of Berne, Switzerland; 35 miles S. E. of Berne; in a valley just N. W. of the great mountains Eiger, Mettenberg, and the Wetterhorn, between which descend the upper and lower glaciers of Grindelwald (see map of Switzerland, ref. 5–E). The manufacture of kirschwasser and the herding of cattle are the chief industries of Grindelwald, which is much visited in summer by tourists. Pop. 3,089.

Grinding and Crushing Machinery: mechanical devices for disintegrating hard or fibrous substances. The reduction of large masses to the state of powder usually involves the use both of crushing and of grinding apparatus. Crushing machinery usually reduces the size of masses, or breaks up fragments, by simple pressure. Such action is best in the reduction of hard, brittle, non-fibrous substances.

Grinding machinery acts by compression, combined with a lateral action. Such attrition is better adapted to produce extreme fineness of division than simple crushing; and where the material to be ground is organic, particularly if fibrous and tenacious, this is the only satisfactorily efficient method. Pulverization of hard substances is also frequently effected by percussive action.

In breaking up hard materials existing naturally in masses—as, for example, minerals and the metallic ores—the first operation is usually that of blasting. Holes are drilled to a depth of from a few inches to many feet, according to the nature of the material and the scale upon which the work is to be prosecuted. For this work drills worked by steam, by compressed air, or by electricity, are frequently used. These holes are charged with explosive materials, which are fired, and the mass is rent into fragments. Very large pieces are blasted again, and all, when sufficiently reduced in size, are broken up by the workmen with blows of heavy hammers or by crushing machinery. The *stamp-mill*, shown in Fig. 1, is one of the oldest and most generally known forms of crushing apparatus. A heavy mass of chilled cast iron, B, is secured upon the lower end of a strong vertical beam, E, which also carries, near the upper extremity, a bracket, K, which is engaged by a cam, D, which lifts it to the required height. This beam is guided by a suitable frame, F G, and the lifting is done by a cam or by a series of cams which are keyed upon and revolve with a horizontal shaft, A, driven by a steam-engine or other prime mover. A shield, C, of wood or metal protects the workman against injury by flying fragments. D represents the ore flowing under the stamp-heads, which crush it against the floor, H. A stream of water, I, usually flows over the minerals, carrying off the fine particles, and also preventing the rising of dust. Usually a battery of such stamps, placed side by side, operated by a single shaft, is used. In this case they are so arranged, by the adjustment of the elevating cams upon the shaft, as to make their combined action in resisting the driving-power as uniform as possible. Where two are worked by one shaft their cams are set opposite each other; where three or four or six form a battery their cams are so set as to make angles of 120°, 90°, or 60° with each other. The stamps are sometimes arranged in a circle about a central vertical shaft carrying a single lifting cam which operates all. Its advantages are compactness, low cost with high efficiency, and light driving-power.

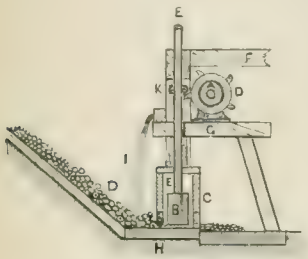


FIG. 1. Stamp-mill.

A modification of the steam-hammer, resembling somewhat that used in forging iron, is sometimes used as a steam-stamp. When properly designed it is very effective in breaking up bowlders and masses too small to be cheaply broken by the use of gunpowder, and too large and too hard to be crushed by ordinary stamps or other breaking apparatus. The stamp-heads, in the ordinary form, are often made to revolve, so as to change their positions with each blow. A battery of five stamps, running on quartz, crushes about 200 bush. in ten hours. The pestles, or stamp-heads, weigh 250 to 500 lb. They are mounted on white oak or hickory beams 6 inches square in section, and make 100 blows per minute, with a fall of 10 or 12 inches. As an average, two-horse power is required per head. *Cornish crushers*, or rolls, somewhat similar to those used in iron-works, are sometimes used for crushing ores and stones.

Where it is not essential that the material shall be completely powdered, or in the reduction to small pieces of masses already broken to moderate size, as in the breaking up of large pebbles in road-making, or in metallurgy in the preparation of coarse material for the more complete comminution effected by stamps or by mills, *stone-breakers* are used. These machines, by the exertion of immense crushing force, crumble the hardest known rocks, and ores broken by them are often better prepared for subsequent operations than are those treated by stamps. The fragments are given a more uniform size, have a cleaner fracture, and are freer from dust. In all varieties of stone-breakers the crushing force is exerted through an extremely small range, and intermittently.

Fig. 2 represents the Blake stone-crusher, an example of this variety of machinery, the drawing exhibiting a longitudinal section, such as would be obtained by removing one side of the main frame A A. The circle at D exhibits a section of the driving-shaft, with the eccentric which actuates the pitman or connecting-rod F, giving it a vertical motion, and, through it, working the toggle-joint C C. This elbow, or toggle-joint, acting against the movable jaw J on the one side and the fixed abutment, or frame of the machine, on the other, forces the former toward the fixed jaw H, crushing any material which may have been thrown into the intervening space from above. N is a wedge which by means of the screw attached can be raised or lowered to diminish or to increase the size of product. B represents the fly-wheel, and C the driving-pulley. The faces of the jaws are protected by removable plates, which sustain all of the wear produced by abrasion. A spring of rubber, L, withdraws the swinging jaw when it has made its forward movement, and the toggle releases it. The action of the machine is as follows: The material, being already broken to a size which admits of its being placed between the jaws, is thrown into the machine, and the movable jaw, swinging through a small arc at each revolution of the fly-wheel shaft, fractures the pieces, and they drop until caught in the narrower space below, and the next approach of the pendent jaw produces new fractures, and again it releases them. The pieces finally become sufficiently small to fall out through the opening at the bottom, which is adjusted by the wedge O to the proper width to suit the individual case. The momentum of the fly-wheel, which makes from 100 to 250 revolutions per minute, and the great leverage obtained by the use of the knee-joint, enable such a machine to exert a crushing force which is only limited by the strength of the frame. With argillaceous minerals water is used to insure free discharge.

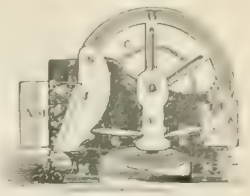


FIG. 2.—Blake stone-breaker.

Various forms of rock-breaking machines have been designed, all of which embody the principles illustrated by the machine just described as a typical example of the class. The work done varies from a half ton per hour, in the smallest machines reducing to coarse sand, up to 12 or 15 tons with the larger sizes doing less complete work. The power required varies from one-half to one and a half horse-power per ton of product per hour.

Fig. 3 represents an example of that class of machinery in which crushing is produced by percussive action—the Whelpley & Storer crusher. It consists of a cylinder or tub-shaped

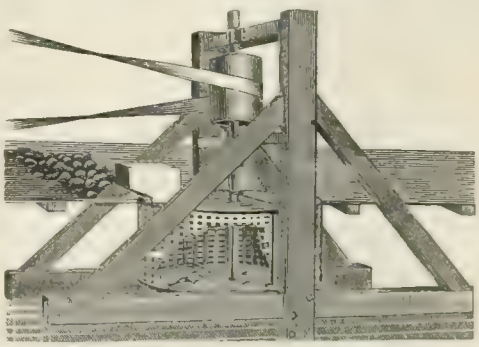


FIG. 3.—Whelpley & Storer crusher.

vessel 30 or 40 inches in diameter, made in sections of heavy iron plates, and perforated with holes of three-fourths of an inch in diameter, or larger, as may be determined by the nature of the material and the fineness of division desired. The top of the cylinder is of thick cast iron, and contains an opening through which the material to be broken falls from a hopper placed above. The bottom of the cylinder is detached, and revolves about a vertical shaft, which is supported by a step-bearing below. It extends upward through the top of the cylinder, and is driven by a belt running upon a pulley at the upper end. On this cylinder bottom or table are bolted several heavy blocks of iron faced with steel. The cylinder just described is surrounded by an inclosure which receives and retains the crushed material thrown out

by the machine. When in operation the table carrying the blocks or "hammers," and forming the bottom of the cylinder, is set in motion, revolving at the rate of from 1,000 to 1,500 turns per minute. The material to be crushed is fed into the hopper, and, falling into the cylinders, meets the whirling hammers, and is at once broken up by collision with their edges and faces and by mutual impact, and is then thrown out, through the perforations in the sides of the cylinder, into the surrounding chamber. The size of the pieces is determined by the diameter of the holes in the cylinder. The larger proportion usually are of about two-thirds the diameter of these holes. The hammers and their steel faces are so attached that they may be readily removed when the former are broken or when the latter become worn out, and new ones may be put in their places. From 5 to 10 tons of material are crushed per hour by these machines in average work, when the entering pieces average between 4 and 5 inches in diameter. The power required to drive these machines is stated to average one and a half horse-power for each ton of broken material.

Materials requiring to be more thoroughly comminuted, or to be reduced to the state of fine powder or of flour, are usually ground in mills such as are hereafter to be described. Fibrous substances and organic materials generally are not readily crushed by the machinery above sketched. For simply crushing sugar-cane and similar substances, where the cellular or porous mass is to be compressed and broken to expel the contained liquid, a set of rolls such as are shown in Fig. 4 is used. These rolls are of cast iron, and

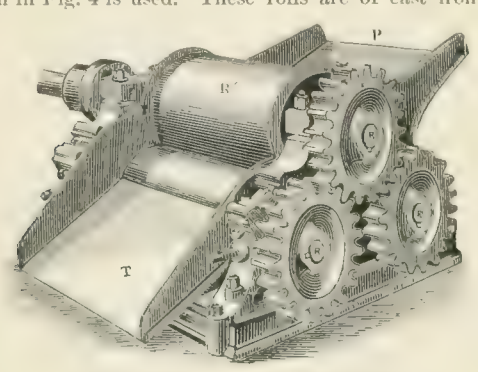


Fig. 4.—Rolls for crushing sugar-cane.

are from 1½ to 3 feet in diameter, arranged as shown in the sketch, one being placed above and between the two others. The cane is fed between the rolls R R^1 from an apron, P. Passing under the rolls, it is guided by a plate arranged for that purpose, between R and R^2, and then, the juice being thoroughly expressed, the crushed cane (or bagasse, as it is called) falls clear, led by the tail-trough T. The effect of the action of the first pair of rolls R R^1 is to crush the cane, and the succeeding heavy pressure exerted by R^1 and R^2 expresses the juice very completely. The juice falls into a trough below, which leads it to a reservoir conveniently situated to receive it. A good mill expresses from 70 to 75 per cent. of the juice of the cane. The larger the rolls, the slower their speed, and the heavier the pressure exerted by them, the more perfectly is the work done. A mill having rolls 40 inches in diameter and 6 feet long, making three revolutions per minute, requires a driving-power of 60 or 70 horses, and expresses 20 tons of cane-juice per day.

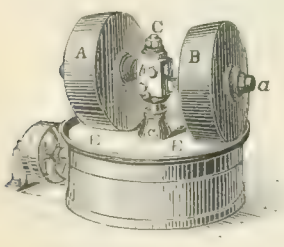


Fig. 5.—Vertical seed-mill.

Fig. 5 represents a form of mill which is also used principally for crushing organic materials, for expressing oil from seeds, and for similar work. It is also used in grinding chocolate, in mixing mortar, and in kneading clay for brick or porcelain manufacture. A and B are two millstones revolving on horizontal axes, *a b*, which are held in position by bearings fastened by bolts to the framework of the machine. The vertical shaft C revolves in bearings steadied by the framework above, and its weight, with that of its appurtenances, is carried by a step at its lower end. Keyed upon this shaft is a strong cast-iron disk, having a high flange around its edge. Fitted to this disk, and well bedded upon it, is a thick stone, E E, upon which the millstones A B rest. The vertical shaft C is driven by a bevel-wheel at its lower extremity, and carries with it the horizontal table E E. The material to be crushed is thrown upon the table, and as the latter revolves the former is carried under the millstones, which revolve by contact, and is crushed and ground by the weight of the stones and by the slight twisting action arising from the combination of the relative motion of the two sets of stones in the vertical and the horizontal plane. In a better form of this mill the bed or table is fixed, and the axle carrying the vertical stones is attached to the vertical spindle and revolves with it. Where the stones are small and their orbit is of large diameter, the action is almost purely that of crushing, but where, as is customary, the millstones are of large diameter and revolve in small orbits, the action combines grinding with crushing. The hydraulic press is often used as a substitute for this form of mill. In crushing and kneading soft materials, as paints or chocolate, the stones have a diameter of 24 or 30 inches, but when designed for breaking ore or for crushing seeds containing oil, they are given a diameter of 5 feet. They make from three to five or six revolutions per minute. The stones are made of some hard rock, as granite, gneiss, or trap, or occasionally of cast iron. Making five revolutions per minute, the heavier stones require about 5 horse-power to drive them over materials offering moderate resistance.

When a thorough pulverization of materials is desired mills of various kinds, in which the action is purely that of grinding, are generally used. An exception to the general rule exists in the pulverizer of Whelpley & Storer, shown in Fig. 6. This machine is only intended for the reduction to fine powder or to dust of such materials as sand, gravel, or

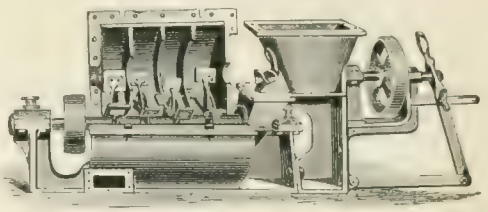


Fig. 6.—Whelpley & Storer pulverizer.

crushed ore. The material is fed regularly and automatically into the machine from the hopper above, and, entering the cylinder, encounters the swiftly revolving "paddles," and, becoming entangled among the accompanying and surrounding eddies and whirlwinds of air, the particles are, by mutual attrition and collision, ground into sometimes impalpable powder. The coarser particles thrown out are found to have rounded surfaces, instead of broken faces and sharp edges, as would be the case were they simply crushed. The velocity of the paddles is about 2 miles per minute. The dust is drawn out by a suction-fan or blower at the end of the cylinder opposite the feed apparatus. One of these machines, a foot in diameter, requires a power of three horses. Those of 2 feet, 2½, and 3½ feet diameter are rated at 9, 12, and 18 horse-power respectively. The weight of the product and its fineness are determined by the rate of feeding and the speed of the blowing-fan. It may be given any degree of pulverization, from that of fine sand to that of an impalpable powder.

For grinding coffee and spices, dry paints, soft ores, solid chemicals, and easily crushed substances in general, mills with grinding surfaces of cast iron are commonly used. In these mills the rubbing faces of the metal are usually corrugated or ribbed in a manner and to a degree which is determined by the nature of the work to be done. Fig. 7 exhibits a mill of this class, such as is designed specially for grinding soft ores and salt. The cone-shaped grinding portion, or stone, A A, is of chilled iron, and the surrounding casing, B B, is of the same material. The form given both surfaces is such that the actions of gravity and of centrifugal force combine to urge the ground material downward and into closer contact with those surfaces. The grinding cone is capable of adjustment vertically by means of the screwed bar, C, carried in the hollow portion of the vertical shaft D, and turned by means of the horizontal handle at the top. The connection between this bar and the cone is

made by means of a "cotter" passing through a slot cut in the shaft, which has the necessary length to permit the vertical motion. The bevel-gear, E, on the horizontal driving-shaft is not keyed in its place, but is secured by taper keys

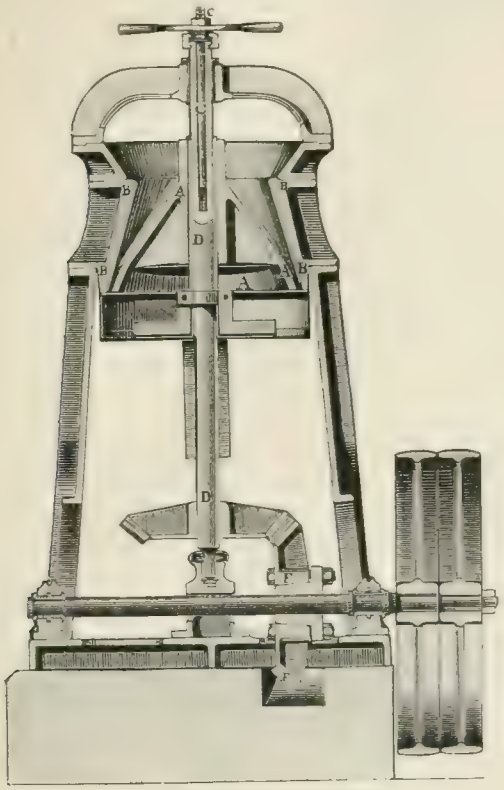


FIG. 7. Salt and spice mill.

which hold only by friction. Should too heavy a strain come upon the machine, it slips on the shaft, and thus prevents injury of the mill.

Another form of mill which has been extensively used in the U. S. is that of Bogardus. This is shown in section in Fig. 8, where *c c* is the lower plate driven by a vertical shaft revolving in the bearing *h*, and supported by the step *g*, and counterbalanced by the weighted lever *a b*, by means of which the required pressure is applied with steadiness and uniformity. The upper plate, similar in form to the lower, is capable of taking up a motion of revolution, also, about a center out of line with the axis of the lower plate, being screwed by bolts *a a* to the loose collar *f f*. A shoe, *l*, acting upon the collar, causes a vibration which shakes the material in the hopper, and sends it downward as rapidly as it can be ground. A screw, *e*, is so arranged as to prevent the weighted lever from forcing the grinding plates into actual contact when the supply of material to be ground has been nearly or quite exhausted. The counterbalance also acts as a safety attachment, allowing any foreign material too hard to be ground to separate the plates, and to leave the mill uninjured, should such subtance by any accident enter it. Fig. 8*a* herewith shows the form of the plates used and their relative position when in place. They should be made of carefully selected and strong chilled iron. Their centers being out of line with each other, their peculiar form gives them a relative motion which is admirably adapted to grinding. These mills are driven from 600 to 800 revolutions per minute. The weight of material ground varies greatly with its character and with the degree of fineness of the product. Two tons of black lead, 1 to 2 tons of dry bones, 3 to 4 tons of iron ore, 1½ tons of white lead in oil, half a ton of bark, 4 to 5 tons of oilcake, and twenty barrels of sugar per hour are said to represent the average work of a mill 16 inches in diameter. The power required is stated at from three-quarters to one and a quarter horse-power. The peculiar form of the plates and their eccentricity of position cause an unusual rapidity of discharge and freedom from liability to choke, thus permitting the grinding of adhesive substances which would obstruct ordinary mills. These peculiarities produce also a uniform action over all portions of the grinding surfaces, and consequent durability.

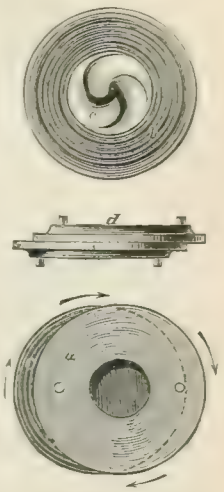


FIG. 8*a*.—Plates of Bogardus mill.

For grinding grain a standard mill is shown in Fig. 9. The grinding surfaces are the faces of two stones, one of which is secured to the frame A which supports the hopper E, and carries the bearing C of the driving-shaft. The other stone revolves, in close proximity to the first, upon the spindle J, which receives its motion from the driving-shaft. The stones are surrounded by a cylindrical casing, C C, which supports the hopper above. This casing is divided at the middle, in order that the upper portion may be removed to allow of the adjustment or repair of the top stone. The upper portion is made lighter than the lower, and frequently of thin sheet iron. The top is open to allow free access of air. The shaft F drives the spindle J by bevel gearing, as shown, or frequently the spindle is driven directly by means of belting. The upper stone is balanced upon the spindle, instead of being rigidly attached, in order that it may adjust itself freely to the slightly irregular distribution of grain between it and the lower stone. The spindle J rests upon a "step" of bronze or other alloy well adapted for machinery bearings. It is so fitted as to be capable of adjustment in all directions, and is supported by a lever, M, which is raised or depressed by the screw and nut N, thus determining the pressure upon the substance passing through the mill and the degree of fineness to which it is ground. The hopper E receives the grain, and, falling downward, it passes through the tube O, flows over the

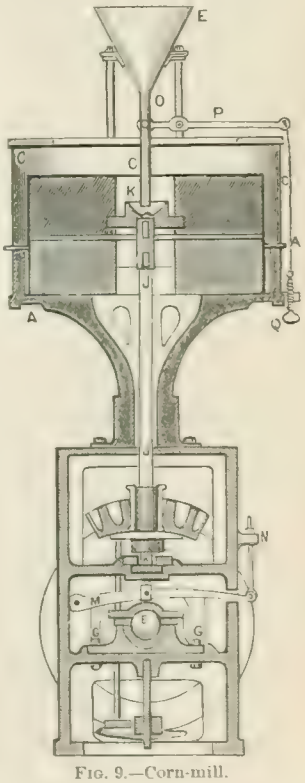


FIG. 9.—Corn-mill.

"rhind" K, the piece of metal by which the upper stone is supported upon the spindle and enters between the stones. The pipe O is supported by a lever, P, and its height above the rhind can be adjusted by the screw Q upon the side of the standard above N, that screw being connected with the end of the lever by a chain or cord. The pipe being lowered upon the rhind, the flow of grain is stopped; being raised, it allows the feeding to go on with greater and greater rapidity as it rises clear of K.

Many other forms of mill are in use, all, however, containing the essential details of the standard mill just described, and shown in Fig. 9. The framing and the hopper and feed-spouts were formerly, and are still frequently, made of wood. The feeding apparatus is often of different form, and the sizes of stones and speed of mill vary greatly. In some cases, as shown in Fig. 10, mills are constructed having the stones set with their axes horizontal, the special advantages being the convenience with which pressure may be adjusted, and the more rapid feed and delivery secured, which permits higher speed and reduces liability of choking. In other mills the spindle is vertical, as in Fig. 9, but the upper stone is stationary, and secured firmly in the casing, while the lower revolves. This gives somewhat more stability, and therefore increased speed and steadiness of motion. In both the latter forms the stones, being less liable to strike and dull each other than in the preceding style of mill, may be expected to wear longer. Their frames are light, yet strong; they occupy comparatively small space; their spindles are short; and the mill with horizontal spindles may be very conveniently driven from the line shafting. The journals of mills running at high speed should always be made long, to insure freedom from heating. The bearings of the mills with horizontal spindles are often made 8 or 10 inches long.

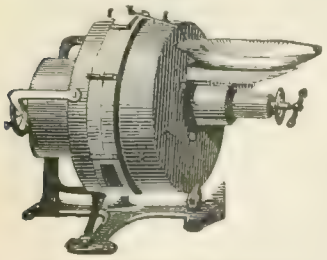


FIG. 10.—Forsman vertical mill

The stones of the mill Fig. 9 are frequently 4 or even 4½ feet in diameter, and a foot in thickness. They are built up, the lower half of the top stone being of pieces of French burr-stone, cut to fit well and cemented firmly together. The upper half is of plaster-of-Paris. The lower stone is of French burr also, the pieces firmly cemented and bedded upon the frame. In the other forms of mill the stones are usually smaller and are often made in a single piece. Where not of one piece they are strongly cemented and surrounded by a strong iron band to prevent liability of being ruptured by the centrifugal force due to their high velocity of revolution. The fixed stone has usually a perfectly flat grinding face; the moving stone is hollowed toward the center to allow the material ground to flow freely between the grinding surfaces, and in order that a more thorough comminution may be secured during its passage toward the circumference. The faces of both stones are cut, as shown in Fig. 11, with straight grooves, of wedge-formed section, and in directions inclined to the radii. The edges of the grooves are thus given a cutting action somewhat resembling that of scissor-blades, and also a tendency to force the grain outward toward the circumference is secured, and thus the feeding is accelerated and choking is avoided. These grooves are usually cut by hand. Machines have been designed to do this work, but none have been generally introduced. They usually consist of a revolving horizontal shaft carrying diamond cutters, and capable of being adjusted and fed automatically along the proper lines.

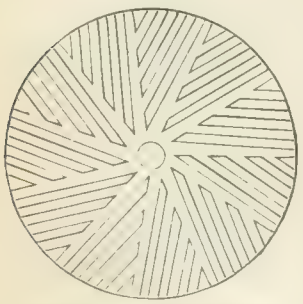


FIG. 11.—Form of mill-stone

The stone used in mills of the class just described are usually of French burr, a siliceous rock containing many small rough cavities, by which the grains are caught and retained until crushed. The stone is very hard, and wears very slowly. It therefore does not injure the flour or meal by mingling with it in fragments or powder. It is quarried of finest quality near La Ferté-sous-Jouarre, in the geological district known as the Paris basin, where it forms a bed of from 10 to 15 feet in thickness. Great difficulty is found in getting out stones of large size; for this reason the stones of large mills are generally built up of fragments. Quarries of very good stone of the quality desired for millstones are worked near Andernach on the Rhine. This is supposed to be a kind of lava from a neighboring and now extinct volcano. In the U. S. there are several deposits of stone suitable for use in mills, but they are usually inferior to imported stones. A quarry of stone nearly if not quite equal to the French stone has been worked many years in the valley of the Savannah river, about 100 miles above Savannah.

Mills, such as are illustrated in Fig. 9, with stones 4 feet in diameter, driven at the rate of 200 revolutions per minute, grind from 7 to 10 bush. per hour, the quantity varying with the degree of fineness. The power required is usually not far from one horse-power per hour for each bushel ground. In later styles, with smaller stones running at higher speed, the yield is greater and the power is less. With 20-inch stones, making 700 revolutions per minute, the power required varies from five to eight, and the product is from 6 to 12 bush. per hour. A stone 2½ feet in diameter, making 500 revolutions, grinds from 15 to 20 bush. an hour with an expenditure of from 10 to 20 horse-power, the meal produced being in the first case very coarse, and in the latter very fine. Roller-mills are the most successful and their new-process flour is in extensive use. See FLOUR.

R. H. THURSTON.

Grindstone: a thick circular disk of stone, usually sandstone, used for bringing dull cutting instruments of steel to an edge, the blade being applied to the edge of the stone, which revolves around a central axis. The best grindstones used in the U. S. are obtained in Berea, O., and on Grindstone island, Nova Scotia. Various forms and materials are also used in making grindstones for cutting glass, gems, etc.

Grindstone Island: a small island near the head of the Bay of Fundy, in Albert County, N. B.; has a lighthouse and grindstone-quarries, the products of which are sent to the U. S.—Another GRINDSTONE ISLAND is one of the Magdalen group, in the Gulf of St. Lawrence.

Gringoire, or **Gringore**, PIERRE: poet; b. at Caen, France, about 1475. Of his life little is known except what can be gathered from his writings. He went to Paris about 1502 and joined the Enfants sans Souci, one of the foremost literary and dramatic brotherhoods of the time, in which he was promoted to the highest dignity. For this society he wrote farces, *soties*, and satires, which achieved a wide but short-lived popularity. D. about 1547. Though he lived after the Renaissance had brought a new spirit into European literature, he belongs rather to the old school of writers than the new, and his writings have the artificial and allegorical character of the works of the later *trouvères*. Chief among his earlier works is *Le Château de Labour*, while of his later works may be mentioned *Les folles Entreprises*, *Les Abus du Monde*, *La Chasse de Cerf des Cerfs*, *Jeu du Prince des Sots et de Mère Sotte*, *L'Homme obstiné*, *Le Monde*, and *Le Nouveau Monde*. Besides these were many moralities, mysteries, and satires, attacking the Church and society in general. Late in life he became a champion of orthodoxy, and wrote the *Blason des Hérétiques*. To this period also belongs the *Mystère de la Vie de Saint-Louis*. His works were published in Paris by Héricault and Montaigeon (1858–75, 4 vols.).

Grinnell: city (founded by Josiah Bushnell Grinnell in 1854); Poweshiek co., Ia. (for location of county, see map of Iowa, ref. 5–I); on the Iowa Cent. and the Chi., R. I. and Pac. Railways; 55 miles E. by N. of Des Moines. As originally laid out, its site comprised 6,000 acres of rich prairie land. The tract was deeded to trustees for the founding of an educational institution, which was first known as Grinnell University, and afterward was consolidated with IOWA COLLEGE (*q. v.*). The city has important branch railway connections, is the center of an agricultural and wool-growing region, and has manufactures of flour, gloves, carriages and wagons, worked lumber, and foundry and machine-shop products. Pop. (1880) 2,415; (1890) 3,332; (1895) 3,232.

EDITOR OF "HERALD."

Grinnell Land: a tract of land in the Arctic Ocean; the northernmost land on the globe hitherto discovered; first seen in 1850, and mapped in 1854 by Dr. Hayes of Kane's expedition. It was named after Henry Grinnell, who fitted out the Arctic expeditions of 1850 and 1854. The station, Camp Conger, occupied by the Lady Franklin Bay expedition, was on Grinnell Land. It is found to extend slightly N. of 83° N. lat., and has on the N. that part of the Arctic Ocean called Lincoln Sea, which when visited was covered with palæocrystic ice.

Grippe: See INFLUENZA.

Griqualand, gree'kwa-länd': two interior districts of South Africa, denominated **East** and **West** respectively. Griqualand East lies between lats. 30° and 32° S. and lons. 28° and 30° E., with Basutoland and Natal on the N. and Kaffraria and Pondoland on the S. Area, 7,594 sq. miles. Pop. 152,618, of whom 4,150 are Europeans. It is a dependency of Cape Colony. Griqualand West is incorporated into Cape Colony. It lies between lats. 27° and 29° S. and lons. 22° and 25° E., N. of the Orange river and W. of Orange Free State. Area, 15,197 sq. miles. Pop. 83,375, of whom 29,670 are Europeans. M. W. HARRINGTON.

Gri'quas: called BASTAARDS by the Boers; a mixed race in South Africa, the offspring of Hottentot and Bushwomen by the Boers, or colonists of Dutch descent. Many of them are well-to-do breeders of cattle, and have adopted the habits and religion of Europeans. They inhabit the districts known as Griqualand East and Griqualand West.

Griscom, JOHN, LL. D.: chemist and educator; b. at Hancock's Bridge, N. J., Sept. 27, 1774; was for thirteen years principal of the Friends' Monthly Meeting School in Burlington, N. J., after which he removed to New York city, and was for more than a quarter of a century an eminent teacher there. With others he organized Rutgers Medical College, in which he was Professor of Chemistry and Natural Philosophy; one of the first to introduce lectures on scientific subjects. He was chiefly instrumental in organizing the Society for the Prevention of Pauperism, and was prominent in many philanthropic movements. D. at Burlington, N. J., Feb. 26, 1852. C. H. THURBER.

Grisebach, gree'se-bäk, AUGUST HEINRICH RUDOLPH: botanist; b. at Hanover, Germany, in 1814; studied medicine and botany at Göttingen and Berlin; was sent by the Hanoverian Government in 1839 to study the flora of Turkey; traveled through Thrace, Macedonia, Albania, and Bithynia, and in 1841 was appointed Professor of Botany at Göttingen and director of the botanical garden. He published *Reise nach Rumelien und Brussa* (2 vols., 1841); *Spicilegium floræ Rumelicæ* (2 vols., 1843–45); *Flora of British West India Islands* (1864); *Die Vegetation der Erde* (1872). D. May 9, 1879. Revised by CHARLES E. BESSEY.

Grisi, gree'zĕe, GIULIA: singer; daughter of a French topographical officer; b. at Milan, May 22, 1812. She studied at Milan and Bologna, where at the age of sixteen she made her first public appearance in Rossini's *Zelmira*, and captivated the audience by the charm of her voice, manner, and person. Subsequently she achieved triumphs at Florence, Pisa, and Milan. At the Scala she first appeared as Norma. Her efforts to overcome defects of training were so successful that she ranked with Pasta and Malibran. For her the opera *Puritani* was written. In 1836 Grisi married a Frenchman, Gérard de Melcy, but the union was unhappy and was legally dissolved. She afterward married Signor Mario, the tenor. In Aug., 1854, they visited the U. S. together, and sang in the principal cities. In later years her residence was in England. She appeared at Covent Garden theater as late as 1864. Before that time her popularity in Italy and France had been on the wane. D. in Berlin, Nov. 29, 1869.

Grisons, gree'zōn' [Fr., the Germ. name being *Graubünden*]: the easternmost and largest, but at the same time the most thinly peopled, canton of Switzerland; bounded E. by Tyrol, S. by Lombardy, W. and N. by the cantons of Uri, Glarus, and St. Gall. Area, 2,773 sq. miles. The whole canton consists of a system of high and wild mountains, containing 240 glaciers, from which rise the Rhine, Inn, Ticino, and Adda; these rivers form valleys, and thereby give the country its geographical physiognomy. The southern valleys are fertile; wheat, vines, and figs are grown. But the highlands yield only pasturage, and dairying and cattle-rearing are the main sources of wealth. The name Grisons (Graubünden), "the gray league," is derived from the plain gray garment worn by the Swiss farmers who in the beginning of the fifteenth century formed a league and broke the yoke under which the nobility held them. Pop. (1894) 95,469, of whom one-third speak German, and the rest peculiar Romanic dialects. The principal town is Chur (Ital. *Coira*; Fr. *Coire*), with 9,000 inhabitants.

Griswold, ALEXANDER VIETS, D. D.: bishop; b. at Simsbury, Conn., Apr. 22, 1766; ordained priest 1795; rector of St. Michael's church at Bristol, R. I., 1804–30; of St. Peter's, Salem, Mass., 1830–35. The eastern diocese of the Protestant Episcopal Church was organized in 1810, and in May, 1811, Dr. Griswold was ordained its first bishop. He published *The Reformation and the Apostolic Office* (Boston, 1843), sermons, etc. D. at Boston, Mass., Feb. 15, 1843. See *Memoirs* by John S. Stone, Philadelphia, 1844.

Griswold, MATTHEW, LL. D.: Governor of Connecticut: b. at Lyme, Conn., Mar. 25, 1714; held the office of Lieutenant-Governor of Connecticut for several years; Governor 1784–85; also judge of the Supreme Court; president of the convention which ratified the Federal Constitution 1788. D. at Lyme, Conn., Apr. 28, 1799.

Griswold, ROGER: Governor of Connecticut; b. at Lyme, Conn., May 21, 1762; graduated at Yale College in 1780 and was admitted to the bar in 1783. He was member of Congress from 1795 to 1805; appointed judge of the Supreme Court of Connecticut in 1807, and was Lieutenant-Governor 1809–11; Governor 1811–13; was regarded as a man of great talents and legal ability. D. at Norwich, Conn., Oct. 25, 1812.

Griswold, RUFUS WILMOT, D. D.: editor; b. at Benson, Vt., Feb. 15, 1815; spent much of his early life in travel at home and abroad; became a printer, then a Baptist preacher, and afterward a journalist. In 1841 he brought out an anonymous volume of poems and a volume of sermons. He became the chief editor of *Graham's Magazine*, Philadelphia, in 1842–43, and of *The International Magazine* of New York in 1850–52. He was author of *Poets and Poetry of America* (Philadelphia, 1842); *Prose-writers of America* (1846); *Washington and the Generals of the Revolution* (2 vols., 1847); *Curiosities of American Literature* (1847); *The Republican Court* (New York, 1854), and other works, and published the first edition of Milton's prose works in America (New York, 2 vols., 1847). He was also engaged as one of the editors of the works of Edgar A. Poe (New York, 3 vols., 1850). D. in New York city, Aug. 27, 1857.
Revised by HENRY A. BEERS.

Griswoldville: town; on railway; Jones co., Ga. (for location of county, see map of Georgia, ref. 4–H); 12 miles E. by N. of Macon; noted before the war for its extensive cotton-gin manufactory, and during the civil war for a pistol-factory. Here was fought on Nov. 22, 1864, a bloody battle between a portion of Gen. William T. Sherman's command, under Gen. Charles R. Woods, and a number of the Georgia reserves, under Gen. G. W. Smith, in which the latter lost between 500 and 600 in killed, wounded, and missing, while the Union losses were 84, Gen. Walcott being among the wounded. Pop. not in 1890 census.
Revised by JAMES MERCUR.

Groats: See FLOUR.

Gröber, GUSTAV: Romance philologist; b. in Leipzig, May 4, 1844. In 1869 he became privat docent in Zurich; in 1874 Professor of Romance Philology in Breslau; in 1882 professor in Strassburg. He is one of the most eminent living representatives of the new science virtually founded by DIEZ (*q. v.*). He is the founder and editor of the important *Zeitschrift für romanische Philologie* (1876, *seq.*). He is also the editor-in-chief of the work entitled Gröber's *Grundriss der romanischen Philologie* (Strassburg, 1888, *seq.*). To these and other works he has contributed many valuable linguistic and other studies. A. R. MARSH.

Grocyn, WILLIAM: philologist; b. at Bristol, England, 1442; educated at Oxford; became prebendary of Lincoln 1486, and about 1489 traveled abroad with the object of perfecting his knowledge of the Greek language, then but little studied in England. After a considerable time spent in Rome in the study of the language under eminent teachers, he returned to Oxford, where he was appointed the first professor of Greek. Grocyn was a friend of Erasmus, whom he entertained at his house in Oxford. D. in 1519.

Gro'dek: town of Austria-Hungary; in Galicia; 20 miles S. S. W. of Lemberg (see map of Austria-Hungary, ref. 3–K). The inhabitants are mostly engaged in the cultivation of flax. Pop. (1890) 10,717.

Grod'no: government of European Russia; bounded S. and W. by Volhynia and Poland, and N. and E. by the governments of Wilna and Minsk. Area, 14,931 sq. miles. The ground is low and level; in the northern part, in the basin of the Niemen, of a light, sandy soil, covered with immense forests of pine and beech; in the southern part, in the basin of the Dnieper, of a swampy and marshy character. Rye, flax, hemp, and timber are exported in great quantities; cattle and bees are reared; wolves, bears, elks, and roebucks abound in the forests. Pop. (1889) 1,354,425.

Grodno: town of Russia; capital of the government of Grodno; on the right bank of the Niemen; 148 miles by rail N. E. of Warsaw (see map of Russia, ref. 7–B). Many of the palaces formerly belonging to Lithuanian noblemen are now decaying, though one built by Augustus III. is still in good repair, and is a magnificent structure. Grodno has a military hospital, a medical academy, a cadets' school, two gymnasia, extensive manufactures of weapons, silk, and cloth, and a lively trade. Pop. (1889) 39,826.

Grolier de Servier, Jean, Vicomte d'Aguisy: art collector and bibliophile; b. at Lyons, France, 1479; acquired influence at the court of Francis I., and after holding several important commands, represented France as ambassador at Rome, where he became closely associated with savants and literary men of distinction, and made a remarkable collection of the best works of all kinds published at that time. Many volumes were printed expressly for him and bound in most luxurious styles, with the frontispieces and initials painted in gold and colors, each volume bearing the device *Portio mea, domine, sit in terra viventium*, on one side, and *Io. Grolierii et amicorum* on the other. He also made a valuable collection of medals. D. in Paris, 1565. In 1675 the volumes were sold and scattered, but the collection of medals was kept intact and purchased by Louis XIV. Grolier's volumes are much sought after by book collectors, and command very high prices.

Groningen, grōn'ing-en: northernmost province of the Netherlands; area, 790 sq. miles. It is flat and protected against the inundations of the sea by dikes. It is fertile and well cultivated. Its southeastern part is marshy, but affords good pasturage. Grass-culture, dairying, fishing, and ship-building are the main pursuits of the population. The people belong to the Frisian race and to the Reformed Church. Pop. (1890) 275,356.

Groningen: town of the Netherlands, the capital of the province of Groningen; on the Hunse, which here forms a good port, accessible for large vessels, and communicating by canals with the Dollart and the Zuyder Zee (see map of Holland and Belgium, ref. 2–I). Groningen has a university founded in 1614, a public library, a botanic garden, a hospital, and an institution for deaf and dumb. Boat-building is carried on, and there are manufactures of linen and woolen goods, tobacco and cigars, brushes and tiles. Pop. (1890) 56,413.

Grono'vius (*Gronov*): the name of a distinguished Dutch family of scholars. The eldest and most famous is Johann Friedrich, classical scholar and critic; b. in Hamburg, Sept. 8, 1611; educated in Jena, Leipzig, Altdorf, Leyden, and Groningen. Professor of History and Eloquence at Deventer in 1642; Professor of Greek and History in Leyden in 1659. D. Dec. 28, 1671. Prolific editor of Latin classics, *Livy*, his masterpiece (1645), the two *Senecas* (1649), *Gellius* (1651), also *Statius's Silvæ* (1653), *Tacitus* (1672), the two *Plinys*, *Sallust*, *Martial*, *Plautus*, and author of many archæological treatises. Cf. Urlichs in J. Müller's *Handbuch d. class. Alterth.*, i., p. 70.—Jakob, his son, b. Oct. 20, 1645, at Deventer. Studied in England; attached to the Dutch embassy at Madrid in 1672; Professor of Belles-Lettres at Pisa, and in 1679 in Leyden. Editor of Greek and Latin writers, such as *Stephanus Byzantius*, *Harpocration Lex.*, *Pomponius Mela*, *Arrian*, *Herodotus*, *Ammianus Marcellinus*, *Curtius*, *Phædrus*, and others. Chiefly remembered as the editor of the monumental *Thesaurus Antiquitatum Græcarum* (13 fol. vols., 1697–1702). D. at Leyden, Oct. 21, 1716.
Alfred Gudeman.

Gros, grō, Antoine Jean, Baron; historical and portrait painter; b. in Paris, Mar. 16, 1771. Pupil of David; Legion of Honor 1828; created baron 1824; member of the Institute 1816. He painted several large pictures depicting the campaigns of Napoleon, ceilings in the Louvre and the dome of St. Geneviève, and numerous portraits. One of the best of these is the portrait of *General Count Fournier-Sarlovèze*, in the Versailles Museum. Other works are in the Louvre; his style was stilted and pompous, but is not without serious qualities of color and drawing. D. in Paris, June 27, 1835. William A. Coffin.

Grosbeak, grōs'bēk [*gross*, large + *beak*, after type of Fr. *grosbec*, grosbeak; *gros*, large, coarse + *bec*, beak]: a popular name of several birds, principally belonging to the family *Fringillidæ*. The U. S. have the evening grosbeak (*Hesperiphona vespertina*), the pine grosbeak (*Pinicola enucleator*), the rose-breasted grosbeak (*Habia ludoviciana*), the blue grosbeak (*Guiraca cærulea*), and others. The cardinal grosbeak (*Cardinalis virginianus*) is the Virginia redbird, a fine songster, often seen in cages. The social grosbeak (*Philetærus socius*) of South Africa is one of the weaver-birds (*Ploceidæ*), which builds a huge roof in some large tree, beneath which sometimes as many as 300 pairs of birds are lodged.

Grose, Francis: antiquary; b. at Greenford, Middlesex, England, 1731; resigned his office of Richmond herald 1763; was a paymaster of militia whose convivial habits are immortalized by Burns, who was for a time his associate. Grose published several freely illustrated antiquarian works, which are not of high value, but his *Classical Dictionary of the Vulgar Tongue* (1785) and his *Provincial Glossary* (1787) are of some merit. D. in Dublin, May 6, 1791.

Gross Aspern: See Aspern.

Gross, Samuel D., M. D., LL. D., D. C. L.: surgeon; b. in Pennsylvania, July 8, 1805; graduated in the Jefferson Medical College, Philadelphia, 1828; in 1835 was elected Professor of Pathological Anatomy in the medical department of the Cincinnati College, Ohio, and in 1840 to the professorship of surgery in the University of Louisville, Ky. In 1850 he was selected to become Dr. Mott's successor in the University of New York, and in 1856 he succeeded Dr. Mütter in his *alma mater*. Author of *System of Surgery*, a cyclopædia of this department of medicine. D. May 6, 1884.

Grosse Isle: an island in the river St. Lawrence, 29 miles below Quebec; is 2½ miles long and a mile wide. It is the property of the province, and is used as a quarantine-ground.

Grossenhain, grōs'en-hīn: town of Germany; in the kingdom of Saxony; on the Röder; 21 miles by rail N. N. W. of Dresden (see map of German Empire, ref. 5–G); has large manufactures of cloth, hosiery, machinery, and cigars. It was a strongly fortified place in the Middle Ages. Pop. (1890) 11,938.

Grosseteste, grōs'test [Anglo-Fr. *grosse*, fem. of *gros*, great + *teste*, head]: Robert, Bishop of Lincoln (probably named *Grosseteste*, great head, from his learning and ability); b. at Stradbrook, Suffolk, about 1175; studied law, physics, and divinity at Oxford and Paris; was made Archdeacon of Wilts in 1214; received other preferments, and in 1214 received the doctorate of theology and became *rector scholarum* at Oxford; defended (1232) the Jews against the king and people; became Bishop of Lincoln 1235; reformed his large diocese with vigor; opposed successfully alike the intrusions of king, nobles, and the pope in local ecclesiastical affairs; was involved in a long controversy with Innocent IV., who strove to fill the richest places in all the Church with Italians and Provençals; was one of the most learned and popular preachers of his day, a voluminous author, and a successful instructor, Roger Bacon being among his pupils. In 1253 he flatly refused to appoint the nephew of Pope Innocent IV., a young Italian, to a Lincoln canonry, but his clergy stood by him, and he kept on as if nothing had happened. This independence has given him his fame. D. at Buckden, Oct. 9, 1253. He is one of the central figures in the history of the thirteenth century. See his *Life* by G. G. Perry (London, 1871) and by J. Felten (Freiburg im Breisgau, 1887), and his letters, ed. by R. Luard, in the Rolls Series (1862). Revised by Samuel Macauley Jackson.

Grosse'to: province of Tuscany, Italy, on the Mediterranean. Area, 1,710 sq. miles. Barren mountains and unhealthful and unproductive marshes occupy much of its surface. Capital, Grosseto. Pop. (1890) 120,836.

Gross-Glogau: See Glogau.

Grossi, grōs'sē, Tommaso: poet; b. at Belluno, on the Lake of Como, Jan. 20, 1791; passed his whole life as a notary in Milan. He began his literary career by a poem in the Milanese dialect, *La Principe*, which nearly cost him

his life. In 1816 followed two short poems in the same dialect, *La Fuggitiva* and *La Pioggia d'Oro*, the first of which is a model of pathetic poetry. His *Ildegonda*, a romance in verse (1820), made that species of writing fashionable in Italy, and its success led Grossi to try to restore the epic, neglected since the time of Tasso, by his poem, *I Lombardi alla Prima Crociata*. But this poem, printed in 1826 by a generous subscription, did not equal public expectation, and was soon forgotten. In 1834 Grossi published his *Marco Visconti*, which soon became very popular, and three years later his *Ulrico e Lida*. D. at Milan, Oct. 10, 1853.

Gross Kaniza: See KANIZA.

Grossulite: See GARNET.

Grosswardein, grōs-vaar'dīn: town of Upper Hungary; on the Körös; 130 miles E. by S. by rail from Budapest (see map of Austria-Hungary, ref. 6–J). It consists of the town proper, which was formerly a fortress, and eight suburbs. Its cathedral is a magnificent building. It manufactures oil, vinegar, spirits, tiles, watches, pottery, and wine; has a considerable trade in cattle, and has two Roman Catholic bishops—one of the Latin and one of the Roumanian rite. Pop. (1890) 38,219.

Gros Ventres: See SIOUAN INDIANS.

Grote, GEORGE, D. C. L., F. R. S.: historian; b. at Clayhill, Kent, Nov. 17, 1794, of German ancestry; studied at the Charterhouse, and in 1809 entered his father's banking-house as a clerk; became a liberal political writer, and sat in Parliament for London 1832–41, and was distinguished by efforts in favor of the use of the ballot in elections. In 1823 he began to devote much attention to Greek history, and the fruit of his labors was his famous *History of Greece* (12 vols., 1846–56; 6th ed. 10 vols., 1888). His democratic standpoint made him peculiarly fit for a sympathetic interpretation of Athenian history and culture, but the great archæological and epigraphic discoveries made since his day have greatly diminished the scientific value of this work. His other principal works are *Plato and the other Companions of Socrates* (3 vols., 1865; 5th ed. 1888); *Aristotle* (unfinished, 2 vols., 1872; 2d ed. 1879); *Minor Works*, containing essays and reviews (1873). In 1860 he became vice-chancellor of the London University, and in 1869 president of University College. D. in London, June 18, 1871; was buried in Westminster Abbey. See *Character and Writings of G. Grote*, by Alex. Bain, prefixed to *Minor Works*, and *Memoirs*, by Mrs. Grote (London, 1873).

Revised by ALFRED GUDEMAN.

Grotefend, grō-te-fent', GEORG FRIEDRICH: philologist and archæologist; b. at Münden in Hanover, Germany, June 9, 1775; educated partly at Hanover and Ilfeld, and a student at the University of Göttingen 1795–97. Grotefend was for nearly thirty years director of the lyceum at Hanover, 1821–49. Much of his professional work was in the field of Latin philology; but his chief claim to fame rests upon his discovery of the key for deciphering the ancient Persian inscriptions of Persepolis. (See IRANIAN LANGUAGES and CUNEIFORM INSCRIPTIONS.) The results of his investigations he presented before the Academy of Science at Göttingen Sept. 4, 1802, having succeeded in deciphering, with comparative accuracy, the cuneiform names of Darius, Xerxes, and Artaxerxes. This discovery formed the basis for further researches, and the inscriptions have since been completely deciphered, thanks to Grotefend's beginning. The interest which he felt also in his own mother-tongue was shown by his founding a society for the preservation of the German language. Among his publications are *Rudimenta linguæ Umbricæ* (1835–38); *Neue Beiträge zur Erläuterung der babylonischen Keilinschrift* (1840); *Zur Geographie und Geschichte von alt-Italien* (1840–42). See the biographical sketch by B. Delitsch-Haupt in *Beiträge zur Assyriologie*, vol. i. D. at Hanover, Dec. 15, 1853.

A. V. WILLIAMS JACKSON.

Grotius, HUGO (*de Groot*, de grōt): jurist and scholar; b. at Delft, Holland, Apr. 10, 1583. His father, a learned man, who was burgomaster, sent him to Leyden at the age of eleven, and after three years' residence at the university, under Joseph Scaliger and other eminent professors, he accompanied the ambassadors of the States-General into France. Here he received notice from the king, Henry of Navarre, on account of his precocious learning. Returning to Delft in 1599, he was in the same year admitted to the bar at The Hague, and soon gained distinction by works in various departments of learning, such as editions of the classics (*Lucan*, *Silius Italicus*), and by original compositions. In 1601 he was appointed historiographer of Holland; in 1607 he was made advocate-general of the fisc for Holland and Zealand; and in 1610 the office of pensionary (paid counselor) of Rotterdam was conferred upon him. By virtue of this office he had a seat in the States of Holland, and afterward in the States-General. In these years he gave several works to the world—in 1608 his *De mari libero*, in defense of the freedom of the seas against the pretensions of Portugal and England; in 1610 his treatise in Latin—the language in which nearly all his works were written—on the antiquity of the Batavian republic; and in 1612 he finished his annals and history of Belgian affairs, which, however, did not see the light until after his death. All the time from his first visit to France he had enjoyed the friendship of John of Barneveldt, the grand pensionary of Holland, the head of the states' rights party, and a favorer of Arminian opinions in theology. Grotius shared his opinions in theology and politics; and when, about the time of the meeting of the synod at Dort, the stadtholder Maurice, the head of the national party, with whom the Calvinists sided, caused the arrest of Barneveldt on unfounded charges of secretly plotting for the Spaniards, Grotius also was arrested and imprisoned. The result is well known. Barneveldt was put to death, Grotius was held in confinement, first at The Hague, then in the Castle of Lowenstein, near Gorkum, until Mar. 21, 1621, when he was conveyed, by a stratagem of his wife, in an empty book-chest, to Gorkum, whence he escaped to Antwerp, and from there found his way to Paris. In his imprisonment he was not idle. He translated the *Phœnissæ* of Euripides into Latin verse, wrote an introduction to the jurisprudence of Holland, and composed his important commentaries on the New Testament, together with the treatise on the truth of Christianity. In France he had a pension from the king of 3,600 florins. Here he published, in 1623, his treatise *De jure belli et pacis*, to which modern international law owes its first development. He visited Holland in 1631, but found his enemies still able and willing to make him trouble, and chose Hamburg for his residence in 1632, where he entered the service of Queen Christina of Sweden two years later. He was made a privy councilor and the queen's ambassador in France. His diplomatic life becoming uncomfortable to him, in 1645 he asked for a recall. The queen offered him honorable employment, but he was unwilling to engage longer in the service of courts. He took ship for Germany, encountered a violent storm on the Baltic, and reached Rostock spent with fatigue, to die Aug. 28, 1645.

Grotius was one of the most versatile scholars of his age. His editions of several of the classics, with his elegant translations into Latin verse (especially of the *Anthologia Planudea* and *Theocritus*), show that he possessed high poetic genius, and assure to him a high place among classical scholars. His notes on the New Testament, marked by their purely philological character, and removed from theological bias, would alone have given him a high reputation; his historical and legal writings were the occasional works of a great man; his treatise on the truth of Christianity was long a classic; his theological works prove him to have been a believer in the atoning death of Christ for the sins of men upon an explanation of the doctrine different from that commonly received at the time, and they remove him from the doctrines both of Pelagius and of Socinus. But he will be remembered longest as having first brought system into the law of nature in his preface to the *De jure belli*, and into the law of nations in the body of that work. His mild Christian humanity led him to attempt to bring better principles than those of his age into the intercourse of nations, especially into the laws of war, and his thorough knowledge of Roman law furnished the basis of the system. See *Life of Hugo Grotius*, by Butler (London, 1826), and the work of Hély, *Étude sur le Droit de la Guerre et de la Paix de Grotius* (1875). *De Jure Belli* was translated into English by Whewell in 1853.

Revised by ALFRED GUDEMAN.

Groton: village; Tompkins co., N. Y. (for location of county, see map of New York, ref. 5–F); 26 miles S. of Auburn, 40 miles S. of Owego; is situated on the Southern Central Railroad. It has a union graded school, several large machine-shops, and other manufactories, including an immense cooperage and extensive carriage-shops. Pop. (1880) 913; (1890) 1,280.

Grotta del Cane, grot'tă-del-kaa'nā [Ital., Cave of the Dog]: a small cave, 10 feet deep, 4 feet wide, and 7 feet high, in Southern Italy, between Naples and Pozzuoli, remarkable

for its exhalations of carbonic acid gas, in which a candle is instantaneously extinguished and small animals stifled. It received its name from the circumstance that small dogs are generally used to show the experiment. It is mentioned by Pliny, and apparently the exhalations were more powerful in his time than now.

Grottaglie, grot-taal'yā: town of Italy; in the province of Lecce, on the highroad between Taranto and Brindisi (see map of Italy, ref. 7-H). It has some cotton-factories, and in its vicinity is found a peculiar red clay eminently suited to the manufacture of earthenware. Pop. 8,880.

Grotte, grot'tā: town of Sicily; in the province of Girgenti; about 12 miles E. of the ancient Agrigentum and 11 miles N. E. of Girgenti (see map of Italy, ref. 10-E). It has a considerable sulphur-trade. Pop. 8,775.

Grouchy, groo-shee', Emmanuel, Marquis de: marshal and peer of France; b. at Paris, Oct. 23, 1766; entered the artillery in 1781. On the outbreak of the Revolution he was colonel of a regiment of dragoons, advanced to brigadier-general, and fought in 1794 in La Vendée, but was discharged, like all officers of the nobility. After the fall of Robespierre he was reinstated in his former place, and fought with distinction under Joubert and Moreau in Italy and on the Rhine in 1799 and 1800, but was treated somewhat coldly by Napoleon on account of his sympathy for Moreau. On Oct. 26, 1806, he defeated the Prussian cavalry at Zehdenik, and after that time he was much and successfully employed in the campaigns in Prussia, Spain, Austria, and Russia; on the retreat from Moscow he led the body-guard of the emperor, a legion consisting of officers only. On the restoration of the Bourbons in 1814 he was banished from France, and although he was allowed to return in 1815, he was treated with suspicion. He joined Napoleon immediately on his return from Elba, received command, fought successfully in Northern France, and was made a marshal of France. On the afternoon of June 17, 1815, Napoleon having defeated the Prussians at Ligny on the preceding day, he was ordered to pursue Blücher with an army of 34,000 men and 100 guns, and although, on the 18th, he heard the cannonade from Waterloo, and was entreated by his staff to march in that direction, he adhered to his orders and pushed forward toward Wavre. As Napoleon sent no orders to recall him, it seems utterly unjust to lay the burden of the defeat on him. After the battle he collected the scattered remnants of the army and led it back to France, but resigned his command when the negotiations began between the allies and the provisional government. The Bourbons banished him a second time, but, after residing for five years in the U. S., he was permitted to return to his estate near Caen. After the Revolution of 1830 his rank of marshal was acknowledged, and he was created a peer of France. D. at St.-Étienne, May 29, 1847. Besides a number of pamphlets, he published *Fragments historiques*, in vindication of his conduct in 1815, military and diplomatic.

Ground: the foundation or basis upon which anything rests. Ground is in the idea what cause is in reality. That which actually causes the movement of the wings of a windmill is theoretically the ground of the phenomenon. Thus *ground* and *sequence* express in one sphere exactly the same correlation as *cause* and *effect* in another. Ground and reason are so far identical as they belong to the same sphere, but a different field is ascribed to them. Reason is objective, and refers to a process; ground is subjective, and refers to the volition. Reason is scientific, ground is moral.

Ground Bass: a musical form belonging to an early period of modern music. It consists in a short theme or subject placed in the bass and constantly reiterated throughout the piece. Over this play varied figures and contrapuntal conceits. Both Bach and Händel made occasional use of this device. In modern times Brahms may be mentioned as giving a fine example in his *Variations on a Theme of Haydn* for full orchestra. Dudley Buck.

Ground-doves: a popular name for those species of pigeon which seldom fly, but walk or run, often quite rapidly, upon the ground. The ground-dove of the Southern U. S. (*Chamæpelia passerina*) is less than 7 inches long. The genus comprises the smallest pigeons known. The name is also applied to a kind of thrush—the spotted ground-thrush or ground-dove—found throughout the greater part of Australia and Van Diemen's Land, and greatly prized on account of the delicacy of its flesh. Unlike the generality of thrushes, it cares little for trees or bushes and seldom is known to perch on the branches, preferring the tops of low stone-covered hills or rude and rocky gullies. It seldom voluntarily raises itself in the air except to fly from one side of a gully to another.

Ground-finch: See Chewink.

Ground-gru, or **Ground-ice**: See Anchor-ice.

Ground-hog: See Woodchuck.

Ground-ivy: See Gill-over-the-ground.

Ground-nut, or **Peanut**: See Goober.

Ground-pines: See Club-mosses.

Ground-rent: See Rent.

Ground-squirrels: any one of various rodents intermediate in character between the true squirrels and the marmots. They are of the genera *Tamias*, *Spermophilus*, etc. See Chipmunk, Prairie-squirrel, and Sciuridæ.

Groundsel-tree [O. Eng. *grundeswelge*, ground-swallower, by analogy of *grund*, ground for *gundeswilge*, pus-swallower; *gund*, pus + *swelgan*, swallow]: a name given in the U. S. to *Baccharis halimifolia*, *angustifolia*, and *glomeruliflora*, handsome resinous shrubs of the order *Compositæ*. They grow chiefly near the seacoast.

Grouper [an adaptation of the Spanish-American name *garrupa*, probably from Port. *garupa*, crupper]: a name popularly applied in the Southern Atlantic and Gulf States to marine fishes of the genus *Epinephelus* or *Mycteroperca*. The species of the genus are numerous, they attain a large size, and are very important food-fishes. F. A. L.

Grouse [formed (by analogy of *mouse*, *mice*, etc.) as a sing. to earlier *grice*, grouse, from O. Fr. *griesche*, *poule griesche*, moorhen, liter., gray hen]: a name given to the game birds of the sub-family *Tetraoninæ*, a group of large gallinaceous birds inhabiting the northern hemisphere, and most numerous in North America. They have the head completely feathered except a bare strip above the eye, the tarsus partly or completely feathered, the feathers sometimes, as in the ptarmigan, extending to the toes. The tail consists of sixteen to twenty feathers, and the sides of the neck are frequently adorned with tufts of feathers. The most common and best-known European species are the black grouse (*Tetrao tetrix*) and the red grouse (*Lagopus scoticus*). The former is found all over Central and Southern Europe, and is remarkable for the form of its tail, four or five of the exterior feathers being laterally curved. The red grouse is confined to the British islands, and is the popular game bird. See Blackcock, Capercailzie, Partridge, Pinnated Grouse, and Ptarmigan.

Revised by F. A. Lucas.

Grove, Sir William Robert, Q. C., F. R. S.: b. at Swansea, July 11, 1811; was educated at Brasenose, Oxford, and at Lincoln's Inn, and was called to the bar in 1835; gave special attention to experimental physics, and invented valuable electrical appliances, among which was the powerful voltaic battery which bears his name; was Professor of Experimental Philosophy in the London Institution 1840–47. In his remarkable lecture *The Progress of Physical Science since the Opening of the London Institution* (1842), he first advanced the doctrine of the mutual convertibility of the various natural forces, heat, light, electricity, etc., all of them being nothing but modes of motion. This doctrine is further developed in his famous essay *On the Correlation of Physical Forces* (1846). He became Q. C. in 1853; a royal medalist in 1847; president of the British Association in 1866; a justice of the common pleas in 1871; knight bachelor in 1872; and was judge of the high court of justice 1875–87, when he was made member of the privy council. D. in London, England, Aug. 2, 1896.

Groveton, Battle of: See Bull Run, Second Battle of.

Grow, Galusha Aaron, LL. D.: U. S. party leader; b. at Ashford, Conn., Aug. 31, 1823; graduated at Amherst College in 1844; studied law, and was admitted to the bar in 1847; was member of Congress from Pennsylvania in 1851–53, 1855–57, and 1859–63; he was chairman of the committee on territories 1859–61; was Speaker of the House of Representatives in the Thirty-seventh Congress (1861–63); and was appointed delegate to Baltimore convention in 1864 and 1868; president of International and Great Northern Railroad of Texas 1875. Declined mission to Russia 1876. Elected Congressman-at-large 1894.

Growth or Development: gradual natural increase; the increase in size of organisms and the evolution and perfection of their various functions. (For the development of functions, see article on EMBRYOLOGY.) The word growth is also applied to the increase in size of inanimate objects, such as stones, crystals, and other inorganic bodies, but such enlargement is of an entirely different character from that which occurs in living things. In the former growth is due to the addition of particles to the outside, while in plants and animals it is dependent upon assimilation and deposition within through the agency of living protoplasm. Stones grow with extreme slowness, crystals with varying rapidity, according to the degree of concentration of the solution, the nature of the substance, and many other attendant conditions, sometimes with such rapidity as to be distinctly visible to the naked eye. In living things the rapidity and degree of growth are governed largely by the species, the amount and nature of the nutritive material available, and many other circumstances. In some of the lowest forms of life, such as certain bacteria, etc., growth and development to perfect mature organisms require but minutes or hours; in other organisms it is but a question of days; while in higher forms of life years or centuries are required. In man growth is more rapid proportionately during the earliest periods of his existence, and as a rule becomes less and less with succeeding years until it ceases. He attains his full growth at about thirty years, although development of certain of his faculties may continue for years after.

The following table of measurements, founded chiefly upon the figures of Quételet, is generally a fair index of the average height and weight of the two sexes from the time of birth until ninety years. The table is inaccurate chiefly in not showing that girls from about twelve to fourteen are heavier than boys at the same age.

AGE.	LENGTH (CENTIMETERS).		WEIGHT (KILOS.).	
	Male.	Female.	Male.	Female.
Birth	49·6	48·3	3·20	2·91
1	69·6	69·0	10·00	9·30
2	79·6	78·0	12·00	11·40
3	86·0	85·0	13·21	12·45
4	93·2	91·0	15·07	14·18
5	99·0	97·0	16·70	15·50
6	104·6	103·2	18·04	16·74
7	111·2	109·6	20·16	18·45
8	117·0	113·9	22·26	19·82
9	122·7	120·0	24·09	22·44
10	128·2	124·8	26·12	24·24
11	132·7	127·5	27·85	26·25
12	135·9	132·7	31·08	30·54
13	140·3	138·6	35·32	34·65
14	148·7	144·7	40·50	38·10
15	155·9	147·5	46·41	41·30
16	161·0	150·0	53·39	44·44
17	167·0	154·4	57·40	49·08
18	170·0	156·2	61·26	53·10
19	170·6	.....	63·32	.....
20	171·1	157·0	65·00	54·46
25	172·2	157·7	68·29	55·08
30	172·2	157·9	68·90	55·14
40	171·3	155·5	68·81	56·65
50	167·4	153·6	67·45	58·45
60	163·9	151·6	65·50	56·73
70	162·3	151·4	63·03	53·72
80	161·3	150·6	61·22	51·52
90	.....	.....	57·83	49·34

Immediately after birth, and for the first five to seven days, the body loses weight, but at the end of ten to twelve days the original weight has been regained. Growth is more rapid during the first year of life, the weight increasing about three to four times and the length more than during any subsequent year. Although full stature is acquired at about the thirtieth year, the body may continue to increase in weight. As a rule, after the fortieth year there is a slight annual decrease both in stature and weight. The diminution in stature is due chiefly to a shrinkage of the intervertebral disks. Some individuals grow heavier instead of lighter, especially so after the loss of the sexual functions. Girls and boys grow in about the same ratio up to about the eleventh year, then girls increase in weight more rapidly than boys, and from about twelve to fourteen are heavier; then boys increase in weight more rapidly, so that at fifteen or sixteen they are heavier than girls and continue so. For the definition of mental growth, see MIND.

EDWARD T. REICHERT.

Grub [deriv. of *grub*, dig]: the larva of a coleopterous insect. Larvæ of dipterous insects are called *maggots*; those of *Lepidoptera* are *caterpillars*. The distinction, however, is not always consistently carried through in popular parlance. Thus at certain seasons the gad-fly, which is a dipterous insect, will exceedingly annoy sheep by buzzing about their noses, making constant efforts to deposit eggs in their nostrils. The eggs thus deposited hatch into maggots, but the ailment they cause by hanging to the sinuses in the head is called "grubs in the head." Larvæ of the other orders of insects have no special popular names. See ENTOMOLOGY.

Gruber, groo'ber, JOHANN GOTTFRIED: author; b. at Naumburg, Prussian Saxony, Nov. 29, 1774: made from 1792 to 1797 extensive studies, though of a somewhat miscellaneous character, at the University of Leipzig. From 1803 to 1810 he resided in Weimar, where he became very intimate with Wieland, of whom he wrote a good biography (2 vols., 1815). In 1815 he was appointed Professor of Philosophy at the University of Halle, and in 1818 he began, together with Ersch, the publication of the great *Allgemeine Encyklopädie der Wissenschaften und Künste*, which he conducted alone for many years after the death of Ersch. D. Aug. 7, 1851.

Grub Street: a London street, described by Johnson as "originally the name of a street near Moorfields, much inhabited by writers of small histories, dictionaries, and temporary poems, whence any mean production is called *Grub Street*." It was originally tenanted by manufacturers of archery material. Marvell first used the name in its opprobrious meaning, as did Swift and Pope and other wits. Pope makes a severe assault in his *Dunciad* on the class who lived there, the most famous of whom are Goldsmith, Johnson, and Fox the martyrologist. During the Commonwealth it was a species of Alsatia, and was a safe refuge for the pursued. For more than a hundred years it was the residence of index-makers, copyists, translators, small writers, etc. A Grub Street author frequently lived a year on £15 or £20. The street is now known as Milton Street, the poet Milton having lived near it at one time.

Grün, ANASTASIUS: See AUERSPERG.

Grün'berg, grün'bärch [Germ., green mountain]: town of Prussia, in the province of Silesia; beautifully situated on an affluent of the Oder, 34 miles N. W. of Glogau by rail (see map of German Empire, ref. 4–H). It is famous for its wine, and has some manufactures of cloth and leather, woolen goods, twine, and machinery. Besides exporting large quantities of grapes, especially to Berlin, it annually produces about 700,000 gal. of wine of a kind somewhat similar to champagne and highly valued in Russia. Pop. (1890) 16,092.

Grundt'vig, NICOLAI FREDERIK SEVERIN: reformer; b. at Udby parsonage, in the island of Seeland, Denmark, Sept. 8, 1783; studied languages, history, and theology at the University of Copenhagen. In 1808 he attracted some attention by his book on the Scandinavian mythology (much enlarged in 1839; 3d ed. 1870), and still more in 1812 by a powerful picture in dramatic form of the contest between Christianity and heathenism in Denmark. His *World's Chronicle* (1812; new ed. 1837), was written from a positive Christian standpoint, considering all events as divine rewards or punishment. His first large religious work was *Kirkens Gjenmale* (1825), in which he attacked the rationalistic views then reigning in the Danish Church. The dispute was bitter, and brought Grundtvig under ecclesiastical ban from 1826 to 1831. His *True Christianity*, his *Sunday-book*, and many minor essays and papers are principally of practical tendency. He advocated the complete severance of Church and state. He possessed eminent gifts as an exhorter. He was pastor of the workhouse church of Vartou Hospital in Copenhagen from 1839 till his death there Sept. 2, 1872. He also deeply touched the hearts of his countrymen by his hymns and patriotic ballads. His party developed gradually into a school, and his school became an element of reform in Danish civilization. See his *Life* in German by J. Kaftan (Basel, 1878). See DANISH LITERATURE.

Revised by S. M. JACKSON.

Grundy, FELIX: jurist; b. in Berkeley co., Va., Sept. 11, 1777; was educated at the Bardstown Academy by Priestley; studied law and became famous in criminal cases; was chosen a member of the convention to revise the constitution in 1799; was elected to the Legislature in the same year; upon the resignation of Judge Todd was appointed

chief justice of Kentucky. Removed to Nashville, Tenn.; was in Congress 1811–15; U. S. Senator 1829–38. President Van Buren in 1838 selected him as Attorney-General of the U. S.; in 1840 he resigned his office, and was re-elected to the Senate. D. at Nashville, Tenn., Dec. 19, 1840.

Grüneisen, grün'ī-zĕn, Karl [in Germ., green iron]: theologian and writer; b. in Stuttgart, Germany, Jan. 17, 1802; studied theology at Tübingen and at Berlin, where he came under the special influence of Schleiermacher. After holding various ecclesiastical charges, he was appointed almoner to the royal court of Würtemberg. D. in Stuttgart, Mar. 1, 1878. Besides his theses for the degree (*De protestantismo artibus haud infesto*, Stuttgart, 1839), and several collections of sermons (1835, 1842, etc.), he published a volume of hymns (1823); several pamphlets relative to the projected union of the different churches in Germany (*Ueber Gesangbuchsreform*, 1839); and with Eduard Mauch, *Ulms Kunstleben im Mittelalter* (Ulm, 1840), etc.

Gruner, grün'er, or **Grüner**, Wilhelm Heinrich Ludwig: engraver and ornamentist; b. at Dresden, Germany, Feb. 24, 1801. After studying copperplate engraving under Krüger, he devoted several years to travel and study in Italy, France, and in Great Britain, where he finally settled, and where most of his important works were executed. He is best known by a number of sumptuous works on decorative art, among which may be mentioned *Specimens of Ornamental Art*, and monographs on the bas-reliefs of the façade of Orvieto, on the fresco decorations of the Renaissance in Italy, on the presses (*scaffale*) decorated by B. Luini in S. Maria delle Grazie, at Milan, and on his own decorations executed in Buckingham Palace. As a decorator he executed important work also in Osborne House and in the mausoleum of the Duchess of Kent. Besides serving a brief term as professor in the Dresden Academy, he made a few short visits to his native city, dying there Feb. 27, 1882.
A. D. F. Hamlin.

Gruppe, groo'pe, Otto Friedrich: philosopher, archæologist, and poet; b. at Dantzic, Prussia, Apr. 15, 1804; entered the University of Berlin in 1825. In 1830 he became a contributor to the *Allgemeine Preussische Staats-zitung*, and his *Antæus* (1831), containing an open attack on the philosophy of Hegel, attracted some attention. In 1844 he was appointed Extraordinary Professor of Philosophy at the University of Berlin. The most noteworthy of his poetical works are his tragedies, *Otto von Wittelsbach* (1860) and *Demetrius* (1861), the latter a completion of a fragment by Schiller. His archæological writings, among which *Ariadne, die tragische Kunst der Griechen* (1830) may be mentioned especially, are very numerous, but are not distinguished by decided originality. D. Jan. 7, 1876.

Gruter, grü'ter, Janus (*Gruytère*, grü'ĕe-tār'): classical scholar; b. in Antwerp, Dec. 3, 1560; studied in Cambridge (England) and Leyden; Professor of History in Wittenberg 1589, in Heidelberg 1592. On the siege of the city by Tilly (1622) he lost his private library, and the famous Palatine collection of books, of which he was keeper, was conveyed to Rome soon after. Gruter is best known for his *Inscriptiones antiquæ totius orbis Romani* (2 vols., 1603), which receives its chief value, however, from the famous indexes contributed to it by Joseph Scaliger. He also edited a number of classical authors, such as Seneca, Sallust, Tacitus, Ovid, Cicero, Plautus. His critical talent was not of the highest order, but his erudition was encyclopædic. D. Sept. 20, 1627. Alfred Gudeman.

Grütli, grüt'lĕe, or **Rüt'li**, rüt'lĕe: a small plateau on the western shore of the Lake of Lucerne, in the canton of Uri, Switzerland; renowned as the place where Stauffacher, Fürst, Melchthal, and thirty other confederates met on the night of Nov. 7, 1307, and started the insurrection against Austria which resulted in the independence of Switzerland.

Gruyère, grü'yār', or **Gruyères**: a small town in the canton of Freiburg, Switzerland (see map of Switzerland, ref. 6–C). The most famous cheese manufactured in Switzerland comes from the vicinity of Gruyêre and bears its name. See Cheese.

Grysbok, grīs'bok [from Dutch *grijsbok*: *grijs*, gray + bok, buck, antelope]: the *Calotragus melanotis*, a small reddish-gray antelope of the wooded mountains of South Africa. It is extremely active and timid, and its flesh is good.

Guacharo Bird, gwä-chaa'rō-bĕrd' [Amer. Span. *guácharo*, guacharo, liter., sickly, moaning, so called from its cry]: a bird (*Steatornis caripensis*) related to the goat-suckers, but, on account of important structural differences, placed in a separate family or even sub-order. It has a wide, stout, hooked bill, slender body, long wings and tail, and small feet. The plumage is reddish brown, deepest on the back, lighter below, marked with dark bars and heart-shaped white spots. It lives in the northern parts of South America and the Southern West Indies, inhabiting caves and coming out only in the night. The large but shallow nest is built of the excrement of the bird, which consists largely of the seeds and tough coverings of the fruit on which it feeds. The birds become excessively fat, and are caught in great numbers by the Indians, who try out their oil, which is sweet and limpid and used as food. The flesh is also eaten. F. A. Lucas.

Guachos: See Gauchos.

Guadalajara, gwä-dä-lä-chaa'rä, or **Guadalaxa'ra**: province of Spain; the northernmost part of New Castile; bounded on the N. by the provinces of Segovia, Soria, and Saragossa, on the E. by Saragossa and Teruel, on the S. by Cuenca, and on the W. by Madrid. It is mountainous, covered by the Guadarrama range and its offshoots, fertile, without trees, but rich in minerals. Much wheat is raised here. Area, 4,870 sq. miles. Capital, Guadalajara. Pop. (1887) 201,496.

Guadalajara, or **Guadalaxara**: town of Spain, the capital of the province of the same name; on the left bank of the Henares; 35 miles N. E. of Madrid by rail (see map of Spain, ref. 15–F). It is picturesquely situated, well built, contains the magnificent palace of the Dukes del Infantado, and a royal college of engineering, and has manufactures of flannel and serge. Pop. (1887) 11,235.

Guadalajara: capital and principal city of the state of Jalisco, Mexico; near the west side of the Rio de Santiago; 408 miles N. W. of Mexico city, and 5,052 feet above the sea (see map of Mexico, ref. 7–F). A branch of the Mexican Central Railroad runs through the place, and will be continued to San Blas. Except Mexico and Puebla, Guadalajara is the largest and finest city in the republic. The streets are wide and straight, and there are numerous public squares, ornamented with trees and fountains. The cathedral, founded in 1561, had the cupolas of both towers shaken down by the earthquake of May 31, 1818, but it has been partially restored, and is one of the finest buildings in Mexico. The government palace, bishop's palace, and mint are all large and handsome structures. The city possesses a university and an academy of fine arts, both in flourishing condition. It is the center of the Mexican cotton and woolen trade, and has several large mills, besides manufactories of a peculiar glazed pottery, saddlery, confectionery, etc. The surrounding region is fertile, and there is an extensive local trade. The climate is dry, temperate, and healthful, though liable to sudden changes; average temperature, 71·7° F. Guadalajara was founded in 1542, and was early an important place. To a great extent it has retained its ancient appearance and customs. Pop. (1889) 105,000. Herbert H. Smith.

Guadalaviar, gwä-dä-lä-vĕe-aar', or **Turia**, too'rĕe-ä [Guadalaviar is Span., from Arab. *Wādī-al-abyadh*, White river]: a river of Spain; rises in the Sierra Albarracin, in Southwestern Aragon, near the sources of the Tagus, and after a southeastern course of 130 miles, through Valencia, it falls into the Mediterranean.

Guadalcazar, gwä-dal-kä-zaar': a city of the state of San Luis Potosí, Mexico; 40 miles N. E. of the city of Potosí and 15 miles from the railway (see map of Mexico, ref. 6–G); 6,000 feet above sea-level; celebrated for its production of mercury. Pop. 7,600. M. W. H.

Guadalquivir, gwä-dal-kĕe-veer' [Span., from Arab. *Wādī-al-kabīr*, the Great river]: a river of Spain; rises in the Sierra de Cazorla, in the province of Jaen, and after a southwestern course of 316 miles through the provinces of Jaen, Cordova, and Seville, it falls into the Atlantic 18 miles N. of Cadiz. It is navigable to Seville, 12 miles below which it separates and forms two islands. Its lower course is sluggish, through a marshy, unhealthful, but fertile tract. Its affluents are: on the right, the Guadalamar and the Jandula; on the left, the Guadajoz and the Xenil.

Guadalupe: a river of Texas; a branch of the San Antonio; rises in Edwards County, and after a course of 200 miles falls into the San Antonio 13 miles from its mouth, in Espiritu Santo Bay. It flows for the most part through a beautiful region.

Guadalupe Hidalgo, gwăă-dăă-loo'pā-ĕĕ-daal'gō: a village of Mexico, in the federal district; at the foot of the Guadalupe Mountain; 3 miles N. of Mexico city (see map of Mexico, ref. 7–H). Pop. about 4,000. It is celebrated for a chapel built on the spot where, it is said, the Virgin Mary appeared to an Indian lad in 1736; in 1734 the Virgin of Guadalupe was proclaimed the especial patroness of the Indians. The shrine is yearly visited by thousands of pilgrims, and is very richly ornamented. Guadalupe Hidalgo gave its name to a treaty, signed there Feb. 2, 1848, between representatives of Mexico and the U. S.; by this treaty the war was brought to an end, and Texas, California, and the intervening territory were ceded to the northern republic.

HERBERT H. SMITH.

Guadalupe Mountains: a range of Northwest Texas and of New Mexico; between the Rio Grande and the Pecos, forming a long spur of the Rocky Mountain system.

Guadeloupe, gwăă-dā-loop': one of the Lesser Antilles, in the West Indies; situated in lat. 16° N., between Dominica and Antigua; area, 618 sq. miles (see map of West Indies, ref. 7–M). Properly it is composed of two islands, separated by a narrow strait called Rivière Salée, or Salt river. The western and larger part is known as Guadeloupe proper, or sometimes Basse Terre, from the capital town; it is entirely mountainous, the highest peak being an active or hardly quiescent volcano called the Soufrière, 4,858 feet above the sea. The eastern portion, or Grande Terre, is mainly a coral formation, slightly undulated and nowhere more than 350 feet high. Both were originally covered with forest, now confined to the mountains. The soil is fertile and well watered; there are a number of hot springs. The climate is damp and warm (average temperature, 78·8° F.), but modified by sea-breezes and generally healthful. Epidemics of yellow fever are now rare. Guadeloupe belongs to France; it is ruled by a governor and elected council, and sends a senator and a deputy to Paris. United to it are the neighboring small islands of Marie Galante, Les Saintes, Désirade, and Petite Terre, with St.-Barthélemy and the French part of St.-Martin. Including the dependencies, the population in 1889 was 165,889, less than a sixth whites, the rest Negroes and mulattoes. Sugar, coffee, and cacao are the principal products. Exports in 1889, valued at over $5,000,000, nearly all going to France: the imports from various countries were somewhat less. Capital, Basse Terre, but Pointe à Pitre is the largest town. Guadeloupe was discovered by Columbus, Nov. 3, 1493; settled by the French in 1633, who finally drove out the Caribs. The British have taken it four times, but it has remained a French possession since 1815. HERBERT H. SMITH.

Guadiana, gwăă-dĕĕ-aa'năă [Span., from Arab., meaning river of joy]: a river of Spain; rises in the Sierra Alcaraz, in La Mancha; runs for a distance of 30 miles under ground; passes through La Mancha and Estremadura, enters the Portuguese province of Alemtejo, and falls into the Atlantic after a course of 316 miles. It is navigable only for about 35 miles. Its chief affluents are: on the right, the Giguela; on the left, the Javalon and the Ardila.

Guadix, gwăă-deech': town of Spain; in the province of Granada, on the river Guadix (see map of Spain, ref. 19–F). It is an old town, but well built, and contains a fine cathedral, a Moorish castle, and other handsome buildings. It is a bishop's see. In the vicinity are several hot mineral springs. Pop. (1887) 11,989.

Guaduas, gwăă'doo-ăăs: a town of Colombia; department of Cundinamarca; 53 miles N. W. of Bogotá, on the road to Honda and the Magdalena; in a beautiful valley, 3,353 feet above the sea (see map of South America, ref. 2–B). It is important for its transit trade, and, having a delightful climate, is much frequented by inhabitants both of the high land and of the river plain. In the vicinity there are hot springs and, it is said, a bed of coal. Sugar-cane and coffee are cultivated in the district. *Jipijapa* or Panama hats are exported in considerable quantities. Guaduas was founded in 1614. Pop. about 9,000; of the district, 11,000.

H. H. SMITH.

Guahyba: See JACUHY.

Guaiacum, gwī'a-kŭm [Mod. Lat., from Span. *guayaco*, from the native American name]: a genus of trees, natural order *Zygophyllaceæ*, of which the important species are *G. officinale* and *G. sanctum*, small evergreen trees, with blue flowers, growing in the West Indies and adjacent mainland. The wood, commonly called *lignum-vitæ*, is exceedingly hard and heavy, sinks in water, and is much used in manufactures, as for ship-blocks, ten-pin balls, etc. It is exported from the West Indies in logs or billets, of which the sapwood is yellow and the heart-wood greenish brown. It has a peculiar odor when rubbed or heated. *Guaiac resin*, or *guaiac*, is the concrete juice of the same tree, obtained from the wood, and also exported from the West Indies. It comes in deep greenish-brown or olive-colored brittle resinous masses, of feeble fragrant odor, and, after melting in the mouth, of a hot, pungent taste. It is a complex body, containing three acids, a peculiar resin, and other substances. It is completely soluble in alcohol, forming a deep-brown tincture. Guaiac readily oxidizes on exposure, turning green, and from the change of color produced by contact with some animal and vegetable substances is useful as a chemical test, as for detection of blood in stains. It is used sometimes in medicine as a so-called "alterative" in rheumatism and syphilis, and as an emmenagogue and sudorific. *G. sanctum* grows in Florida. EDWARD CURTIS.

Guaira (or **Guayra'**) **Fall**: See PARANA (River).

Guaira, LA, Venezuela: See LA GUAIRA.

Gualdo-Tadino, gwaal'dō-taă-dee'nō: town of Italy; 22 miles N. of Foligno (see map of Italy, ref. 5–E); in the province of Perugia; once fortified, and governing itself under the protectorate of Perugia. In 1815 it was incorporated with the papal states, and in 1833 it was honored with the title of City of Pope Gregory XVI. In its neighborhood are the ruins of the ancient *Tadinum*, where Narses defeated Totila in 552. Pop. 7,500.

Gualeguay, gwăăl-ā-gwăă-ee': a city of the province of Entre Rios, Argentina; on a river of the same name, a branch of the Paraná (see map of South America, ref. 8–E). It is in the midst of a rich grazing district and has extensive meat-curing establishments, over 100,000 head of cattle being slaughtered annually. Dried meat, hides, tallow, and wool are exported in large quantities from Port Luiz, 7 miles below, where the river is navigable for large vessels; a railway connects this port with the city. Gualeguay was founded in 1783. Pop. (1892) about 12,000. H. H. SMITH.

Gualeguaychú, gwăă-lā-gwī-shoo': a city of the province of Entre Rios, Argentina; about 50 miles E. by N. of Gualeguay (see map of South America, ref. 8–E); on a river of the same name, 8 miles above its mouth in the Uruguay. It is one of the principal cattle-markets of the republic, has very extensive *saladéros* or meat-drying yards, tanneries, and an establishment for preparing extract of beef. The Gualeguaychú river has a bar at its mouth; sea-going vessels load in the Uruguay, 20 miles below the city, and freight is carried down to them in barges. Notwithstanding this disadvantage, the port is the third in Argentina in commercial importance. Pop. (1889) 14,000. HERBERT H. SMITH.

Guamanga: See HUAMANGA.

Gu'an: a name applied to various gallinaceous birds of the family *Cracidæ*, all natives of warm parts of America. One of these, the *Penelope cristata* of Brazil and Guiana, is domesticated in those countries and in Holland, and prized as food. The only species found in the U. S. is the Texas guan or chachalaca (*Ortalis vetula maccalli*), a bird about 2 feet in length, of a dark olivaceous above, lighter below; tail glossy green, all save the middle pair of feathers tipped with gray. It is found in the valley of the lower Rio Grande, in Mexico and Texas, builds a flimsy nest in bushes, and is readily domesticated. F. A. LUCAS.

Guanabacoa, gwăă-năă-băă-kō'ăă: a town of Cuba; 3 miles E. S. E. of Havana, and practically a suburb of that city (see map of West Indies, ref. 3–B). It is built on a group of hills overlooking the harbor, and cooled by sea-breezes; in the vicinity there are fine groves, watered by many little streams, and hot springs and baths much frequented by invalids. The town has a small theater, casino, hospital, an old convent, now used as a school, and a fine public square. Many wealthy families reside here, or visit the place during the hot months. It is connected by railway with Havana. Pop. (1887) 11,144; of the district, 28,043. HERBERT H. SMITH.

Guanacaste, gwăă-năă-caas'tā: a province of Costa Rica; embracing the northwestern part of the republic, with the peninsula of Nicoya; area, about 4,000 sq. miles. It is crossed from S. W. to N. E. by a chain of mountains, with several active volcanoes and peaks over 5,000 feet high; the whole surface is much broken. There are extensive and

valuable forests, interspersed with open lands affording excellent pasturage. The principal industries are cattle-raising and timber-cutting. Pop. (1892) 20,049. Capital, Guanacaste or Liberia, centrally situated, with about 6,000 inhabitants (see map of Central America, ref. 7–I). Santa Cruz and Nicoya, in the peninsula, are towns of some importance. Until 1858 Guanacaste formed a part of Nicaragua. See Seebach, *Reise durch Guanacaste*, in Petermann's *Mittheilungen*, p. 241 (1865). HERBERT H. SMITH.

Guanaco, gwăă-naa'kō [or *huanaco*, Amer. Span., from the native name]: a kind of lama (*Auchenia guanacus*) found from the highlands of Ecuador and Peru to the plains of Patagonia, and even on some of the adjacent islands. The neck and legs are slender, the hair wavy, of a fawn color above, pale yellow to pure white below. The guanaco stands about 3 feet high at the shoulder. This animal is of great importance to the Patagonian Indians, not only furnishing them with the major part of their food, but providing them with clothing as well. The guanaco is regarded as the wild stock from which the domesticated LAMA (*q. v.*) has been derived. F. A. LUCAS.

Guanahani, gwăă-naa'haa'nēē: the first American island discovered by Columbus in 1492. It was one of the Bahamas, near the middle of the group, but beyond this it can not be identified. According to Columbus's account, it was flat, covered with trees, surrounded by reefs, and had a lake in the interior. Geographers long identified it with Cat island, but the weight of modern opinion inclines to Watling's island as the first landfall. Various others, as Samana, Acklin, Mariguana, and Grand Turk, have had their advocates. HERBERT H. SMITH.

Guanajay, gwăă-năă-chī: a town of Cuba; 26 miles W. S. W. of Havana, with which it is connected by railway (see map of West Indies, ref. 3–B). Pop. (1892) about 12,000. It is beautifully situated at the foot of the Anafe Mountains, and is one of the great sanitariums of Cuba. There are extensive coffee plantations in the vicinity. H. H. S.

Guanajuato, gwăă-năă-choo-ăă'tō, or **Guanaxuato**: a central state of Mexico; bounded N. by Zacatecas and San Luis Potosí, E. by Querétaro, S. by Michoacan, and W. by Jalisco; area, 11,374 sq. miles. The general surface is a plateau, over 6,000 feet high, but this is much broken by higher land and deep river-valleys. Two principal chains of mountains cross the central and northeastern parts of the state from S. S. E. to N. N. W.; in the southern part an isolated group of volcanic hills surrounds the plain of Santiago, and there are other extensive and fertile plains. Maize and wheat are largely grown in the higher lands, and sugar-cane in some of the warm valleys. Cotton and woolen cloths, pottery, etc., are manufactured in various places. But by far the most important industry is mining; the silver deposits are among the richest in the world; many of the ores contain a large percentage of gold; and there are valuable mines of copper, lead, and quicksilver. From 1812 to 1888 the mint of Guanajuato coined 257,590,997 silver dollars and $20,771,569 of gold; the average yearly coinage of silver is now about $4,500,000; that of gold is falling off. Guanajuato was settled by Spaniards soon after the conquest, and the mines were extensively worked during the colonial period. Pop. in 1892 estimated at 1,007,116, including about 150,000 semi-civilized Indians, mainly of the Otomi race. The bishopric of Leon corresponds to this state. HERBERT H. SMITH.

Guanajuato, or **Santa Fé de Guanajuato**: capital and principal city of the state of Guanajuato; centrally situated in the rocky valley of the Guanajuato river, a small branch of the Lerma, 6,663 feet above the sea (see map of Mexico, ref. 6–G). It is built on very uneven ground, with steep and tortuous streets, but with many handsome buildings, including the government palace, mint, and Jesuit church. There is an ancient university, little frequented. The surrounding region presents a singular appearance, owing to the mining villages on the hills and the many establishments for treating ore in the valleys. The celebrated *Veta Madre* (parent vein), to which the city owes its existence, was long reputed to be the richest in the world. There are about fifty crushing-mills. A short branch railway connects the city and mines with the Mexican Central line. Guanajuato was founded in 1554. It was the scene of several striking episodes of the war for independence. Pop. (1889) 73,531. HERBERT H. SMITH.

Guanare, gwăă-naa'rā: a city of Venezuela; capital of the state of Zamora; on a beautiful plain at the foot of hills; 2 miles from the river of the same name and 218 miles S. W. of Caracas; 469 feet above sea-level (see map of South America, ref. 1–C). It lies in a rich grazing region, and is one of the principal centers of the trade in cattle, horses, and mules; coffee, cacao, etc., are cultivated on the neighboring hills. Several highways meet here, and there is an active commerce with Valencia, Puerto Cabello, and Ciudad Bolivar. The city was founded in 1593. Pop., including the immediate vicinity, 10,880. HERBERT H. SMITH.

Guancavelica: See HUANCAVELICA.

Guanches, gwaan'chez: the aboriginal race of the Canary islands, now extinct, though the chief families of the group boast of their Guanche blood. Partly subdued (1402–05) by Bethencourt, who forced those who submitted to embrace Christianity, they were not wholly conquered till 1495. They were of large stature and possessed some noble traits of character. A short vocabulary of their words has been preserved, and has led some writers to assert that the Guanches were of Berber origin. Catacombs where they placed the embalmed bodies of their dead are shown.

Guanine, gwaa'nīn [deriv. of *guano*]: a white, amorphous powder, insoluble in water, alcohol, and ether ($C_5H_5N_5O$); discovered in guano by Unger in 1844. It does not occur in fresh excrement of birds, but is found in excrements of garden spiders, in the green organ of the river-crab, in the Bojanian organ of the pond-mussel, in the pancreas of horses, in the scales of the bleak, and in concretions of pork diseased with the guanine gout. Guanine combines with acids, bases, and salts, forming well-crystallized compounds. By digestion with hydrochloric acid and chlorate of potassa it yields guanidine and parabanic acid, with some other substances in lesser quantities. Guanidine has the formula CH_5N_3, is crystalline and alkaline, with a caustic taste. It combines with acids, forming crystalline salts.

Guano, gwaa'nō [= Span. *guano*, *huano*, from Peruvian *huanu*, dung]: properly, the accumulated excrement of birds. In his *The Natural and Moral History of Indies* (Seville, 1590), Father Acosta, a Jesuit priest, speaks of islands off the coast of Peru which resemble hills covered with snow, so deeply are they covered with sea-fowls' dung, and says that the natives use this as a manure and call it guano. Of still older date are the *Commentaries of the Incas*, written by Garcilaso de la Vega, who died in 1568. Garcilaso gives a very interesting account of the manner in which the birds producing the guano were protected by the laws of the Incas, by which it was made a crime punishable by death to kill the sea-fowl, gather their eggs, or even to visit the islands during the breeding-season. Humboldt called attention to the great value of guano, and the sample analyzed by Fourcroy and Vauquelin was sent to France by that savant in 1805. He stated that "the guano is deposited in layers 50 to 60 feet thick upon the granite of many of the South Sea islands, off the coast of Peru. During 300 years the coast-birds have deposited guano only a few lines in thickness. This shows how great must have been the number of birds, and how many centuries must have passed over, in order to form the present guano-beds."

About 1840 Peruvian guano was introduced into Great Britain, and in 1842 the Government began to export guano on its own account. From a few thousand tons that were at first imported annually the amount rapidly increased to 500,000 tons per annum. Before the civil war the importation of Peruvian guano into the U. S. had reached 80,000 tons per annum, the greater portion being consumed in the Southern States. At the beginning of the war this demand ceased, but at its close the trade at once revived. The high price which guano commanded soon led to the search for and the discovery of similar deposits in other parts of the world. Large deposits were found on the coast of Chili and Peru, in South Africa, and on numerous islands in the Pacific Ocean and Caribbean Sea, and the importation into Great Britain caused the price to fall to £9 10*s.* per ton. Yet the consumption increased, and the superior quality of the Peruvian over the other varieties being established, its price advanced, and Chincha islands guano was sold in Europe for £13 10*s.* per ton of 2,240 lb., and in the U. S. for $67.50 gold. The Chincha islands, after yielding from 12,000,000 to 15,000,000 tons of guano, became exhausted in 1874. In 1868, when the exportation from the Guañape islands began, the amount of guano upon these and the other Peruvian islands was estimated at 5,000,000 tons. It is probable, therefore, that at an early date these sources of guano will

be exhausted. In various localities upon the west coast of South America, in Bolivia, Chili, and Peru, there are extensive deposits of guano, but of a quality inferior to that obtained from the Peruvian islands. Guano of low grade is supplied by many islands of the Pacific, several of which are in the Auckland group. An act of the U. S. Congress, passed in 1856, granted protection to citizens who should occupy and operate unclaimed deposits of guano, and in 1859 no less than forty-eight islands had been thus secured. "Bat-guano," consisting of the dung of bats and birds, is formed in the caves of many warm countries, and may yet become important. The so-called "fish-guano" is the refuse of fishes caught for their oil. It has a high but unequal value as a fertilizer, and is prepared chiefly in Norway and on the Atlantic coast of the U. S.

Composition of Guano.—The composition of guano varies, as may be seen by inspecting the subjoined tables of analyses. The first table represents the composition of guanos containing more or less ammonia-producing compounds, and the second the composition of guanos in which these compounds are quite wanting. (See APATITE.) Of the former class, the Guañape and Ballista only are found in the markets of the U. S. to any extent; and of the latter class, the South Carolina and Florida phosphates have usurped the markets by reason of their cheapness. Extensive deposits of phosphates occur in various parts of the world, and are largely used in the manufacture of the class of fertilizers termed superphosphates. The Guañape islands are situated a few miles off the coast of Peru, in latitude 8° 27′ S., and the Chinchas about 300 miles farther S. These islands, as well as Ballistas, Lobos, and Macabi islands, all of which are situated off the same coast, are the property of the Peruvian Government.

West Indian deposits, where ammonia-producing compounds are mostly wanting. Between these extremes the various grades of guano range. Peruvian and African guanos are white and pungent in odor; that from the Pacific islands is brown and inodorous.

The constituents in guano of value to the agriculturist are ammonia and ammonia-forming compounds, soluble and insoluble phosphoric acid, and potash.

Adulteration of Guano.—This practice is by no means uncommon, and consists in adding to a genuine guano of established reputation earth, such as apatite, which resembles the original guano in appearance. Imitations of Peruvian guano have been frequent, this article being the best-reputed of the kind in the market. In purchasing guano, therefore, one must patronize reliable dealers, as it is not possible by any examination within the scope of a practical farmer to distinguish the genuine from the adulterated article. As serious variations in the composition of the genuine Peruvian guano have been noticed, its market price is based on the amounts of nitrogen, phosphoric acid, and potassium oxide they contain, and its sale is subjected to the State laws for the regulation of the sale of commercial fertilizers.

Application of Guano.—No definite rules can be given for guano as to what soils will be most benefited, or the necessary quantity. This must be determined by experiment. Peruvian guano should not be applied to crops in its pure state, but should be previously mixed with four times its weight of good soil, thus avoiding the danger of injury to the seed. The amount required per acre depends on its composition, the condition of the soil, and the requirements of the crops, and must for this reason vary considerably. The increasing scarcity of high-grade Peruvian guano

AMMONIACAL GUANOS.

PARTS, ETC.	Chincha islands.					Guañape islands.			Ballistas.	Elide.
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Date of shipment	1804	1852	1853	1857	1870	1869	1870	1870	1870	1858
Ammonia	10·54	15·24	16·25	16·39	15·97	11·24	13·18	11·92	10·74	10·03
Phosphoric acid, soluble	11·35	9·70	.	4·17	5·02	13·58	6·09	3·35	2·95	5·19
" " insoluble	..	10·00	8·11	10·37	7·90	....	8·24	13·18	13·59	6·35
Potash	2·96	3·24	.	.	.	. .	..	.	.	5·52
Water	.	8·50	.	12·68	14·35	.. ..	19·72	19·32	12·85	27·47

1. Carried to Europe by Humboldt, and analyzed by Fourcroy and Vauquelin. 2, 3. Imported into Great Britain, and analyzed by Dr. Andrew Ure. 4. Average of analyses of four lots of guano imported into the U. S., analyzed by Prof. S. W. Johnson. 5. Average of analyses of two cargoes imported into New York, analyzed by Prof. C. F. Chandler and F. A. Cairns. 6. Analyzed by Prof. S. W. Johnson. 7. Average of analyses of nine cargoes imported into New York, analyzed by Prof. C. F. Chandler and F. A. Cairns. 8. Average of analyses of six cargoes imported into Savannah, Ga., analyzed by Dr. A. Means and F. Bruckman, M. E. 9. Imported into Savannah, Ga., analyzed by Dr. A. Means and F. Bruckman, M. E. 10. From the coast of California, analyzed by S. W. Johnson. Analysis of Lobos island guano shows 13 per cent. of ammonia.

PHOSPHATIC GUANOS.

COMPONENT PARTS.	Sombrero isl.	Swan island.			Redonda isl.	So. Carolina.	Baker's is.
	1.	2.	3.	4.	5.	6.	7.
Lime	49·82	44·77	19·46	0·61	0·57	35·71	42·74
Magnesia		0·70	1·57	0·14	. .	. .	2·54
Sesquioxide of iron	....	1·42	5·17	9·04	14·40	15·01	
Alumina		1·91	10·12	14·04	16·60		
Phosphoric acid	37·83	33·38	25·39	31·05	43·20	24·95	39·70
Sulphuric "	.....	0·12	0·03	.	. .	2·40	1·30
Carbonic "	5·04	3·08	0·38	0·10	.	2·55	.
Silica and insoluble matter	0·40	5·68	21·16	24·80	1·60	11·67	
Water expelled at 212° F.	2·62	2·58	2·87	3·62	24·00	9·15	2·92
" " above 212° F.	3·50	2·70	8·30	13·81			8·32
Organic matter		2·57	5·02	1·74	.		
Undetermined matter	0·79	1·09	0·53	1·05	.		2·48
	100·00	100·00	100·00	100·00	100·37	101·44	100·00

1. From Sombrero island, West Indies, lat. 18° 36′ N., lon. 63° 27′ W. from Greenwich, imported into the U. S. in 1859, analyzed by S. W. Johnson. 2, 3, 4. From Swan island, West Indies, lat. 17° 22′ N., lon. 83° W., imported in 1866, analyzed by C. F. Chandler and F. A. Cairns. 5. From Redonda island, West Indies, imported in 1869, analyzed by C. U. Shepard. 6. From Ashley river, S. C., analyzed by C. U. Shepard in 1868. 7. Baker's island, lat. 0° 13′ N., lon. 176° 22′ W., analyzed by J. D. Hague, 1862.

Navassa guano belongs to this class, and has yielded as high as 37 per cent. of insoluble phosphoric acid. This island is situated in the West Indies, E. of Jamaica, lat. 18° 25′ N., lon. 75° 5′ E.

In the tables of analyses the ammonia is calculated as dry ammonia gas (NH_3), the phosphoric acid as phosphoric anhydride (P_2O_5), and the potash as oxide of potassium (K_2O).

Deeply imbedded in the guano are well-preserved remains of aquatic birds and other animals of the present epoch. The phosphatic character of these deposits is due to the fact that these animals feed largely upon fish. The ammoniacal compounds are most abundant in the guanos found in situations where the rainfall is very light and the subsoil of a compact, clayey nature. When the rainfall is abundant these substances are decomposed and leached out, and the earthy constituents remain. Such is the condition of the and serious variations in its composition have tended to lower its consumption. See FERTILIZERS.

Revised by C. A. GOESSMAN.

Guapay, or **Guapahy**: river of Bolivia. See MADEIRA.

Guaporé River: See MADEIRA.

Guarana, gwăă-răă-năă′: a substance prepared from the seeds of *Paullinia sorbilis*, a climbing shrub of Brazil, of the order *Sapindaceæ*. The seeds are dried, powdered, then moistened and made into a paste; this, mixed with more of the seeds, either whole or merely bruised, is rolled into cylinders, which on drying form a strong, hard, mottled, reddish-brown mass. The essential ingredient of guarana is a crystallizable prin-

ciple apparently identical with caffeine. It is prepared principally by the Indians of the river Tapajós, and is largely used in preparing a drink by the people of Central and Western Brazil. Its physiological effects resemble those of tea, but are stronger. Taken in excess it brings on nervous prostration. Revised by H. H. Smith.

Guaranine, gŭa-rā-nēen : See Caffeine.

Guarantee Companies: business corporations which carry risks where investigation into moral and legal conditions removes largely the element of chance from the company's liability to loss. They thus differ materially from fire, life, and accident insurance companies, where chance practically determines the risk.

The insurance principle was first applied as a matter of pure speculation. In fire-insurance still it is a matter of chance whether there will be a fire. In life-insurance, when and how the insured may die is a pure speculation, but that he will die is certain. In marine-insurance risks are taken even on long overdue vessels, entirely on the theory of chances as to the vessels reaching port in safety. As the virtues of the insurance principle became appreciated, it was applied to other fields where chance had less to do with the liability of the company than other considerations which could be guarded against by previous investigation, and where, with proper care, loss might never come. The companies entering these fields have adopted generally the designation "guarantee" as distinguishing their business in the respects stated from the more hazardous business of the insurance companies.

They have in some cases developed from the prevailing tendency to substitute corporate responsibility for individual responsibility, as in the case of fidelity guarantee or rent guarantee; in other cases, not so much to protect against loss as to save from annoyance and delay, and often from vexatious legal contests, as in the case of title guarantee. In all of these companies the fundamental theory is that proper care exercised at the right time will go far to prevent all loss; in the matter of fidelity, that an investigation into the man's habits, history, and associations will enable the company to determine whether he is, and will be, honest or not; in the matter of title, that a careful investigation by the company at the hands of its own skilled advisers will enable it to pick out with certainty the good titles and run practically no risk whatever in guaranteeing them; that in the matter of rent, a proper investigation into the proposed tenant's career will accurately determine whether the payment of the rent by him is certain or not. So, too, the true province of the investment guarantee companies is not to guarantee against loss on dubious or speculative investments, but to pick out with great care the good ones, those on which there can be no loss, and having done so, to put their stamp upon them so that the inexperienced and the unwary can buy them without risk of deception and loss.

Fidelity guarantee was the first development. It originated in London in the year 1840. It provides the protection of corporate capital to employers of every class, against loss by dishonesty and breaches of trust in officers and employees. It takes the place of individual bonds. The guarantee is issued only after careful investigation by the company into the character, habits, and record of the person for whom the guarantee is given, and in practice proves a help both to the employer and the employee. The employer gets a permanent guarantor which renews its guarantee annually and responds promptly on any breach by the employee; and the employee is relieved of the difficulty of securing friends to go on his bond, feels the support which a good record with the guaranteeing company gives him, and feels also the certainty of having to reckon with the company in case of fraud on his part. The business has grown to large dimensions in Great Britain and her colonies, and in the U. S. The expenses of management are large because a force sufficient to make careful, extensive, and rapid investigations has to be maintained; and the losses are also heavy, because even after the most careful investigation the company may be deceived as to the character and trustworthiness of some of the insured. When loss comes it is generally for substantial amounts. The premiums charged, however, are from a half of 1 per cent. to 1 per cent. per annum on the amount of the bond, and furnish a gross income sufficient to stand substantial losses and heavy expenses, and leave satisfactory net incomes for the corporations. The Guarantee Society of London was the first company organized to do this business. The business was introduced into the U. S. in 1872 by the Guarantee Company of North America, a Canadian corporation. The Legislature of the State of New York in 1853 passed the first act enacted in the U. S. authorizing the formation of such companies, but it was not until 1875 that the first company was organized and actually undertook the business under a charter from that State.

Title guarantee originated in Philadelphia in 1876. Its fundamental object was the protection of holders of real estate and lenders thereon against loss by reason of defective titles. Previously, titles to real estate had been examined by individual attorneys, and on the strength of their opinions as to title clients had invested their money. If there was a mistake in that opinion, or some misinformation as to the facts of family history or other facts, and the title proved defective, the loss usually fell upon the client. The expenses of the legal examination were heavy, and were repeated from the beginning with each new transaction in the property, because no new purchaser or lender would rely upon the opinion of the lawyer for the previous owner. Experience had shown that the losses were small in comparison with these burdensome and ever-repeated legal expenses. The title-guarantee companies proposed to make a single examination of the title at the hands of their own counsel, and, on approval, to issue an absolute guarantee, which could be reissued to the successive owners or lenders, protecting all equally against loss and saving a large portion of the legal expenses previously involved in each transaction. To facilitate them in their work and to increase their safety, the title-guarantee companies in the large cities make their own copy of the real-estate records, arrange them ordinarily according to the pieces of property affected, and obtain practically a correct ledger account of the record of each lot of land in the city or county. When requested to guarantee the title to a lot, this record of the lot is passed through the law department of the company, investigated by lawyers skilled in the work, and if approved and guaranteed, so marked, and the record never again examined back of that point. As the business of the company increases and gradually covers the county, it meets more and more in its law work routes previously traveled in great part before, and reduces, to the manifest advantage of the community, the time required to put through a transaction. After the formation of the original company in Philadelphia, companies were formed in Washington, Baltimore, Boston, and New York in the order named, and thereafter rapidly in all of the principal cities of the U. S.

The system has not been introduced into other countries largely because their land laws are different from those of the U. S. The business of a company in a city like New York or Philadelphia results in guarantees in the course of a year to the amount of from $30,000,000 to $50,000,000.

The title-guarantee companies have done much to change real estate from dead capital, or capital not available in emergencies, into negotiable and available capital. A property with title guaranteed can at once be mortgaged without the delay required under the old system for a re-examination of the title, and a mortgage with title guaranteed can be at once transferred, and is available as collateral at bank or trust company.

The experience of the title-guarantee companies has been that their expense account is heavy because their work is professional work, and increases very much as their business increases; but their losses are small. In the large cities they are less than 2 per cent. of their premiums. The premium charged for the guarantee is paid once and not annually. For an original guarantee it ranges from a little more than a half of 1 per cent. on the small transactions to a little less than a half of 1 per cent. on the large ones. On a transfer of the property or the making of a mortgage upon it, the examination is brought down to date and the policy reissued to the new owner or lender for about a third of the first premium.

Credit guarantee brings to a merchant corporate protection against loss on debts due by customers. It is applied on two different systems: one where the merchant submits particular bills of account for guarantee; and the other where the company guarantees the merchant on his whole line of accounts against loss up to an agreed amount named in the policy, after the merchant has himself borne a certain fixed percentage of loss. The former plan was first tried by a company organized in New York in 1887. It was not successful, largely because the merchant under any such plan naturally submitted only his poorest accounts, and the

business proved so hazardous for the company that it was obliged to go out of business. The second plan above mentioned has proved safer and more practicable. It was first put into practice in Newark, N. J., where the United States Credit System Company was organized in 1889. Inasmuch as the merchant stands the losses up to a certain fixed amount, and is interested to lose not even that amount himself, he becomes to that extent an insurer of the guaranteeing company and endeavors to save it from all loss. Under this system the percentage charged is about 3 per cent. per annum on the amount of the guarantee, and the losses are expected to average not much over 1 per cent. per annum. The expense account is large because of the necessity of extensive investigations all over the country.

Rent guarantee brings corporate protection to the landlord against loss of rents on leased premises. It originated as an independent business in New York in the year 1892, although it had been previously undertaken to some extent as a department of corporations in Great Britain, formed primarily for other purposes. The principle is applied in two ways, one by guaranteeing to the landlord who has leased his premises that the tenant will pay the rent provided for in the lease; another by guaranteeing to obtain for the landlord a certain net rental, and find the tenant or tenants to pay the rent. The former course is the one adopted by most companies. The premium charged is about 2 per cent. of the rent stipulated to be paid. Statistics as to the losses are meager, but as the companies ordinarily take security wherever obtainable, the chance for loss is not great, and the convenience to landlords would seem to be sufficient to justify the business of the companies.

Investment guarantee brings to lenders on mortgage and purchasers of bonds the protection of corporate capital against loss by reason of poorly selected investments. The principle was first applied in Berlin in 1862, where a company was formed to guarantee the payment of mortgages on real estate. The practice does not seem to have been adopted by other countries until 1886, when a company was formed in London to guarantee the payment not only of bonds and mortgages, but of municipal and corporate bonds generally. Since then numbers of companies have been formed in the United Kingdom and the U. S. to do a similar business, aside from the various mortgage companies organized to negotiate mortgages on farm lands throughout the Western States of the U. S., which, as incidental to the sale of their mortgages, have been accustomed to guarantee their payment.

Investment-guarantee companies have been successful or the reverse according to the lines of investment which they have undertaken to guarantee. Those which have undertaken to guarantee issues of manufacturing or industrial bonds where the character of the investment necessarily depends on the future management of the issuing corporation, which is beyond the control of the insurance corporation, have not been successful. Those which have guaranteed mortgage investments, like the original company in Berlin, and which have served really to stamp their approval on the good investments, and not to back up the doubtful ones, have prospered. In companies of the latter class, both the expenses and the losses are small. The premiums average from a quarter to a half of 1 per cent. per annum. For guaranteeing issues of corporate bonds, however, the premium is large, and experience shows that the losses are large.

Employers' liability guarantee belongs perhaps to the class of insurance where the risk is almost entirely a matter of chance rather than to the class where investigation can eliminate largely the risk; but many of these companies call themselves "guarantee" rather than "insurance" companies. They protect employers against loss by reason of claims for accidents to their employees. Owners of buildings, manufacturers, and railway and steamboat companies use these corporations and pay them large premiums for protecting them against all damage claims on the part of their employees or others. The guaranteeing company adjusts the claims with the injured and pays them, or, if no amicable adjustment can be made, defends the suits and pays the judgments, if any. Their expenses are heavy and their losses are heavy, but their premiums are large, reaching many thousands of dollars per year, often, on a single policy guaranteeing a railway corporation. The business originated in London in 1880, when the Employers' Liability Assurance Corporation was organized. Its organization followed almost immediately upon the passage by Parliament of the Employers' Liability Act of 1880, which very much enlarged the liabilities of employers for accidents to their employees. As against these companies an attempt has been made to form an employees' guarantee company, the purpose of which is to take up in behalf of the employee who has been injured the legal fight against the employer or the employers' guarantee company, and guarantee to a member at least the best of legal ability in aid of a recovery on his claim against his employer. A company for this purpose was formed in New York in 1889, but was not successful. In 1892 a "legal protection guarantee company" was formed in London, with the same object.

CLARENCE H. KELSEY.

Guar'anty [from O. Fr. *guarantie*, guaranty, warranty, deriv. of *guarant*, earlier *warant*, surety; from O. H. Germ. *werento*, pres. partic. of *weren*, grant, secure, warrant > Mod. Germ. *gewähren*, grant, assure]: a special promise to be responsible for the payment of some debt or the performance of some obligation or duty in case of the failure of another person, who is primarily liable to such payment or performance. It is less broad in its meaning than SURETYSHIP (*q. v.*), as that term includes implied as well as express promises. It requires all the elements essential to give contracts validity. The party promising must labor under no legal disability, and there must not only be a proposal upon his part, but a sufficient acceptance of the offer by the promisee. It is not necessary that acceptance be expressed in a positive declaration, since it may be presumed from acts evincing a readiness to comply with the request or demand upon which the promise was based, as if a shopkeeper should deliver goods to some person through faith in the guarantor's assertion that he would be responsible for the payment if the receiver of the goods were guilty of default. But unless the offer of the guarantor be absolute in its terms, there must generally be notice of acceptance given him, that he may know that the liability which he was ready to assume has become fixed and definite. The promise must be founded upon a valid and sufficient consideration. This may be of but trifling amount, but must have been operative as the inducement to the guarantor's action. If indebtedness had already been incurred, an engagement to pay it in case it were not satisfied by the one primarily liable would be nugatory, on account of the lack of consideration. In such a case as this a new and independent consideration would be necessary. It would be sufficient if the creditor should agree to postpone the collection of the debt for a specified or a reasonable time. If the giving of the guaranty were contemporaneous with the formation of the contract for which the guarantor proposed to be answerable, the consideration which supported the principal agreement would support the collateral one also. It is not requisite that any benefit be received by the party giving the guaranty. It is sufficient that the person in whose favor it is given receive a benefit, or if the person to whom it is given put himself to some inconvenience, or part with some property, or undertake some obligation on the faith of the guarantor's promise. If a person in the form of a guaranty assume an obligation for a claim which would not be enforceable against the original debtor, as if he should promise to be responsible for articles, other than necessaries, supplied to married women or infants, he becomes himself a debtor. The reason is that as the promise of the infant, etc., is void, there is but one valid promise, and that is his own. A guaranty may be resorted to not only as a means of insuring the satisfaction of pecuniary liabilities, but also to secure the faithful performance of duty on the part of public officials, private agents, etc.

After a valid guaranty has been given the rights and obligations of the guarantor are determined upon somewhat peculiar principles. As his engagement is undertaken for the benefit of others, rather than his own, the law is scrupulous in protecting his interests. Hence if any attempt be made to change materially the nature or extent of his liability by subsequent agreement between his principal and the party to whom the guaranty was given, he is, in general, relieved from liability; thus, in the case of a guaranty of the good conduct of a clerk to a partnership, the introduction of new members into the firm as to all subsequent acts performed by the clerk would ordinarily extinguish all liability.

The contract of guaranty does not impose a primary but only a secondary liability; and it is a just and reasonable requirement that diligent efforts be made to collect the sum due of the principal debtor. A mere delay or indulgence

to his principal would not necessarily be sufficient for the guarantor's discharge, since he might not be injuriously affected in consequence. He might, if he desired, discharge the debt himself, and bring an action against the debtor at any time. There is an important distinction between a guaranty of *payment* and of *collection* of a debt or claim. In the case of a guaranty of payment the creditor may proceed at once against the guarantor without any reference to the principal debtor. In a guaranty of collection he must, as the term imports, strive to *collect* the debt from the debtor before resorting to the guarantor, and will be bound to proceed with diligence in his efforts to make such collection. If there should be in any case a valid agreement, without the guarantor's assent, between the creditor and the debtor for indulgence, preventing a resort to legal proceedings for a certain length of time, the guarantor would be discharged. If a guarantor should at any time pay the debt, he would be entitled to be substituted in the creditor's place as to the right to retain any property which the latter held in pledge to secure the claim. This is called in law the doctrine of SUBROGATION (*q. v.*). Sometimes a guaranty is extinguished or discharged because the creditor gives no due notification to the guarantor that the debtor has refused to pay on demand. The rule requiring notice is not, however, so strict as in the case of indorsers of negotiable paper, and the guarantor would not be discharged unless there was an unreasonable delay. The general principle would be the same as that which has been stated as applying to notice of acceptance of the guaranty by the creditor. If the guarantor had made a positive categorical promise, no notice would, in general, be necessary to bind him, but otherwise he ought to be speedily informed, in order that he might be enabled to take advantage of every available means to secure reimbursement from his principal. On this matter of notice the law of the various States is, however, not uniform.

The British Statute of Frauds, which has been substantially re-enacted throughout the U. S., requires that "upon any special promise to answer for the debt, default, or miscarriage of another person, the agreement, or some memorandum or note thereof, must be in writing and signed by the party to be charged therewith, or some other person thereunto by him lawfully authorized." A contract of guaranty must accordingly be in writing to be of any legal validity. But in the determination of the question whether certain promises are to be deemed guaranties or original engagements, which might be enforced even though made orally, very nice distinctions have been taken. The form of the undertaking here becomes important. There must of necessity be two promises—one of the principal debtor; the other, of the guarantor. If the transaction results in only one promise, the apparent guarantor will be in fact the true debtor, and no writing will be necessary. If A should say to B, "Let C have so many goods, and I will pay you," there will be but one promise (that of A), and writing will not be required. If A had said, "Charge the goods to C, and if he does not pay you I will," his promise would be void, as it would be collateral to that of C, who would be the true debtor, and would need to be in writing. It is a further rule that the promise need not be in writing unless it is made to the creditor himself. So it has been considered that a promise apparently collateral is not within the statute whenever the leading object of the promisor is not to discharge the debtor, but to subserve some interest of his own distinct from a payment of the debt. An instance of this kind would occur if any person, A, should pay his creditor, B, by an order upon his (A's) debtor, C, with a guaranty that the latter should discharge the debt. This would be, in effect, but a peculiar method adopted by A of discharging his own obligation. This rule, however, has been sharply criticised in some of its aspects by able jurists as working, in many instances, a practical evasion of the Statute of Frauds. Consult Fell on *Guaranties*; Parsons on *Contracts*; Chitty on *Contracts*; Kent's *Commentaries*, etc. T. W. DWIGHT.

Guaranty: in international law, a compact by which a power not a party to a treaty promises its aid in the event of certain specific promises made in the treaty being violated by one of the powers party to the treaty. Such a guaranty may refer to the promise to pay a sum of money or to cede territory, to one relating to the integrity of a state, the right of succession, religious franchises, etc. (See Woolsey's *Introduction*, § 105.) A guaranty requires the party making it to give the kind and amount of aid promised in a case to which, in his judgment, the promise applies. If the promisee declines his aid, he is under no obligation to give it; but general guaranties are dangerous, because they furnish pretexts for interference. If a debt is guaranteed, and is not paid, Vattel holds that the promisor is not bound to make it good, but only to do his best to induce the party owing the debt to fulfill his engagement. A *surety* would be obliged, says the same author, to do what the principal party has failed to do, but not the guarantying party. In the Middle Ages vassals or towns sometimes attached their seals to a political engagement of their sovereign, and persons watched over the execution of treaties, called conservators. Out of these usages modern political guaranties have grown.

Guaranys, or **Guaranís**, gwä-rä-nēez': a great race of South American Indians who at the time of the conquest occupied most of the present territory of Paraguay, with portions of Southern Brazil and Northeastern Argentina, and much of Uruguay. By language and customs they were closely allied to the Tupís of Brazil. They were divided into many hordes with different names, having little or no tribal union. The Guaranys lived in fixed villages; they had made some little progress in primitive arts, had no religion beyond a vague fear of demons and respect for their medicine-men, and the power of their chiefs was very limited. Most of them readily submitted to the Spaniards. The Jesuits established their most powerful missions among the Guaranys of Paraguay, and adopted the language for the general use of the missionaries. Many of the first conquerors formed unions with the Guarany women, and Guarany, in a corrupt form, and with much intermixture of Spanish, became the common language of Paraguay, where it is still generally spoken; many devotional books, and even a newspaper, have been printed in it. The population of Paraguay is mainly derived from the mixture of the Guarany and Spanish races, and Guarany blood, mingled with that of Spanish, Portuguese, African settlers, and of other Indian tribes, is common in the country population of Southern Brazil and Uruguay. A few hordes, as the Ka-ás of the upper Paraná, remain in a wild state, and the Indians of the disputed territory of Missiones, between Argentina and Brazil, are still called Guaranys. See Valle Cabral, *Bibliographia da lingua Tupí ou Guaraní* (Rio de Janeiro, 1880). The best works on the language are those of Montoya (1639, etc.), republished by Porto Seguro with the title *Gramatica y diccionarios de la lengua Tupí ó Guaraní* (Paris and Vienna, 1876). HERBERT H. SMITH.

Guaratinguetá, gwä-rä-tēen-gwā-taá: a city of the state of São Paulo, Brazil; 3 miles N. of the Parahyba river; on the railway between São Paulo city and Rio de Janeiro (see map of South America, ref. 6–G). It is the center of a rich coffee region, and has a flourishing trade. Pop. about 10,000. H. H. S.

Guard: See FENCING.

Guardafui, Cape: See CAPE GUARDAFUI.

Guardi, goo-aar'dē, FRANCISCO: a Venetian painter; b. in 1712; a follower of Canaletto, whose drawings he sometimes painted, which accounts for his work being often taken for Canaletto's. He had great facility of invention, and his rapidity was remarkable. He often painted a picture in three days. Many of Guardi's works are in England, but four of the best are in Venice. D. in 1793. W. J. S.

Guard, National: See NATIONAL GUARD.

Guardian [from O. Fr. *guardien*, deriv. of *garder*, of Teuton. origin; cf. Germ. *warten*, Eng. *warden*, etc.]: the custodian of a minor or of any one who is unable to take care of himself. Guardians are of various kinds, and may be divided into two general classes: I. Those who become so by operation of law, without the need of any specific appointment. II. Those who are appointed by courts or by a parent, either in pursuance of some inherent power residing in the appointing tribunal or in accordance with the provisions of particular statutes.

I. The first class includes those kinds of guardians existing at common law, which were four in number: (1) guardian by nature; (2) guardian by nurture; (3) guardian in socage; (4) guardian by estoppel. These forms of guardianship still have a recognized existence in England, and also in the U. S., so far as the fundamental changes which have been made in the laws of inheritance render them admissible in the latter country. (1) A *guardian by nature* was originally one who

had charge of the person, but not of the property, of an heir-apparent until he became twenty-one years of age. This authority was vested primarily in the father, but in case of his death could be exercised by the mother. As in the U. S. all the children of a family inherit equally, guardianship by nature appertains to no particular one among them, but includes the whole number, and, as regards a parent's authority and duties, constitutes the same legal relation that is usually considered in law under the topic of PARENT AND CHILD (*q. v.*). (2) A *guardian by nurture* had charge of the persons of the younger children, who were not heirs-apparent, but his authority terminated when a child reached the age of fourteen. The laws of equal inheritance in the U. S. cause guardianship by nurture to be identical with guardianship by nature, so that, as a distinct relation, it has virtually become obsolete. (3) A *guardian in socage* had custody not only of an infant's person, but also of his lands. Whenever a child under the age of fourteen acquired socage lands by descent, that one of his relatives who could by no possibility inherit the estate had the right to undertake the control of his person and the management of his inheritance until that age was reached. If the child possessed personal property, the guardian might take charge of this also as incidental to his principal trust. The infant upon reaching the age of fourteen had the right to choose a new guardian, but if he failed to exercise this privilege the previous guardianship continued. In the U. S. this form of guardianship is generally superseded by the appointment of guardians by will or action of the courts, though in default of such appointment it is sometimes retained, with important modifications. Thus capacity to inherit the lands would no longer be regarded as a disqualification in the guardian. (4) *Guardianship by estoppel* takes place when a stranger or a wrong-doer interferes with the management or disposition of a minor's property, as by receiving to himself the rents and profits of land. He will then be compelled in a court of equity to account as a guardian, and will be *estopped* from denying a fiduciary relation to the minor's estate.

II. Guardians who are appointed by courts or parents are much more frequently met with than those just described. When the appointment is made by virtue of an inherent power residing in a particular court, the guardian is either (1) a guardian in chancery or (2) a guardian *ad litem*. Other guardians are selected by virtue of statutory provisions, and when appointed by courts are either (3) guardians appointed by probate or surrogate courts, or (4) those appointed by other courts under special statutes. Statutory guardians who are appointed by parents are termed (5) testamentary guardians.

(1) The English court of chancery assumed the power to appoint guardians as incidental to its general jurisdiction over minors and their estates, and this long constituted one of its important prerogatives. In the U. S., courts exercising equity powers have generally retained the same authority, though in some instances the right has been defined anew by statute or in some degree qualified. The guardianship continues until the ward reaches the age of twenty-one. If the appointment is made when he is over fourteen, his selection is commonly allowed fo guide the decision of the court, but when he is under that age the court exercises an independent discretion. The wishes of parents and friends will, however, be considered. The guardian is required to give bonds for the faithful management of the ward's estate. (2) Every court in which an infant is one of the parties to a particular suit has a special and necessary power to appoint a guardian *ad litem* (i. e. for the litigation), to protect the infant's interest during the course of the proceeding. A general guardian will not be permitted to act in such a capacity unless he receives a particular appointment for the purpose. An attorney-at-law is frequently selected, particularly in cases before courts of equity. (3) The ecclesiastical courts of England had no inherent power to appoint general guardians, and it was therefore necessary for the authority to be conferred by statute. Powers of this kind have been quite generally created throughout the U. S. The same principles generally apply to appointments when the infant is above or under fourteen as have been stated in reference to chancery guardians. Courts of equity often exercise a supervisory control over the action of surrogates or probate officers, and may remove guardians appointed by them if good cause be shown, as well as those appointed in other modes. (4) In some States statutes have been passed giving particular courts designated the power to appoint guardians in special instances. Reference must be made to the statutes themselves, and the fact need only be alluded to here for the sake of completeness. (5) Testamentary guardianships are created by the last will of a father, and give the appointee rights superior to the claims of other guardians, and continue until the ward arrives at majority. They are, however, under the control of the court of chancery, may be held to account there, and may be removed if unfaithful. They were introduced by statute in the reign of Charles II. to remedy a defect in the law growing out of the abolition of military tenures whereby children were permitted to enter upon their estates at the early age of fourteen. Statutes have been generally enacted in the U. S. containing substantially the same provisions. The right of appointment is personal to the father, and can not be delegated. It is sometimes qualified, as in New York, by a requirement of the consent of the mother. Testamentary guardians are under the control of courts of chancery in the same manner as other guardians.

The authority of a guardian over the person of his ward is in many respects the same as that which a parent possesses. He has a right to direct the child's education, both in the common branches of learning and in religious training. He may, moreover, act as a parent in changing the child's domicile. If a ward marries, the guardianship of the person terminates, and in the case of a female child the same has been held true of the property. In the management and disposal of personal property a guardian has very extensive powers, but his only right in the control of a ward's real estate is to receive the rents and profits accruing, and to place the land upon lease so that it may continue profitable. All additions to the infant's personal property, as legacies and distributive shares, pass into the guardian's control, and he possesses power to sell chattels without obtaining the consent of the court, but must at the same time exercise prudence and a wise discretion. The erection of buildings or other improvements upon the ward's land with the ward's money is not allowable at the guardian's discretion; and if the guardian uses his own money for the purpose he can have no claim for its recovery. Authority to perform such acts must be derived from the court of chancery. At common law there was no power to sell the infant's land. A special act of Parliament was necessary. But by statute enacted generally in the U. S., authority has been conferred upon the proper court to grant permission of sale upon petition when it appears by judicial investigation that the ward's interests demand such a course. The subject is regulated in detail by statute and by rules of court. The power of a guardian, in all cases, is local, being confined within the jurisdiction of the court by which he is appointed.

The duties of a guardian are the same in nature as those of all trustees, since guardianship is in reality a personal trust. His action must be guided by a constant purpose to subserve the interests of his ward, and not to promote his own advantage. He can not act for his own benefit in any proceedings which he undertakes to enforce his ward's rights or to increase the value of his ward's property, and if he should in such cases receive personal emolument, it would enure entirely to the advantage of the infant. Property must be kept in a productive condition, and if money is received it must not be suffered to lie idle, but should be profitably invested. Rules of court are sometimes established or statutes enacted pointing out the kind of securities in which a ward's money may be invested, and these requirements must be strictly followed. If the guardian is guilty of undue neglect in employing the funds received as his duty demands, he will be charged with simple interest, and in cases of gross delinquency with compound interest. The court of chancery has power to enforce an accounting by a guardian at reasonable intervals in order to exhibit the condition of the estate, and he may also be called to account by the ward when the latter deems it necessary or when he attains majority. Dealings between a guardian and his ward are very carefully scrutinized by the courts, on account of the position of authority which the former possesses and his power to coerce his ward into unreasonable and imprudent bargains. Hence even after the relation has terminated the guardian is permitted to derive no advantage from contracts made with his ward, unless so long an interval has elapsed that the presumption can reasonably be entertained that no unfair advantage was taken. The amount of compensation which a guardian shall receive for his services is usually determined by statute, and is estimated at a certain percentage upon moneys received and paid out.

T. W. DWIGHT.

Guards: troops whose nominal duty it is to guard the person of a monarch. In the British service the Household Brigade, as it is called, consists of the First and Second Life Guards, the Royal Horse Guards, the Grenadier Guards (three battalions), the Coldstream Guards (two battalions), and Scots Guards (two battalions). The body-guards for special ceremonial occasions are the Yeomen of the Guard, the Gentlemen at Arms, and the Royal Archers. The actual guard of the British sovereign's person is detailed from one of the first three regiments of heavy cavalry.

Guárico: See CAPE HAYTIEN.

Guarini, GIAMBATTISTA: Italian poet; b. in Ferrara near the end of 1538; d. in Venice, Oct. 7, 1612. He was great-great-grandson of the celebrated humanist GUARINO DA VERONA (*q. v.*). He studied jurisprudence at Padua, then returned as Professor of Belles-Lettres to Ferrara (1557). Here he married Taddea, daughter of Niccolò Bendidio. Little is known of his private life at this time, except that he had a lawsuit with his father over the division of some property. In 1564 he returned to Padua, became a member of the Academy of the Eterei, and a friend of Tasso. In 1567, however, he went back to Ferrara to enter the service of Alfonso II. d'Este, who trusted him and employed him on numerous missions. The most important of these was to Poland (1574–75), when Alfonso tried to obtain the election to the Polish throne. The mission was unsuccessful; but upon his return to Ferrara, Guarini found himself a greater favorite than ever, especially as the court poet, Tasso (*q. v.*), had now become insane and was confined in the hospital of Sant' Anna, and Guarini alone could rival him in poetical abilities. He did not find the life pleasant, however, and in 1583 he withdrew to his country estate, La Guarina, in the Polesine. Here, too, things went far from smoothly, apparently owing to the poet's proneness to lawsuits, though these could not altogether distract him from composition. In 1585 he was in Turin, at the time of the marriage of Charles Immanuel I. to Catherine, sister of Philip III. of Spain. Fearful of losing him to the duke, Alfonso now recalled him to Ferrara as secretary. He did not long remain, and we find him for a number of years hovering about the little courts of Italy, with occasional periods at La Guarina. He became involved in lawsuits with his own sons, and led an embittered life. His fame grew, however, and in 1611 he had the honor of election as Prince of the Umoristi in Rome, of whose number were Marini, Tassoni, and Chiabrera. In a sense, Guarini's poetical impulse may be said to have come from his desire to rival Tasso. This naturally made his relations with the latter somewhat strained at last, though it did not prevent him from seeing through the press the corrected Ferrarese edition of the *Gerusalemme Liberata* (1581) and Tasso's *Rime* (1582). Up to 1580, however, Guarini produced nothing beyond shorter lyrical pieces—sonnets, madrigals, canzonette, etc.—though many of these had great beauty of diction. In this year, when Tasso's *Aminta* saw the light, he began to think of a more serious composition. The result was the *Pastor Fido*, Guarini's most famous work, which gradually took shape during the next ten years. In 1585 he was able to offer it to Charles Immanuel I., but he did not print it till 1590, and he continued to work upon it until the twentieth edition had appeared (Venice, 1602), to which he adjoined his important treatise, *Compendio della poesia tragicomica*. Long before this, however, the work had attracted widespread attention, and had excited a violent literary controversy with regard to its *genre*, in which the poet himself joined, aiming particularly against a professor of ethics in Padua, Giásone de Nores, two treatises entitled *Il Verato* (1588) and *Il Verato secondo* (1593). The controversy continued throughout the seventeenth century. The *Pastor Fido* itself is what its author called a *tragicommedia pastorale*. The original suggestion seems to have come from the story of Coresus and Callirhoe, which is told by Pausanias (vii., 21, 1); but Guarini made all kinds of changes and additions. The success of his piece came, however, not from the theme, but from the novelty of the conception, the delicacies of the style, the poetic unreality of the situations, the veiled but always discernible learning—in short, the conjunction of qualities dear to the later Renaissance. Its charm was felt by all the cultivated nations of Europe, and most of these soon had translations. That into English was made in 1648 by Richard Fanshaw. Besides the works already enumerated, Guarini left several Latin orations connected with his various missions and public employments; a prose comedy, *La Idropica*, composed in 1582, first played in 1608, and printed in Venice in 1613; a prose dialogue, *Il Segretario, dialogo nel qual non sol si tratta dell' ufficio del Segretario et del modo del compor lettere, ma sono sparsi infiniti concetti alla Retorica, alla Loica, ed alle Morali pertinenti* (Venice, 1594); and a *Trattato della politica libertà*, which was first printed, with a *Life* of Guarini by Ruggieri, in 1818. There is no complete edition of Guarini's works, that of Verona (4 vols., 1737–38) never having been finished. The best edition of the *Pastor Fido* is that of G. Casella (Florence, 1866). See V. Rossi, *Battista Guarini ed il Pastor Fido, studio biografico-critico con documenti inediti* (Turin, 1886); A. Saviotti, *Guariniana* (Pesaro, 1888); F. Th. Richter, *Guarini*, in *Ersch und Grubers Allgemeine Encyclopädie* (Leipzig, 1877).

A. R. MARSH.

Guarino da Verona, gwăă-ree nō-dăă-vā-rō-năă: humanist; b. in Verona, Italy, Dec., 1370. At an early age his abilities attracted attention, and in 1388 he was sent to Constantinople to study Greek at the expense of Paolo Zeni, the rich Venetian. The better to carry out this plan he entered the family of the famous Manuel Chrysoloras (see CHRYSOLORAS, MANUEL) as a kind of amanuensis; and perhaps it was to his enthusiasm that his teacher owed his remarkable reception in Italy not long after. After five years Guarino returned to Italy, and possibly lived for a time in Venice. In 1405 or 1406 he went to Florence, where he was received with admiration and delight by the cultivated circle there devoting itself to the study of antiquity. After a time, however, his success as a teacher and lecturer aroused the jealousy of Nicolò Nicoli, and he found Florence an uncomfortable place to live in. In 1414 he left Florence, and from 1415 to 1418, possibly longer, he was settled in Venice. In 1420 or 1422 he transferred his abode to Verona, where he taught with extraordinary success, having among his pupils some who became distinguished scholars. In 1429 he was invited by the Marquis Nicolò d'Este to Ferrara as tutor to his illegitimate son Lionello. In 1436 he was made Professor of Greek and Latin and of Rhetoric in the university, and he continued to live at Ferrara until his death on Dec. 4, 1460. In many ways he is one of the most interesting figures of the humanistic movement. Unlike most of his fellows, he led an exemplary life, and was true to his wife Taddea Cendrata. His influence as a teacher was almost unbounded, and his theories of education are highly interesting. His literary work, however, was mostly confined to school-books and translations. Among the former may be mentioned his Latin version of the *Erotemata* of Chrysoloras, his *Vocabularius Breviloquus*, and his *Grammaticæ Institutiones*. Among the latter were fourteen *Lives* of Plutarch and several treatises from Plutarch's *Moralia*; Isocrates; Basil's *Homilies*; Strabo. See C. de Rosmini, *Vita e Disciplina di Guarino Veronese e de' suoi discepoli* (3 vols., Brescia, 1805–06); R. Sabbadini, *Guarino Veronese e il suo epistolario* (Salerno, 1885); art. *Guarino* in *Ersch und Grubers Allgemeine Encyclopädie*, by F. A. Eckstein.

LUCY A. PATON.

Guarne'rius, or **Guarne'ri**, gwăăr-nā'rĕe: the family name of certain violin-makers of Cremona in the seventeenth and eighteenth centuries. The most famous of the family was GIUSEPPE ANTONIO (1683-1745), known as GUARNERI DEL GESÙ, whose best work ranks with the finest Amati and Stradivari instruments. The other Guarneri hardly attained the first rank as violin-makers.

Guasipati: capital of the territory of Yuruari, Venezuela; in the district claimed by Great Britain, and in an important mining district on the river Yuruari, a branch of the Essequibo, in about lon. 62° W., lat. 7° 15′ N. Pop. 3,046.

M. W. H.

Guastalla, gwăăs-taal'lăă: town; in the province of Riggo nell' Emilia, Italy, which, together with several large villages—so near as to be almost suburbs—formed the little duchy of Guastalla (see map of Italy, ref. 3-C). This duchy was given in dower by Napoleon I. to his sister Paulina. Afterward it was adjudged by the allied powers in 1815 to the ex-Empress Maria Theresa, and in 1860 it annexed itself to the new kingdom of Italy. The town, which is situated on the Po, 19 miles by rail N. E. of Parma, is the see of a bishop and has a school of music. Pop. 2,648.

Guatemala, gwăă-tĕe-maa'la, rarely **Guatimala**: a republic of Central America. It lies between parallels 14° and 18° N. and meridians 88° and 93° W., and is bounded on the N. by Mexico, on the E. by British Honduras, and on

the S. E. by Honduras and San Salvador. Area, estimated at 63,400 sq. miles. The boundary with Mexico is not yet well settled. It has a full coast-line on the Pacific on the S. W., but reaches the Caribbean Sea only at the head of the Gulf of Honduras.

Topography.—Much of Guatemala is incompletely known and the maps are imperfect. The main chain of mountains runs parallel to the Pacific coast, and only 40 or 50 miles distant. Nearly parallel to this and farther inland is another series of lower and roughly parallel ranges, while beyond these come the departments of Vera Paz and Peten, forming the northern half of the state, the geography of which is practically unknown. The general relief of the country is varied and picturesque. There are no less than thirty-one volcanic summits, some of which are surrounded by an extensive *malpais*, and furnish an abundance of sulphur. The most famous of these is the Volcan de Agua, or Water Volcano, which destroyed old Guatemala with a deluge of water in 1841. It is 13,100 feet high. The water was probably derived from a crater lake. The state is well watered. The streams on the west side have only a short course before the Pacific. Those on the N. and N. E. pass into Mexico and British Honduras. The Motagua, on a branch of which is the capital, is the largest of the streams in Guatemalan territory. It rises between the two sierras, and after a course of 250 miles it falls into the Bay of Honduras near the Honduranian frontier. It is navigable to within 90 miles of the capital. To the N. of it lies Lake Izabal, or Golfo Dulce, which is connected with the sea by the broad strait-like Rio Dulce, and, except for the bar at the mouth of the latter, permits free navigation 50 miles inland. Lake Peten, in the department of the same name, is of irregular form, about 27 miles long and 13 in extreme breadth. It is celebrated for the antiquities found about it, especially on an island in its western portion, on which stands the village of Flores, the capital of the department.

Climate.—The climate is a healthful one except in the vicinity of the swamps along the Pacific coast. The mountainous character of the surface gives a triple division to the climatal areas, depending on altitude—viz., *tierra caliénte*, *tierra templáda*, and *tierra fría*, or hot, temperate, and cold districts respectively, the middle one being at elevations between 1,300 and 4,900 feet. The rainfall is from 50 to 80 inches, and is greatest on the eastern coast. The rainy seasons are of the usual tropical type—that is, double. They occur in early summer and in autumn, with a short dry season in late summer and a long one in winter. The autumnal rains grow longer and extend into early winter as the east coast is approached. During the summer rainy season the weather is often tempestuous; cold northers, apparently from the Gulf of Mexico and the U. S., are occasionally felt.

Productions.—The mines in the republic are of small importance. About 40,000,000 of pesos of silver have been taken from the mines at Alotepeque, but they are practically exhausted. Lead, coal, and marble are known to exist in considerable quantities, and lithographic stone is said to exist in Zacapa. The fauna is more like that of South than North America. The jaguar, cougar, and tapir are common. Bats are so numerous that villages are sometimes depopulated because of them. The alligators are of different species on the Atlantic and Pacific slopes. Insects, especially mosquitoes, are very abundant. Horses are small but excellent; cattle are raised to some extent, but are generally imported. Vegetation is very rich, especially in the *tierra caliénte*, and the country abounds in magnificent forests of valuable woods, the commercial use of which has barely begun. Maize and haricot beans form the chief sustenance, and rice and wheat are extensively grown. The coffee of Guatemala is so excellent that it rarely gets into the general trade, but is bought on the bush for special markets. Indigo and cochineal were formerly important products, but they are being replaced in trade by the anilines and other artificial colors. Cocoa is extensively cultivated. Among the other productions are tobacco, sugar, vanilla, chili, aloes, sarsaparilla, ipecacuanha, castor oil, and colocynth.

Population in 1880, 1,224,602. The census of 1890 showed it to be 1,460,017. About 60 per cent. are Indians, the remainder mostly half-castes. Descendants of pure European blood are rare. About one-third of the births are illegitimate—due chiefly to the scarcity of priests to perform marriage service. The Indian population is quiet and inoffensive except when under political or religious excitement. Cock-fighting and bull-baiting are the common amusements. Roman Catholicism is the recognized religion, but all sects have freedom of worship.

Administration.—The republic is divided into twenty departments. The government is representative, and the power is vested in a national assembly, the members of which are elected by universal suffrage for four years and a president elected for six years. The net revenue for 1890 was $6,638,366, and the expenditure $8,300,778. Nearly half the revenue is from duties, and most of the remainder from taxes on spirits, tobacco, etc. More than two-thirds of the expenditure is for public debt, education, and war. On Jan. 1, 1891, the total debt was $16,663,557, and it was increased during 1890 by $3,094,367. Less than $5,000,000 of this indebtedness is foreign. The paper money is maintained at par. The army in 1891 consisted of 3,718 officers and men, and there is a reserve militia of 67,300. In 1890 there were 1,252 schools, of which 462 were rural, attended by about one-third of the children of school age, and were maintained at an expense of $534,144. There is a railway from San José on the Pacific coast to the capital (72 miles), and another from Champerico, another Pacific coast port, northward. The latter is 27 miles long, but will eventually reach San Felipe, near the Atlantic coast. Roads are few, and communication over the country is generally by mule-paths. The imports increased from $3,500,000 in 1886 to $7,640,000 in 1890, and the exports from $6,700,000 to $14,400,000. The chief imports were spices, cotton yarn and cloth, woolen goods, and railway, telegraph, and electric-light material. The imports from the U. S. amounted to $1,200,000. The chief export was coffee, valued at $12,700,000. The sugar and fruit trades are developing rapidly.

Weights, Measures, etc.—The old Spanish weights and measures are in general use. The unit of currency is the *peso*, or dollar of 100 *centavos* of nominal value of $1.00 of the U. S., but in exchange worth about 75 cents.

History.—Many ruins exist to show that there was a high state of civilization among the native races, but these remains have been only partially explored, and appear to be not so important as those of Honduras and Southern Mexico.

In 1524 the Spaniards under Pedro de Alvarado entered the country from Mexico; they easily conquered the Quiches, Cachiquels, and Zutugels; and the audience and captain-generalcy of Guatemala was established, embracing in its jurisdiction all of Central America to the bay of Chiriqui and Chiapas. In 1821 the independence of the country was proclaimed; soon after it joined the Mexican empire of Iturbide, but again became independent in Jan., 1823. In 1824 a confederation of Central American states was formed, and slavery was abolished. The confederation finally fell to pieces in 1839. Then, and for many years after, Guatemala was more or less dominated by Salvador. It completely regained its autonomy in 1851, under Carrera, who was made president at first until 1856, afterward for life. Carrera went to war with San Salvador in 1863, and though the latter state was joined by Honduras, he was successful, occupied the capital of San Salvador, and controlled Honduras and Nicaragua. He died in 1865, and was followed by Gen. Cerna, his own nomination. The liberal party deposed Cerna in 1871, drove out the Jesuits, confiscated their property, and in 1873 placed Barrios in the presidential chair. Barrios pursued a progressive policy. In 1886 Barillas was elected president. Since the end of the confederation in 1851 various attempts have been made to unite the Central American republics, but without success. Guatemala has remained the leading republic, but its financial condition and the ambition of its president have made its recent history troubled. In 1890 cholera and in 1891 smallpox made serious ravages.

References.—Bailly's translation of Juarros's *Compéndio de la história de Guatemala* (1808–18); Ximenez, *Las histórias del orígen de los Indios de Guatemala* (1857); Gavarrete, *Catacismo de geografía de la república de Guatemala* (1860); Foledo, *Geografía de Centro-América* (1874); Bernouilli, *Briefe aus Guatemala*, in Petermann's *Mittheilungen* (1868–69), and *Reise in der Republik Guatemala, ib.* (1873); Stoll, *Guatemala* (1886); Squier, *The States of Central America* (1868); Lemale, *Guía geográfica de los céntros de población de la república de Guatemala* (1882); Brigham, *Guatemala* (1887); official publications of the state, as *Cénso generál* (1881); Bianconi and Medina, *République de Guatemala* (1890); *Informe de la Dirección de Estadística* (1892); *Informe de la Secretaría de Fomento* (1892); *Memórias de los Secretários de Estádo del Gobierno* (1892);

Movimiento de población . . . durante el año de 1891 (1892); also U. S. and British *Consular Reports*.

MARK W. HARRINGTON.

Guatemala, Audience of: See CONFINES.

Guatemala la Antigua, -laa-añn-tee gwañ, or **Old Guatemala**, frequently called merely **Antigua**: former capital of the republic of the same name, destroyed by an earthquake in 1773, was situated in a beautiful valley in lat. 14° 33′ N. and lon. 90° 44′ W., 15 miles W. of the present capital. Before its destruction it was one of the richest, most populous, and most beautiful cities of Spanish America, and had about 60,000 inhabitants. The ruins are still very impressive, and some have been reoccupied. The place was seriously damaged by an earthquake in Sept., 1874. Pop. 14,000. A still older Guatemala was washed away by the Volcan de Agua seventeen years after it was founded by Alvarado.

M. W. H.

Guatemala la Nueva, -laa-noo-ā′vañ, or **New Guatemala**: capital of the republic of the same name; in lat. 14° 36′ N., lon. 90° 30′ W.; elevation above the sea, 4,932 feet; is on the northern end of a large plain, and is surrounded by ravines (see map of Central America, ref. 4–E). It is laid out in wide, regular streets, and has extensive suburbs. The houses are usually of one story, with extensive courts and gardens, and are solidly built. It has several large and attractive open squares or plazas. The principal building is the cathedral, erected in 1780, of simple and elegant design, occupying a space about 450 feet square. The interior decorations include sculptures in wood, and paintings by native artists. There are twenty-four other churches, a hospital, a university, a medical school, the Government buildings, a mint, and other public buildings. The educational advantages are the best in Central America, and include, besides the university, a normal school, a polytechnic, a military college, and several schools for girls. An excellent museum was founded in 1831, and is maintained by the Sociedád Económica. Water is brought from a distance of 8 miles. The city is lighted by electricity, has modern street cars, and an excellent police-force. Its general air of brightness and prosperity has caused it to be called the Paris of America. Pop. (1891) 70,000. MARK W. HARRINGTON.

Guatemotzin, gwaä-tā-mōt-zeen′, or **Guatemoc**, gwaa tā-mōk (also written GUATEMOZIN, QUAUHTEMOTZIN, QUAUHTEMOC, CUAUHTEMOC, etc.): the last Aztec sovereign of Mexico; b. about 1497. He was a nephew of Montezuma II.; was one of the leaders against the Spaniards in 1520; subsequently became high priest, and on the death of Cuitlahuatzin (Sept., 1520) was elected sovereign. He defended Mexico against Cortés in the famous siege, May–Aug., 1521; on the fall of the city attempted to escape in a boat, but was captured by one of the Spanish brigantines (Aug. 13, 1521) and brought before Cortés. The latter was pleased with his noble bearing, and at first protected him, but later he permitted him to be tortured in an unavailing attempt to make him tell where treasure had been concealed. Subsequently Guatemotzin permitted himself to be baptized. He and other captive chiefs were forced to accompany Cortés on his march to Honduras 1524; on the way he was accused of inciting a revolt, and was hanged in Tabasco (early in 1525). HERBERT H. SMITH.

Guavas, gwaa′vaä [from Span. and Portug. *guayaba*, from Brazilian *guayaba*, *guaiva*]: the fruits of *Psidium pyriferum*, *pomiferum*, *cattleyanum*, *pygmæum*, *album*, and other species of the genus, which consists of trees and shrubs of the Asiatic and American tropics, mostly natives of the New World, though cultivated in nearly all warm climates, where they yield important dessert fruits, that of *P. pyriferum* (white guava) being the best. From this is made the guava jelly, a conserve extensively exported, and highly prized for its flavor. It is cultivated to a considerable extent in Florida. The guavas belong to the *Myrtaceæ*.

Guaviare, gwaä-vēē-aa′rā: a river of South America, western branch of the Orinoco; rising on the east slope of the Andes, S. of Bogotá, Colombia, and flowing easterly through a little-known region of forests and llanos; length about 725 miles. It is navigable through about two-thirds of its course, and must ultimately be a highway of great importance, though it is now little frequented. The lower portion of the territory drained by it is claimed by Venezuela.

H. H. S.

Guayane, or **Guayanna**: a former province of Venezuela, corresponding, nearly, to the present state of BOLIVAR (*q. v.*).

Guayaquil, gwī-ăä-keel′: the principal port of entry and largest city of Ecuador; on the right bank of the estuary of the river Guayaquil, or Guayas; about 40 miles from the gulf and 100 miles from the open sea; 165 miles in a direct line S. W. from Quito, but 236 miles by the nearest practicable route (see map of South America, ref. 3–A). The river forms an excellent port, but very large vessels can only reach it at high tide; they generally anchor in the gulf, 47 miles below. The city, built on low, flat lands, is composed almost entirely of flimsy wooden buildings; the streets are dirty and badly paved, and in what is called the old town very crooked; the new town contains the principal commercial houses and residences of the richer class, and is well laid out. The climate is hot and unhealthful; severe epidemics of yellow fever are common, and bilious or "Guayaquil fever" is almost always present. More than half of the total foreign commerce of Ecuador centers here, the principal exports being cacao, rubber, coffee, hides, and ivory-nuts. A railway, starting from the port of Duran, on the opposite side of the river, runs to the base of the Andes. Guayaquil was founded in 1535, on the site of an Indian town. It has suffered frequently from earthquakes, fires, pirates, and revolutions. The city is the see of a bishop, and has a theological seminary and a national college. Pop. (1890) 44,772. HERBERT H. SMITH.

Guayaquil, GULF OF: an inlet of the Pacific Ocean dividing the coast of Ecuador, at lat. 3° S. It is the largest gulf on the Pacific coast of South America, and forms the best and most secure harbor. At its mouth it is 140 miles wide, narrowing gradually and divided within by the island of Puna; large vessels generally anchor on the inner side of this island, and freight and passengers are carried to the city of Guayaquil by small steamers and lighters. The shores are flat and unhealthful. The river Guayas, the most important of Ecuador, flows into this gulf, which may be regarded as its estuary mouth. HERBERT H. SMITH.

Guayas, gwī′ăas: a maritime province of Ecuador; bounded N. W. by Manabi, N. by Pichincha, E. by Los Rios and Oro, S. by the Gulf of Guayaquil, and W. by the Pacific; area, 8,214 sq. miles; pop. (1885) 95,640. Capital, Guayaquil. Guayas lies entirely in the lowland between the Andes and the Pacific, and much of it is covered with thick tropical forest. The climate is everywhere hot and often unhealthful. Agriculture is the principal industry, the most important crop being cacao; coffee, sugar-cane, tobacco, and rice are also raised. *Jipijapa* or so-called Panama hats are made in large quantities by the peasants.

HERBERT H. SMITH.

Guaymas, gwī′măas, or **San José de Guaymas**: the principal coast city and port of entry of the state of Sonora, Mexico; on Yaqui Bay, a branch of the Gulf of California (see map of Mexico, ref. 3–C). It is built on an arid plain, nearly shut in by mountains; the climate is hot, dry, and frequently unhealthful; but owing to its excellent harbor, and to the Sonora railway, which has its terminus here, it has developed a thriving trade, and is growing rapidly. Pop. about 7,000. The name is derived from that of a tribe of Indians. H. H. S.

Gubbio, goob′bĕĕ-ō [Ital. < Lat. *Igu′vium*, the ancient name]: town; in the province of Perugia, Italy; about 27 miles from Urbino (see map of Italy, ref. 4–E). It was an Umbrian city before the founding of Rome, by which it was ultimately conquered. During the Middle Ages it was for a time a small independent republic of 50,000 inhabitants; then fell into the hands of the Dukes of Urbino. Dante found refuge here between 1316 and 1318. There are interesting remains of the ancient fortress, of the theater, and of Etruscan tombs. There are some remarkable old churches, and the municipal palace, of the fourteenth century, is one of the finest existing examples of Renaissance architecture. This palace contains the famous Tavole Eugubine, consisting of seven bronze tablets covered with inscriptions in a very ancient Umbrian character. These tablets were found in a temple of Jupiter not far from Gubbio, and their interpretation has been the subject of much discussion among archæologists. (See Lepsius, *Inscriptiones Umbricæ et Oscæ*, Leipzig, 1841; Bucheler, *Umbrica*, 1883.) In the same building are a valuable library and many fine pictures; also a collection of antique vases, coins, etc., together with specimens of the beautiful ware decorated by Maestro Georgio da Gubbio and known to connoisseurs as the "Gubbio majolica." The modern town is supplied with good water by an aqueduct, and a very large and strongly

built reservoir called the Bottacione. It has some commerce, and is a bishop's see. Pop. 5,540.

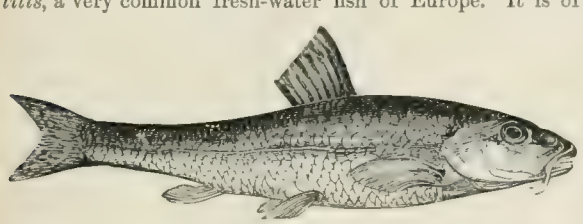
Guben, goo'ben: town; in Brandenburg, Prussia; on the Neisse; 28 miles S. of Frankfort on the Oder (see map of German Empire, ref. 4–H). It has extensive manufactures of woolen and linen hosiery and yarn, and a brisk shipping trade on the Neisse, whose banks here are planted with vines. Pop. (1890) 29,420.

Gubernatis, goo-bär-naa'tēes, Angelo, Count de: Orientalist and *littérateur*; b. at Turin, Italy, Apr. 7, 1840. He founded the Italian Asiatic Society in 1886. He is a prolific writer, most widely known as the author of *Zoölogical Mythology* (1872), and the editor of the *Dictionnaire International des Écrivains du jour*. C. H. Toy.

Gubler Waters: See Châtelguyon.

Gude, goo'de, Hans Frederik: landscape-painter; b. in Christiania, Norway, Mar. 13, 1825. He has produced a large number of paintings of Norwegian mountain scenery. In 1854 he was elected to a professorship at the Düsseldorf Art Academy, but in 1880 he accepted a call from the Berlin Academy. He received a gold medal at the World's Exposition in Paris, and another from the Berlin Academy. R. B. A.

Gudgeon [M. Eng. *gojon*, from O. Fr. *goujon*: Ital. *gobione* < Lat. *go'bio*, *gobio'nis*, deriv. of *gobius*, *cobius*, gudgeon (whence Eng. *goby*) = Gr. κωβιός]: the *Gobio fluviatilis*, a very common fresh-water fish of Europe. It is of



The gudgeon.

the carp family; is a bold biter, and is taken in large quantities with nets. It seldom exceeds 8 inches in length, and is marketed alive, being kept in water until sold. The Niagara gudgeon (*Gobio cataractæ*) is caught in the Niagara river, and is only 5 inches long.

Gudgeon, or **Journal**: the metallic end of a revolving shaft in machinery, or a piece attached to the end of a shaft to receive the wear and tear of friction. Gudgeons turn in journal-boxes, upon brass, Babbitt metal, lignum-vitæ, or other bearings, and are variously lubricated. See Friction.

Guebers, gee'bėr, or **Ghebers** [Pers. *Gabr*, a fire-worshiper]: those who belong to the Persian sect of fire-worshipers, and follow the religion taught by Zoroaster. A few thousands are still found in Persia. In Western India the Ghebres or Parsees, as they are also called, number about 74,000. See Parsees.

Guebwiller: See Gebweiler.

Gueguetenango: See Huehuetenango.

Guelder Rose: See Snowball.

Guelph: city; capital of Wellington County, Ontario, Canada (for location of county, see map of Ontario, ref. 4–D); on the Speed river, and the Grand Trunk and the Canadian Pac. Railways; 47 miles W. of Toronto. It is the center of the greatest cattle-raising region on the continent, and has a large trade, fine water-power, manufactures of woolen goods, agricultural implements, sewing-machines, furniture, carriages, carriage parts, musical instruments, and lime, and 2 daily, 2 weekly, and 2 monthly periodicals. Excellent building-stone is quarried in the vicinity. Pop. (1881) 9,890; (1891) 10,539.

Editor of "Mercury and Advertiser."

Guelph Fund: name applied to the property of 48,000,000 marks ($12,000,000) which was granted by Prussia to the deposed King George V. of Hanover, Sept. 29, 1867, but was taken from him Mar. 2, 1868, on his persistent refusal to renounce his title to the throne. The fund was kept by Prussia and the income devoted to combating Guelph intrigues. Beginning with 1879, the widow of George V., Queen Marie, and two daughters received an income of 240,000 marks from this fund. In 1892 the entire income of the fund was restored to the Duke of Cumberland, son of the ex-king. In Germany the fund was often spoken of as the "Reptile Fund," and was supposed by some to have been used by Prince Bismarck in bribing the press.

C. H. Thurber.

Guelphs, gwelfs, and **Ghibellines**, gib'e-linz [*Guelphs* is from Ital. *Guelfo*, from O. H. Germ. *Welf*, Guelph, liter., whelp; *Ghibellines* is from Ital. *Ghibellino*, from O. H. Germ. *Waiblingen*, a proper name]: names of two mediæval factions. These distinctive appellations were first employed in the twelfth century, and in the contest between the empire and the Church the name of Guelph was equivalent to a partisan of the Church, and the name of Ghibelline to a partisan of the empire. The vulgar tradition says that Guelph and Gibel (called Gibel and Gualef in the chronicle of Pietro Azario in the collection of Muratori) were two brothers who lived in Pistoia, one of whom took the side of the pope, the other that of the emperor, and that hence were formed two great parties in Italy which assumed the names of their separate founders; but this tradition has no historical value. Another states that in the battle near Weinsberg, fought in Germany in 1140 between the troops of Conrad III. of Suabia and those of the Duke of Bavaria, Welf VI. (Guelfus), the former took for their war-cry *Hie Gieblingen* (Gieblingen or Waiblingen was a Suabian fortress, and the Hohenstaufens and their followers were called Waiblingen); and the latter, on the other hand, had for their cry, *Hie Welf!* It is probable, then, that these two designations passed into Italy, or at least made their way toward it, with the Hohenstaufen Suabians, or Waiblingen, against whom the Italians fought under the guidance or the inspiration of Alexander III. and his successors. The German followers of the Suabians, Waiblingen or Ghibellini, having come into Italy, may themselves have given the name of Guelphs to their new enemies. The fury of partisanship was such that simply to call one's self Guelph or Ghibelline became perilous, and Pope Benedict XII. in 1334 found it necessary to prohibit, under pain of banishment, the employment of these epithets, which excited such furious indignation and such sanguinary conflicts. The Guelphs took for their device an eagle tearing a blue dragon, which, in place of a crown, wore upon its head a red or yellow lily, the badge of the Ghibellines; this lily was sometimes exchanged for the red rose. The towers of a palace indicated the party of the owner; if a Guelph, the battlements were *square*; if a Ghibelline, they were *swallow-tailed*. In Florence the Bianchi united themselves with the Guelph party, and the Neri with the Ghibellines; notwithstanding this, the Neri repossessed themselves of Florence by the aid of Pope Boniface VIII., and the Bianchi, being driven out of Florence, became Ghibellines. The names Guelphs and Ghibelline were afterward generally used to indicate two hostile factions in whose mutual quarrels the person of the pope or the emperor had little concern. They were, for the most part, rivalries between family and family, quarter and quarter, village and village, town and town, and in order to give a specious pretext for their sackings, their plunderings, and their assassinations, they invoked in their defense the imperial cause or the rights of the Church. While the latter had manifested a fierce zeal in the wars against the Suabians in the thirteenth century, now, having taken refuge in Avignon, she showed herself entirely indifferent to the conflicts of the Italian partisans who affected to fight either for or against her. The chronicler Pietro Azario, confessing that he had seen "Guelfs fight against one another more fiercely than against Ghibellines," throws a very sinister light upon the character of these factions, which, far from contending for an idea, were incited by the most vulgar interests and the most savage passions. It would be difficult to show which of the two factions had caused, not the most benefit, but the most mischief to Italy and to civilization; certainly both were very fatal. The Guelphs formed the first Company of the People to oppose the tyranny of the Ghibellines; but when the Guelph party had obtained the ascendency it showed itself even worse than the Ghibellines, by favoring those Guelph princes who desired to acquire dominion over certain towns; by creating plebeian governments, which are the least durable because they are the worst; by converting the political question into a social question; and by often calling in against dangerous nobles a fatal foreign intervention. Dante Allighieri, himself in his youth first with the Guelphs and afterward with the Ghibellines, when verging upon old age boasts in his *Paradiso* "that he had made a party for himself," and declares

"the Guelphs and the Ghibellines to be the cause of all the miseries of Italy" (*Parad.* vi. 97–102).

Revised by C. K. Adams.

Guelphs, Order of (usually, but incorrectly, called the **Guelphic Order**: an order of knighthood founded on the anniversary of his birthday, Aug. 12, 1815, by George IV. of England, as regent of Hanover, for his German subjects, but conferred upon many British subjects by George IV. and William IV. Its members are not reckoned as knights in Great Britain, and since the extinction of Hanover the Prussian Government does not recognize its existence.

Güemez de Horcasitas, goo-ā māz-dā-ōr-kăă-see'tăăs, Juan Francisco: general; b. in Oviedo, Spain, in 1682. He served in the Peninsula and Africa, and from 1734 to 1746 was captain-general of Cuba; during this period he gained immense wealth by securing commercial monopolies. Promoted Viceroy of Mexico, he ruled that country from July 9, 1746, to Nov. 18, 1755. On his return to Spain he was created Count of Revillagigedo and captain-general of the army. D. at Madrid, 1768. H. H. Smith.

Güemez Pacheco de Padilla Horcasitas, -păă-chā kō-dā-păă-deel yăă-, Juan Vicente: second Count of Revillagigedo, and better known by his title; b. at Havana, Cuba, 1740. He early adopted the career of arms, and won great distinction in the Peninsular wars. In 1788 he was named Viceroy of Buenos Ayres, but almost immediately was removed to the viceroyalty of Mexico, taking charge of the government of that country Oct. 17, 1789. His term was very prosperous, and he is remembered as one of the best viceroys Mexico ever had; numerous abuses were reformed by him; he cleansed and beautified the capital, established regular mail service, promoted explorations on the Pacific coast, and was beloved because he secured justice to the meanest subject. He was, however, noted for his eccentricities. Revillagigedo was relieved May 15, 1749, and returned to Spain, where he was made director-general of artillery. D. at Madrid, May 2, 1799. H. H. Smith.

Guerara: same as Gerrara (*q. v.*).

Guercino, gwăr-chee'nō, Giovanni Francesco Barbieri (called Guercino from a squint he had): an Italian painter; b. at Cento, near Bologna, in 1590. After some residence at Rome he returned to Cento in 1623, and resided thenceforth in the north of Italy. The great frescoes of the Cathedral of Piacenza occupied him for many years, and about 1640 he removed to Bologna, where he lived from that time. His finest works, the *S. Petronilla*, the *Aurora*, the *St. Philip Neri*, are in Rome; the *St. Sebastian* and the *Virgin with the Swallow* are in the Pitti Palace, and there are four in the Uffizi, at Florence; *St. Bruno and his Companions* and several others are at Bologna; a *Cephalus and Procris* and a *Venus Weeping for Adonis* are in the gallery of Dresden. His style varied much at different periods. His best pictures belong to the second period. His large pictures numbered 250; of smaller works in oil and frescoes he painted very many, and he left a vast collection of drawings. D. in 1666. Revised by Russell Sturgis.

Guereza, gĕ-ree'za: a large, showy monkey (*Colobus guereza*) inhabiting Abyssinia and many parts of tropical Africa. The body is shining black, a band across the forehead, the sides of the neck, the throat, and the end of the short, bushy tail white, as is also the long "mantle" which hangs from the back down the sides and flanks. The fur of this and closely related species is in much demand for muffs and fur collars, but when thus used is dyed a uniform black. F. A. Lucas.

Guericke, gā'ri-ke, Heinrich Ernst Ferdinand, Ph. D., D. D.: theologian; b. at Wettin, 10 miles N. W. of Halle, Prussia, Feb. 25, 1803; from 1829, with an intermission of five years (1835–40), was a professor in the University of Halle. He published *De Schola quæ Alexandriæ floruit* (2 vols., Halle, 1824–25); *Handbuch der Kirchengeschichte* (3 vols., 1833; 9th ed. 1866–67), translated by Prof. W. G. T. Shedd (2 vols., Andover, 1860–70); *Allgemeine christliche Symbolik* (Leipzig, 1839; 3d ed. 1861); *Historisch-kritische Einleitung in das Neue Testament* (1843; 3d ed. under title *Neutestamentliche Isagogik*, 1868); *Lehrbuch der christlichen Archäologie* (1847; 2d ed. 1859), translated by A. J. W. Morrison (*Manual of the Antiquities of the Church*, London, 1851); and some minor works. He was a stanch champion of old Lutheranism. D. in Halle, Feb. 4, 1878.

Revised by S. M. Jackson.

Guericke, Otto, von: physicist; b. at Magdeburg, Germany, Nov. 20, 1602; was burgomaster of that town 1646–81; invented the air-pump 1650; also first constructed the "Magdeburg hemispheres," and made a rude barometer. His principal works are upon physics, etc. Of these, the *Experimenta Nova* (1672; new ed. 1881) is the most noteworthy. D. at Hamburg, May 11, 1686.

Guérin, gā'răn', Eugénie, de: b. at Cayla, Languedoc, in 1805; devoted her life mainly to the care of her brother, Georges Maurice de Guérin. She was a woman of saintly life and of fine intelligence. Her *Journals and Letters* (Paris, 1862; Eng. trans. London, 1865–66, 2 vols.) are remarkable for the rare genius displayed, as well as for the delightful style and devout spirit in which they are written. See *Maurice and Eugénie de Guérin*, by Harriet Parr (London, 1870).

Guérin, Georges Maurice, de: poet; b. in Languedoc, France, Aug. 4, 1810; entered the Church and joined a religious community at La Chesnaye in Brittany, but left it in 1833; went to Paris, where he became a teacher at the Collège Stanislas, and married a creole lady. He was a poet of rare power and of great original talent. His *Reliquiæ* (2 vols., 1860, with a critical notice by Sainte-Beuve) contains his poetical fragments, letters, etc. D. in Paris, July 19, 1839. See Matthew Arnold, *Essays in Criticism* (1865); Harriet Parr, *Maurice and Eugénie de Guérin* (London, 1870).

Guérin, Pierre Narcisse, Baron: historical and genre painter; b. in Paris, May 13, 1774; pupil of Regnault; among his own pupils were Géricault, Delacroix, and Ary Scheffer; Grand Prix de Rome 1797; director French Academy at Rome 1822; created baron 1829; member of the Institute 1819; officer Legion of Honor 1832. His pictures show extreme academical tendencies, and are unsympathetic in style. Among these are *Phædra and Hippolytus* (1802); *Andromache and Pyrrus* (1810); *Dido Listening to the Story of Æneas* (1817); and *Clytemnestra urged by Ægisthus to the Murder of Agamemnon* (1817), in the Louvre; *Napoleon Pardoning Rebels in Cairo* (1806), Versailles Museum; and works in the museums of Bordeaux, Angers, and Valenciennes. D. in Rome, July 16, 1833.

William A. Coffin.

Guernsey, gĕrn'zĕe: the westernmost and (except Jersey) the largest of the Channel islands (see map of France, ref. 2–B). It has a varied, fertile surface, a fine healthful climate, and a thrifty population, who speak a Norman-French dialect, and, though subject to Great Britain, have their own legislature. Capital, St. Peter Port. Area, 12,605 acres. Pop. (1891) 37,754.

Guéroult, gā'roo', Adolphe: writer on social and political economy; b. at Radepont, France, Jan. 29, 1810; entered the St. Simonian Society 1830; was for years a foreign correspondent of the *Journal des Débats*; French consul at Mazatlan 1842–47, at Jassy 1847–48; became one of the editors of *L'Industrie* 1851; sub-chief of *Le Crédit foncier* 1852; founded *L'Opinion Nationale* 1859; was in the Corps Législatif 1863–69, and was a distinguished opponent of Ultramontanism. Author of *Lettres sur l'Espagne* (1838); *De la question coloniale* (1842); *Discours prononcés au corps législatif* (1869); and other works. D. in Paris, July 22, 1872.

Guerrazzi, gwăr-răăt'sĕe, Francesco Domenico: patriot and author; b. at Leghorn, Italy, Aug. 12, 1804. While studying law at Pisa he made the acquaintance of Byron, who produced a strong impression upon him. His eulogy of *Cosimo del Fante* caused him to be restricted in residence to Montepulciano, where Giuseppe Mazzini went to visit him and gave him a new political impulse, as Byron had already given a poetical one. In 1827 Guerrazzi published his *La Battaglia di Benevento*, an imaginative romance filled with protests against tyranny. He was imprisoned in 1831, and banished to Portoferraio, in the island of Elba, in 1834. There he wrote his masterpiece, *L'Assedio di Firenze* (1836), which reveals in a remarkable degree all the good and all the bad qualities of Guerrazzi's genius. It is written as if in the heat of battle, and it powerfully incited the Italian youth to rise against the *foreigner*. *Isabella Orsini* (1844), *Veronica Cybo*, and the *Nuove Tartufi* followed; then his *Autobiographical Letter* to Giuseppe Mazzini. In 1848 he was elected deputy, and finally, on the overthrow of the Capponi ministry, he was chosen triumvir with Giuseppe Montanelli and Giuseppe

Mazzini; afterward, on the flight of the grand duke, he was proclaimed republican dictator. As a statesman his violence irritated the people, who, on the restoration of the grand duke, turned against the ex-dictator. He was illegally arrested, iniquitously prosecuted, and, in spite of his admirable *Apology* (1857), was condemned to perpetual exile. He went first to Corsica, where, in a state of hypochondria, he wrote the terrible *Beatrice Cenci* (1854); afterward followed the *Torre di Nonza* and *Fides*. After some time he returned to Genoa, where he wrote *Il Buco nel Muro*, a most graceful and humorous little work, the *Asino*, a bitter political and social satire, and several other smaller stories. After the proclamation of the kingdom of Italy, Guerrazzi was several times elected to Parliament, and he had just finished his romance entitled *Il Secolo che muove*, afterward published, when he died suddenly, on Sept. 23, 1873. See the work on Guerrazzi by Bosio (1877) and the *Letters* edited by Carducci (2 vols., Leghorn, 1880–82).

Guerrero, gwār-rā'rō (named for a popular hero of the revolution; see next article): a southern state of Mexico; bounded N. W. by Michoacan, N. by Mexico, Morelos, and Puebla, E. by Oajaca, and S. W. by the Pacific; area, 22,866 sq. miles. The mountain-chain called the Sierra Madre del Sur runs through the state from end to end, parallel to the coast, with occasional peaks over 10,000 feet high; the whole northern part of the state is high and more or less mountainous; the coast region is low, but much broken by spurs from the Sierra. The mountain slopes are covered with heavy forest; elsewhere there is much open land, in part very fertile, in other places arid. Agriculture and stock-raising are the principal industries. There are numerous mines of silver, some of the ores yielding gold, but only a few of them are now worked; lead, copper, quicksilver, platinum, and coal are reported. The state of Guerrero was erected in 1847 from portions of Puebla and Michoacan. Pop. (1889) 353,193; capital, Chilpancingo; principal port, Acapulco. HERBERT H. SMITH.

Guerrero, VICENTE: general; b. at Tixtla, Mexico, now in the state of Guerrero, Aug. 10, 1783. He was of humble birth, joined the revolutionists of 1810, and speedily won distinction as a guerrilla chief. After Morelos and other patriot leaders had been killed or imprisoned, Guerrero was for some years almost the only representative of the revolution; with a small band he maintained himself in the southern mountains, repeatedly defeating the Spaniards. Iturbide, who was sent against him in 1820, eventually declared for independence. Guerrero at once joined forces with him, and aided in the expulsion of the viceroy; but he was opposed to the crowning of Iturbide, and was one of the leaders of the army which dethroned him in 1823; subsequently he was a member of the executive junta 1823–24, and vice-president in the Victoria administration 1824 to 1828. As leader of the Yorkino party he led an armed resistance to Pedraza, who had been elected president to succeed Victoria; Pedraza was defeated, congress declared his election void, and made Guerrero president Jan. 12, 1829. Revolts against him broke out almost immediately; unable to maintain himself, he retired to the south at the end of a year. There he kept up a resistance to the Government which had supplanted him until Jan., 1831, when he was captured by a ruse; a court martial condemned him to death, and he was shot at Chilapa, Feb. 14, 1831.
HERBERT H. SMITH.

Guerril'la [Span., dimin. of *guerra*, war, from Teuton. *wërra*, difficulty, conflict: Eng. *war*]: properly the name of partisan warfare, but applied to men serving in a war in an irregular, unauthorized manner. The name was first given to an irregular partisan soldiery of Spain, especially to that which opposed Napoleon's armies between 1808 and 1815. From Spain the name was carried to Spanish America, and thence to the U. S. In the civil war in the U. S. guerrilla-parties were common at various times and places in the border States. If guerrillas are taken captive in open warfare, they should be treated with the privileges of war, unless they are proved guilty of such special crimes as murder, or the killing of prisoners, or the sacking of places, in which cases they are deemed to have forfeited such privilege. Though often a great annoyance to an invading army, they seldom are of much real service to their own side. In Napoleon's wars in Spain, however, his armies met for a time with much serious trouble from guerrilla-parties, to whom the mountainous nature of the country gave great advantages.

Gueselin, BERTRAND DU: See DU GUESCLIN, BERTRAND.

Guess, GEORGE, or **Sequoyah**: a Cherokee half-breed; inventor of the syllabic Cherokee alphabet; b. about 1770; known as an ingenious silversmith previous to his invention of the Cherokee alphabet in 1826. The alphabet contains eighty-five characters, all of which are applied to writing and printing with success. D. at San Fernando, Northern Mexico, in Aug., 1843.

Guest [M. Eng. *gest* < O. Eng. *gæst*, guest, stranger: O. H. Germ. *gast*: Goth. *gasts* < Teuton. *gastas*: O. Bulg. *gosti*: Lat. *hostis* < Indo-Eur. *ghostis*, stranger, guest]: in law, a transient lodger at an inn or hotel. As the innkeeper's liability is much greater to *guests* than *boarders*, the legal distinction between the two classes of persons frequently becomes a matter of importance. See further under the article INNKEEPERS. F. S. A.

Guest, JOHN: sailor; b. in Missouri in 1821; entered the U. S. navy as a midshipman Dec. 16, 1837; became a passed midshipman in 1843, a lieutenant in 1850, a commander in 1862, a captain in 1866, a commodore in 1873; served on the east coast of Mexico during the war between the U. S. and that republic (1846–48), and participated in several sharp engagements with the enemy on shore; in 1854 was second in command of the seamen and marines of the U. S. steamship Plymouth in a severe but victorious fight with the Chinese rebels at Shanghai, who threatened to plunder the foreign residents. He commanded the Owasco of Porter's mortar flotilla in the bombardment of Forts Jackson and St. Philip prior to and during the passage of Farragut's fleet by the forts on its way to New Orleans (Apr. 24, 1862), and afterward at the bombardment of Vicksburg in the summer of same year; in command of the Iosco, took part in both the Fort Fisher fights. D. at Portsmouth, N. H., Jan. 12, 1879, while in command of the navy-yard.

Gueux, gö [Fr., beggars, plur. of *gueux*, poor, beggar]: a name applied at the court of the regent Margaret of Parma in 1566 to the confederated nobles and others of the Low Countries who opposed the tyrannies of Philip II., and especially the establishment of the Inquisition. The malcontents at once adopted the title, and fought long and bravely against the Spaniards, but had finally to yield to superior force. Counts Louis of Nassau and Henry de Brederode were the early leaders of the party, and after hostilities had begun the "sea-beggars," under the noted Admiral William de la Marck, gained many advantages over the Spanish.

Guevara, ANTONIO, de: writer; b. about 1490 in the province of Alava, Spain; d. in 1545. Of excellent family, he passed a part of his youth at the court of Queen Isabella. In 1528 he became a Franciscan, but continued to live at court, where he enjoyed the special favor of the Emperor Charles V. He accompanied this monarch on various journeys to Italy and other parts of Europe, becoming successively court preacher, imperial historiographer, Bishop of Guadix, and Bishop of Mondoñedo. From a worldly point of view this was an extraordinarily successful life; and as a writer Guevara had hardly less good fortune. Perhaps no Spanish author has had, in his own century at least, greater popularity and influence in all Europe. He was the chief Spanish representative of that phase of Renaissance literature which finds its best expression in *Il Cortegiano* of the Italian Castiglione. The aim of both writers was to set forth in a balanced and artificial style reflections of a politico-moralizing kind, after the supposed manner of Cicero, Seneca, and Plutarch. The most famous of Guevara's works was his *Libro aureo de Marco Aurelio, emperador y eloquentissimo orador* (1529), or, as the title of the enlarged Valladolid edition of the same year runs, *Marco Aurelio con el Relox de principes*. The general character of this work was that of Xenophon's *Cyropædia*; but the worthy author thought to win more credit by asserting that his matter was taken from a certain Greek manuscript sent him from Florence. The fraud was exposed in 1540 by one Pedro de Rua, Professor of Belles-lettres at Soria, and Guevara could only say in his own defense that his history of Marcus Aurelius was as true as any other ancient profane history. For this he has been very severely treated (cf. Antonio, *Bibl. Nova*, i., p. 125; Bayle, *Dict. Hist.*, ii., p. 631); but the popularity of his book was hardly at all diminished. In 1539 another folio appeared at Valladolid, containing a series of new treatises by him, which had only less success than his first work. These are: *Prólogo solemne en que el*

autór toca muchas históriàs; *Una Década de las Vidas de los X. Césares emperadóres romànos, desde Trajano á Alexandro*; *De Menosprecio de la Córte y Alabanza de la Aldéa*; *Aviso de privados y doctrina de cortesànos*; *De los inventóres del marcár y de muchos trabájos que se pasàn en las galéras*. In 1539 also Guevara published in Valladolid his so-called *Epístolas familiáres*—chiefly remarkable as rhetorical exercises, with hardly a trace of the style of familiar correspondence. These were widely admired, and came soon to be known as the *Golden Epistles*, under which title they were translated into French in 1565, and three times into English: by E. Hellowes (1574), G. Fenton (1575), and Savage (1657). We have further two professedly religious treatises from Guevara's pen: *Monte Calvario* (Salamanca, 1542; Eng. transl. 1598); *Oratório de religiósos y exercício de virtuósos* (Valladolid, 1542). Of all these works, however, the first retained the palm; and for the English student it has peculiar interest, because, as has been recently shown, it was the chief source and original for that all-important literary movement of Elizabeth's reign which is known as euphuism. (See LYLY). It was translated into English by Lord Berners in 1532, and again by Sir Thomas North (his first work) in 1557, and was speedily the rage among the fine spirits of the English court. Its style was at once imitated, and for a time threatened to determine the development of all future English prose. There came a reaction, however, against this excess of admiration, and what was false and affected in English writing as a consequence of it gradually gave way. It is, however, an influence to be reckoned with in every Elizabethan writer—the greatest not excepted. Besides the English translations mentioned above, there was one of the *Menosprécio de Córte*, by Sir Francis Bryan, Lord Berners's nephew, about 1533 (printed again 1575); of the *Década de los Césares*, by E. Hellowes (1577); of the *Arte de Mareár*, by Hellowes (1578). Guevara's popularity in other countries was no less remarkable, though it perhaps nowhere else had so important consequences. In France translations and imitations were very numerous (cf. Brunet, *Manuel du Libraire*, v.), and from one of these La Fontaine derived the theme of his famous fable *Le Paysan du Danube* (Fables xi., 7). See F. Landmann, *Der Euphuismus, sein Wesen, seine Quelle, seine Geschichte* (Giessen, 1881); *id.*, *Shakspeare and Euphuism*; *Euphuism an Adaptation from Guevara* (London, 1882; extr. from *New Shakspeare Soc. Trans.*, pt. ii., p. 241–276).

A. R. MARSH.

Guevara, LUIS VÉLAZ, de: dramatist and story-writer; b. at Ecija, Andalusia, Spain, in 1572 or 1571; d. in Madrid, 1644. Little is known of his life beyond the fact that he was a favorite at the court of Philip IV. by reason of his wit. He was an extremely prolific playwright, Montalván as early as 1632 (in his *Para Todos*) putting the number of his pieces at 400. Of these, however, few have survived. The most famous and the best was *Mas pesa el Rey que la Sángre* (King before Kin), in which is told the story of that Alfonso Pérez de Guzman who, as governor of the city of Tarifa in 1293, saw his own child slain before his eyes by command of Don Juan, rebellious brother of King Sancho IV. el Bravo, rather than surrender the town. Full of poetry and fine pathos also is *La Luna de la Siérra*, which relates the story of a peasant who saved his beautiful wife from dishonor by an appeal to Queen Isabella. The best-known work of Guevara, however, is the short satiric sketch in prose called *El Diablo Cojuelo* (The Limping Devil), which was subsequently copied by LE SAGE (*q. v.*) in his *Diable Boiteux*. In this the author imagines a student of Madrid obtaining by chance the good will and services of a deformed spirit, who carries him in ten *trancos* or strides through the air from place to place in Spain, unroofing the houses, as it were, and showing him what in their supposed security the dwellers therein are up to. The opportunities for satire thus afforded are cleverly employed. There is no collected edition of Guevara's works. The *Diable Cojuelo* is printed in Rivadeneyra's *Biblioteca de Autóres Españoles* (t. xxxiii.).

A. R. MARSH.

Guiana, gē̆-aa'nă̆a [the name of an Indian tribe: Span. *Guayana*, or *Guayanna*, whence Fr. *Guyane*]: a region in the northeastern part of South America, embracing, in its most extended sense, all the territory bounded by the Atlantic, the Amazon, Rio Negro, Cassiquiare, and Orinoco, or an area of more than 800,000 sq. miles. This is unequally divided between Brazil, Venezuela, and three European colonies, to which the name is applied in a more restricted sense. We shall consider it first as a whole, briefly treating of the colonies in separate paragraphs.

Topography.—This is very imperfectly known, large areas, especially in the Brazilian and Venezuelan parts, being unexplored. It is commonly said that Guiana is a large island, because it is cut off from the rest of the continent by the singular union of the Amazon and Orinoco through the Negro and Cassiquiare. Such a view is trivial, but in a truer sense the region is an island because it is a mass of high land separated from other high portions of South America by the great river depressions. At one point only, near the falls of the Orinoco, hills—supposed to be spurs of the Colombian Andes—appear to approach a corresponding range on the Guiana side, but it is by no means proved that there is a continuous line, broken only by the narrow river channel. The hills of Guiana are visible from the edge of the Brazilian plateau across the Amazon. But a continental depression of a few hundred feet at most would leave Guiana entirely surrounded by salt water, and in most places widely separated from adjoining land.

The surface of this great island is generally described as a table-land with a core of mountains; it is rather a plateau, rising toward the northwest into a huge dome, but so cut up and modified that mountain-like forms have been left in some places, and in others extensive plains and long slopes. The Brazilian portion appears to be a very regular table-land, about 2,000 to 2,500 feet high westward, gradually subsiding to 500 or 600 feet near the Atlantic; it is bordered by low lands with isolated hills adjoining the Amazonian flood-plains, and outlying portions can be seen from the river in the table-topped hills called the Serras of Parú. Near the divide, between rivers flowing to the Amazon and to the Atlantic, it is cut down suddenly northward to the level of about 800 feet; these cut edges are the so-called Acaraí Mountains. From their base there is a long slope to the Atlantic, but this slope is broken by many hills and by two east and west ranges having a mountainous appearance, near latitudes 3° 25′ and 5° N.; these are both W. of the Essequibo, and they are nowhere more than 2,000 feet high. If the main plateau is followed westward, it is found to extend farther north and to be much higher, forming the Parima Mountains on the frontiers of Brazil and Venezuela; these extend eastward into British Guiana, where they are known as the Pacaraima Mountains, and the culminating point is Roraima, an isolated mass with precipitous and inaccessible sides on the extreme western frontier of the colony; this is said to be 7,500 feet high, and is probably the loftiest point in all Guiana. But Roraima is flat-topped and apparently composed of horizontal sedimentary strata; it must therefore be regarded as a higher and outlying portion of the plateau, while others of the Pacaraima range are also portions of the plateau, much cut up and assuming strange, mountain-like forms. Probably the Parima range has the same structure. N. of Parima the territory of Venezuelan Guiana is much broken, gradually falling to the *llanos* of the Orinoco. The Atlantic coast lands are everywhere low and flat; in parts the spring tides would extend 10 or 12 miles inland were they not kept back by artificial sea-walls.

Geology.—Near the Amazon extensive beds of Palæozoic rocks, characterized by fossils, rest on gneiss and granite; over these are sandstones, presumably Cretaceous. All these beds are more or less disturbed, but above them are horizontal sandstones and clays, forming, in part at least, the top of the plateau. The geological survey of British Guiana, made by Messrs. Brown and Sawkins, did not bring to light any fossils, and the age of the beds studied is conjectural, but the structure seems to be the same as that of the Amazonian side—disturbed older rocks, with intrusions of diorite resting on granite and gneiss and capped by horizontal beds, probably Tertiary, which form the top of the true plateau. By the denudation of these upper beds over large areas, the older rocks have been exposed, with extensive sheets of granite, and these often appear to have a mountain structure. Beyond the observations of Crevaux in the French colony, the geology of other parts of Guiana is unknown. Along the coasts and river valleys there are extensive alluviums.

Hydrography.—Guiana has numerous rivers of considerable size; as they flow down from the plateau they form rapids and falls, and hence none of them is navigable for a great distance. The most important on the Atlantic side are the Oyopock, Maroní, Surinam, Corentyn, Berbice, and Essequibo (the latter the largest of all); the Caroní, Caura, and others flow to the Orinoco; the Branco to the Rio Ne-

gro; and the Jamundá, Trombetas, Curuá, Mãecurú, Jary, and others to the Amazon. Some of these Amazonian tributaries form shallow lakes as they flow into the lowlands. On the highlands there are no lakes of considerable size, though large tracts of grass-land are often flooded during the rains. One of these swamps probably gave rise to the report of a great lake called Parima, which is represented on old maps.

Climate.—Warm, and in parts unhealthful near the sea-coast and on the river plains; yellow and bilious fevers have frequently been very destructive in the colonies; intermittent fevers are common only in swampy lands and near the river rapids. In the interior the heat is nowhere excessive, and the climate of the table-lands is temperate and agreeable. Rains, though less profuse than in the Amazonian depression, are abundant. From July or August to the end of November there is a dry season, varied only by occasional showers. Near the northern coast a second short dry season is observable in March. The heaviest rains are generally in April. Hurricanes and very destructive winds are unknown.

Vegetation and Soil.—The lowlands of the coast and river depressions are covered with luxuriant forest, which extend far up the river valleys; and generally the flanks of the hills and of the plateau are heavily wooded. But the top of the main plateau, so far as is known, has only a scattered low growth of trees and bushes, resembling the *campos* of Central Brazil, and on the long Atlantic slope there are vast tracts of grass-land, known in the colonies as savannas. The Parima and Pacaraima Mountains seem to be in great part devoid of forest. On the Amazonian side the *campos* extend over the lowlands in places quite to the river, and there are extensive open tracts near the Orinoco, continuations of the *llanos*. All the low forest lands appear to be fertile, but the richest portions yet utilized are the tide-plains along the Atlantic. By a system of dikes and sea-walls, first used by the Dutch, large portions of these have been reclaimed, and most of the colonial sugar plantations are on them. Their fertility is practically inexhaustible. The savannas, *campos*, and *llanos* doubtless will be utilized in time for cattle-raising.

Fauna and Flora.—These resemble those of other parts of the Neotropical region. (See AMERICA, SOUTH.) A certain proportion of species, but not of larger groups, appear to be peculiar, whence some naturalists are inclined to regard Guiana as a sub-province, but it is generally united with Brazil.

Minerals.—Gold is the only metal thus far developed in paying quantities. The gold mines of British Guiana and the neighboring parts of Venezuela, discovered about 1866, have attracted thousands of miners, and there can be no doubt of the richness of the deposits. There are vague reports of gold from the other colonies and from Brazilian Guiana.

Inhabitants, History, etc.—Of the numerous Indian tribes which formerly inhabited Guiana only a few remnants remain in a wild state, occupying small villages in the interior. The Arawaks of the Atlantic coast are partially civilized; a few hundred or thousand half-wild Caribs are still found in the colonies, and along the great rivers the surviving Indian population has submitted to the whites; including these, the whole Indian population probably does not exceed 30,000. The white and half-breed population is also very scanty, and Guiana, as a whole, is one of the most thinly peopled regions in the world. Probably the entire population of this tract of 800,000 sq. miles does not exceed 450,000, and of these 250,000 are gathered in a comparatively small part of British Guiana. Before the extinction of slavery numerous fugitive Negroes formed settlements in the interior, and these became a terror to the whites. In the colonies these runaways were known as bush Negroes, and in Brazil as *mucambistos*. In Surinam, during the eighteenth century, they waged a long and bloody war on the Dutch, and at length made peace on condition that they might hold a large tract in the interior without molestation. It is said that their descendants number over 25,000. One of the largest and most recent of these Negro colonies was on the river Trombetas, a branch of the Amazon; in 1875 it was reported to have a population of 2,000, fugitives from Brazilian plantations.

Columbus had a glimpse of Guiana as early as 1499, and the Atlantic coast was soon after explored by various captains, but the region was long neglected. Sir Walter Raleigh, in 1595, made a vain attempt to penetrate to the interior in search of El Dorado. It appears that the first Spanish settlement was made on the Orinoco at the mouth of the Caroní in 1576; Spanish missionaries penetrated S. of the Orinoco in the eighteenth century, but the few settlements of Venezuelan Guiana are mostly of very recent origin. The Dutch made their first attempt to settle the coast in 1581, and the English and French a little later, but the first colonies were all failures, and the English and French attempts were repeatedly abandoned. Dutch Guiana was first settled by the English, and British Guiana by the Dutch. (For the history of the colonies see below.) The Dutch early entered the Amazon, but were driven out by the Portuguese about 1620, and this part of Guiana fell to Brazil. The division of the region is now well recognized, but, except the boundaries between the French and Dutch and the Dutch and British colonies, all the limits are very uncertain. Venezuela claims all of British Guiana W. of the Essequibo; Great Britain, on the contrary, would extend her boundaries still farther W. The French claim that their colony, on the coast, extends to Cape North, but Brazil holds as far as the Oyopock. Brazil claims, and will probably hold, the territory which includes all the rivers of Guiana flowing into the Amazon and the Rio Negro, except its extreme upper course, but the divide which should constitute this boundary has never been explored, and the claim is not supported by treaties with Great Britain, the Netherlands, or France.

British Guiana lies on the Atlantic coast, approximately between lats. 1° and 9° N. and lons. 57° and 61° W. Area officially claimed, 109,000 sq. miles, over a third of which is claimed by Venezuela; the southern boundary, with Brazil, is not fixed, and is practically unknown; eastward the river Corentyn separates it from Dutch Guiana. Pop. (1891) 288,328, including 105,465 East Indians or "coolies," mainly contract laborers, and 99,615 Negroes; the aboriginal population is small. British Guiana is a colony of Great Britain, formed of the three settlements (now counties) of Demerara, Essequibo, and Berbice; capital, Georgetown. The governor and lieutenant-governor, appointed by the crown, are assisted by a court of policy of seven official and eight elective members, and a combined court containing, in addition to the above, six elected financial representatives. The suffrage is restricted to about 2,000 voters. The Roman-Dutch law, modified by orders in council, is in force for civil cases; the criminal law is based on that of Great Britain. Revenue for the financial year 1895–96, £567,749; expenditure, £596,493. Sugar-planting is the most important industry. Since 1888 the gold mines have been steadily increasing in importance, and nearly 10,000 miners are now (1897) employed in them. The principal exports are sugar (82 per cent.), molasses, rum, timber, and gold. Total exports for 1895–96, £1,769,500; imports, £1,443,553. About half the trade is with Great Britain. The money in ordinary use is English, with a small circulation of "guilders" and "bits," local coins. The colony has one short railway (23 miles, 1897), about 450 miles of regular river navigation, and 528 miles of postal telegraphs and cables, with 67 post and 42 telegraph offices. The ordinary language is English, and nearly all the population is gathered near the coast.

The Dutch attempted to form a settlement on the Demerara in 1581; driven out by the Spaniards and Indians, they returned in 1596, and, gaining strength, gradually spread along the coasts. In 1796 the colonies were taken by the British; they were given up to the Batavian republic in 1802, but retaken by the British in 1803, and by subsequent treaties were confirmed to Great Britain.

Dutch Guiana, or *Surinam*, lies on the coast immediately to the E. of British Guiana, between lats. 2° and 6° N. and lons. 53° 50′ and 58° 20′ W. It is separated from British Guiana on the W. by the river Corentyn, and from French Guiana on the E. by the Marowijne, or Maroni; the southern boundary, with Brazil, is unsettled. Calculated area, 46,060 sq. miles. Pop. (end of 1890) 56,873, exclusive of the bush Negroes, said to number 25,000, and a few Indians. Capital, Paramaribo. Dutch Guiana is a colony of the Netherlands, with a crown-governor, who, with the attorney-general and three crown members, forms the council for executive business. There is an assembly or "states" of four members chosen by the governor, and one for every 200 electors. The laws are those of the Netherlands. The country is divided into sixteen districts and numerous communes. The official language is Dutch, but English is in common use in the larger towns. The prevailing sects are the Moravian Brethren and Reformed Lutheran (Protestant). Revenue, 1896, $710,000; expenditure, $833,600.

Agriculture is almost the only industry, and sugar is the principal product: also cacao, bananas, coffee, rice, corn, etc. The exports for 1894 amounted to $2,025,125, and the imports to $2,490,030. There are no railways, and the telegraphic system is of small extent. The interior is little known.

The territory of Dutch Guiana was settled by the English in 1652, and received the name Surrey-ham, corrupted to Surinam. At the peace of Breda, 1667, it was given to the Netherlands in exchange for the New Netherlands (New York). Taken by the British in 1799, it was given up to the Batavian republic in 1802; it was again in the power of the British from 1804 to 1816, when it was restored by the Peace of Paris.

French Guiana, often called *Cayenne*, lies between Dutch Guiana, the Atlantic, and Brazil; from the latter country it is separated, provisionally, by the river Oyopock and the watershed, but the French claim southeastward to the Araguary, near the mouth of the Amazon, which would nearly double their territory. The area not in dispute is estimated at 46,840 sq. miles. Pop. (1890) 25,796, exclusive of a few wild Indians. The capital, Cayenne, had 10,600 inhabitants, and there were 4,400 confined or ticket-of-leave convicts. The country is held as a colony and penal settlement of France. It has a governor, appointed at Paris, and sends one deputy to France. The climate of the low coast region is hot and very unhealthful, and there have been many severe epidemics of yellow fever; it has proved especially fatal to the prisoners, hence since 1864 white convicts have been sent elsewhere. The interior is healthful. But little of the land is cultivated, and that poorly; the principal product is sugar; gold is obtained in small quantities. The exports in 1889 amounted to about $850,000, and the imports to $1,800,000; the imports constantly exceed the exports in much the same proportion. The local budget in 1891 was about $365,000; a large amount is yearly appropriated to the colony by France.

The French attempted settlements here as early as 1604, and again in 1624; Cayenne was founded in 1634. But all the efforts made to establish a strong colony ended disastrously, and several times the country was abandoned. It was in the hands of the Dutch 1654–64; was ravaged and abandoned by the English 1667, and again by the Dutch in 1676. In 1763 15,000 colonists were sent out from France, and within two years 13,000 of them died of disease and hardship. During the French Revolution some 600 royalists and political prisoners were sent to Cayenne, where two-thirds of them perished. The colony was taken by the British in 1809 and restored to France by the Peace of Paris; the penal settlement was then established. The present population consists almost entirely of Negroes and Asiatics, with a few Indians.

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Herbert H. Smith.

Guicciardi'ni, gwĕĕt-chär-dee'nĕĕ, Francesco: statesman and historian; b. at Florence, Italy, Mar. 6, 1482; became Professor of Jurisprudence there in 1505; ambassador to Spain 1512; to Leo X. 1513; governor of Modena 1518; defended Parma, as the pope's lieutenant-general, against the French 1421; was made president of the Romagna 1523; governor of Bologna 1531–34; was a partisan of the Medici family. He is chiefly memorable for his *History of Italy* (1561–64; best edition, 10 vols., Pisa, 1819–20), which by common consent occupies the first place among Italian histories. It has been translated into English by Sir G. Fenton (1579) and by A. P. Goddard (10 vols., 1755–59). D. at Arcetri, May, 1540.

Guicowar's, or Gaikwar's, Dominions: See Baroda.

Guido d'Arezzo, gwee'dō-dăă-ret'sō: See Gamut.

Guido Reni, -rā'nĕĕ: painter; b. at Calvenzano, near Bologna, in 1575. He was the son of a musician, who, finding him uninterested in his own art, placed him in the school of Denis Calvart, whom he left to become a pupil of the Caracci. Here, in opposition to Caravaggio, then becoming famous for his vehement mannerisms, Guido learned the gentle, sweet, harmonious style to which he owes his reputation. His fame having reached Rome, Guido was invited there, and went at the age of twenty-one. Here he painted the *Crucifixion of St. Peter* and the celebrated *Aurora with the Chariot of the Sun*, afterward engraved by Rafael Morghen. He returned to Bologna, where he painted several pictures, the most celebrated of which are *The Murder of the Innocents*, for the Church of St. Domenico, now in the Pinacoteca, and the *Repentance of St. Peter*, for the Casa Sampieri. Again he went to Rome at the solicitation of the pope. His most eminent works of this period are the *Fortune*, now in the Capitol Museum, the *Rape of Helen*, and the *Magdalen*, in the Barberini Palace. A short visit to Naples, whence he was driven by his jealous rivals, intervened beween his second stay in Rome and his final return to Bologna, where he passed the remainder of his years, till his death in 1642. Guido was an artist of immense productiveness, but of unequal merit. His manner changed at different periods. His earliest works were done in the style of Caravaggio, with strong effects of light and shade. The productions of his later life were marked by gentleness, grace, and beauty, by sweetness of tone and harmony of color. He excelled in the treatment of pathetic and devout subjects, and in treating others brought their more gracious aspects into prominence. Even in his best works there is some lack of vigor in drawing and color; his average work is tame, monotonous, at times insipid, redeemed, however, by elegance of tone and delicacy of touch. His numerous *Madonnas* have a sameness of expression that is wearisome. Guido, besides painting on canvas and in fresco, modeled in clay, and is said to have executed statues. He etched a number of plates, which are esteemed. The so-called portrait of Beatrice Cenci, at the Palazzo Barberini, Rome, is one of the most remarkable of his portraits. The galleries of Europe contain very many of his canvases, especially the public galleries of Bologna, Dresden, Florence, Madrid, the Pinakothek at Munich, the Louvre, the Hermitage at St. Petersburg, and the new museum at Vienna.

Revised by Russell Sturgis.

Guienne, gee-en', or **Guyenne**: one of the old provinces of France, lying N. of Gascony, with which it formed the ancient Roman province of Aquitania, of which its name is supposed to be a corruption. It is divided into the departments of Gironde, Lot-et-Garonne, Dordogne, and Aveyron, and includes parts of Tarn-et-Garonne and of Landes.

Guignes, geeñ, Joseph, de, F. R. S.: Orientalist; b. at Pontoise, France, Oct. 19, 1721; obtained early distinction as a Chinese scholar; became F. C. S. (London) 1752; was chosen to the Academy of Inscriptions 1754; became Syriac Professor in the Collège de France 1757; keeper of the antiques in the Louvre in 1769. D. at Paris, Mar. 19, 1800. The *Histoire générale* (of the Huns, Turks, Mongols, etc.) is his principal work. The elder De Guignes was a man of noble and exalted character. This can not be said of his son, Chrétien Louis Joseph (1759–1845), a distinguished Sinologist, who published as his own a Chinese, French, and Latin dictionary, taken mainly from the manuscripts of Father Basile de Glemona, a Franciscan missionary, whose papers were deposited in the Vatican library.

Revised by C. H. Toy.

Guignet's (gĕĕn'yāz') **Green**: See Chromium.

Guigniaut, gĕĕn'yi-ō', Joseph Daniel: b. at Paray-le-Monial, France, May 15, 1794; studied at the Lycée Impé-

rial, at the École Normale (1811–13), and the Lycée Charlemagne (1813–17); was *maître des conférences* in history at the Normal School 1818–22; held the corresponding chair in Greek letters 1826–28, and then became director of the same school and Professor of Greek in the faculty of letters. In 1835 he left the Normal School, and became Professor of Geography in the faculty; was chosen to the Academy of Inscriptions 1837, and in 1847 received the cross of an officer of the Legion of Honor; was secretary-general of the council of the university 1845. He wrote much upon Greek literature and antiquities; published texts and variations of the *Prometheus Bound* of Æschylus (1829) and *Les religions de l'antiquité* (1825–51, 10 vols.), based upon the *Symbolik* of F. Creuzer. In 1862 he became honorary Professor of History, a commander of the Legion of Honor, and perpetual secretary of the Academy of Inscriptions. D. in Paris, Mar. 12, 1876.

Güija, goo-ee'hăă: a lake of Central America, on the confines of Guatemala and Salvador; 3,300 feet above the sea. It is 19 miles long, varying in width from 3 to 12 miles, and several hundred feet deep. The waters abound in fish. The small Lagúna de Metapan is separated from it only by a narrow isthmus. These two lakes occupy the center of a great hollow, surrounded by a dozen volcanic peaks. They have no outlet. H. H. Smith.

Guild, Reuben Aldridge, LL. D.: librarian and author; b. at West Dedham, Mass., May 4, 1822; graduated at Brown University 1847, and was its librarian 1848–93. Author of *The Librarian's Manual* (1858); *Life, Times, and Correspondence of James Manning, and the Early History of Brown University* (1864); *A Biographical Introduction to the Writings of Roger Williams* (1866); *History of Brown University, with Illustrative Documents* (1867); *Chaplain Smith and the Baptists* (1885).

Guildford: town; capital of Surrey, England, on the Wey; 30 miles S. W. of London (see map of England, ref. 12–J). It is a quaint old town, and has a considerable trade in grain. It has a hospital founded in 1619, a county hospital, a county-hall, and a grammar school. Pop. (1891) 19,448.

Guildhall: the town-hall of London, and the place of meeting of several municipal courts. It was built in 1411; was nearly destroyed by the Great Fire 1666; rebuilt in its present form 1789. Its main hall is 153 feet long, 48 broad, and 55 high, and has a very fine open timber roof and rich windows; but the Gothic front dates from a later restoration, about 1865. The two colossal wooden figures called Gog and Magog are kept here. There are several interesting monuments and portrait-busts. The lord mayor's and other civic feasts have been held here since 1500.

Guilds [M. Eng. *gilde* > O. Eng. *gild*, payment, tribute (but with meaning derived from *gildscipe*, guild); deriv. of *gildan*, offer > Eng. *yield*]: associations formed for a common object, originally of a religious, protective, or social nature, but afterward including among their purposes the promotion of the economic interests of their members. Theories have assigned the origin of these associations to the common banquets of the Scandinavians or to the *collegia* of the ancient Roman artisans, but neither is adequate to account for their existence since similar institutions have flourished in countries where the guild has never made its appearance. The origin should rather be sought in a complex of causes of the same general nature as those at the basis of all organization in society. The religious guilds were probably the earliest of these fraternities in England, where from the sixth century associations of priests were formed to further the cause of religion and promote the welfare of their members, for which objects each member was bound to contribute a fixed sum, or gild, as it was originally called. Similar objects marked the social guilds, which, however, were distinguished from the former by being made up of laymen, and in their later history devoting themselves more exclusively to the material interests of their members. No species of misfortune affecting the health, liberty, or property of a guild brother, provided it was not brought on by his own fault, was beyond the scope of the purposes of these fraternities, which thus were not unlike the friendly societies or mutual relief associations of modern times. The religious and social guilds spread throughout England and the Teutonic countries of the Continent, but in Protestant states did not, as a general rule, survive the Reformation, being abolished on the ground that they fostered superstition. In England the property of the religious guilds was sequestrated by Henry VIII. Institutions bearing the same name and having similar objects have been formed in the nineteenth century. The first attempt of the kind was the formation of the Guild of St. Alban at Manchester, 1851. It was followed in 1861 by the organization of the Society of the Love of Jesus in Plymouth, and the Sisterhood of St. Peter at Kilburn. Since that time the idea has become very popular, and organizations of the kind have been formed in both Great Britain and the U. S. The object of these organizations is purely religious. Their principal aim is to institute a more effective carrying out of parish work and to impart more dignity to the layman's labors.

In both of these classes of mediæval guilds provision was sometimes made for bringing criminals to justice, and distributing among the guild brothers the fines paid by the offenders. This, however, was the especial characteristic of the protective or frith guilds which flourished in the north of Europe during the Middle Ages, when an organization for mutual defense was needed to supplement the defective civil administration. In addition to the usual obligations of mutual charity, care of the sick, and relief of the unfortunate, the brethren of the frith guilds were bound to pay certain contributions for the purpose of protecting property, punishing crimes committed against members of the guild, and aiding guild brothers to pay the fines imposed in consequence of their own offenses. Thus, recognizing the principle of the responsibility of the guild for its members, they became an important factor in keeping the peace. In England they can be traced from the seventh to the tenth centuries, but on the Continent their origin belongs to a later period, probably to the eleventh and twelfth centuries.

These three classes of associations show the attempt to realize the ideal of Christian brotherhood taught by the Church, and in each of them the religious feature is conspicuous. The economic guilds, of a later and radically different origin, have attracted more general attention. These were of two kinds—merchant guilds and craft guilds. The former can be traced in England as far back as the period of the Danish supremacy, but it was not till the conquest that they began fairly to develop. Their privileges, obtained upon application to the king, and embodied in the town charters, gave them the exclusive right to carry on trade in the city or suburbs, and to buy and sell freely without payment of tolls and customs. This amounted to a monopoly of internal trade. They existed as independent organizations from the eleventh to the thirteenth or fourteenth centuries, and during the greater part of that time performed important functions in the municipal administration; but gradually they lost their identity as trading associations, and coalesced with the town corporations, or became mere assemblies for admitting strangers to the freedom of the city. More rarely they were transformed into private companies with objects quite dissimilar to their ancient purposes. The origin of craft guilds belongs to the same general period as that of the merchant guilds, and members of the former often secured the privilege of retail trade by becoming enrolled in the latter. The essential purpose of the craft guilds was the monopoly of industry. None but members could carry on the industry in the city or suburbs. It was not, however, an independent organization, but always subject to the general laws and the municipal administration by which it was recognized as an auxiliary in maintaining the peace, and called upon to furnish a military contingent in time of danger. In England the monopoly enjoyed by the craft guilds did not prevent artisans from entering them if they had served the requisite apprenticeship, but merely forbade trading by outsiders whose wares were not guaranteed by guild regulations, designed to prevent fraud and the deception of the public. On the Continent, however, the guilds were subject to tyrannical restraints, and were not open to all citizens. Apprenticeship began between the ages of twelve and seventeen, and lasted from two to ten years. In England the usual term was seven years, after which the apprentice enjoyed a position of independence as shopkeeper and master. The period of the greatest prosperity of the craft guilds was from the twelfth to the fifteenth or sixteenth centuries. In France they were abolished at the time of the Revolution, but in Great Britain many of their privileges lingered till they were swept away by the legislation of 1835. See Toulmin Smith, *English Original Ordinances*, etc. (1870); L. Brentano, *On the History and Development of Guilds*

(1870); Madox, *Firma Burgi* (1726); G. Schanz, *Zur Geschichte der Deutschen Gesellen-Verbände im Mittelalter* (1877); G. Fagniez, *L'Industrie à Paris au 15me et au 17me siècle* (1877); Edwin R. A. Seligman, *Two Chapters on the Mediæval Guilds of England* (1887); Charles Gross, *The Gild Merchant* (2 vols., 1891). Revised by F. M. Colby.

Guilford: town (founded in 1639 by an English colony under the Rev. Henry Whitfield); New Haven co., Conn. (for location of county, see map of Connecticut, ref. 12-H); on the N. Y., N. H., and H. Railroad; 16 miles E. of New Haven. It has five churches, high-school building of granite, new town-hall, and a weekly newspaper. There are several very old buildings. The principal industries are farming, iron-casting, and the manufacture of woolen goods. The regicides Goffe and Whalley were secreted here, and Fitz Greene Halleck was born here. The Point, about a mile S. of the town, and Sachem's Head, 3 miles S. W., are favorite summer resorts. Pop. (1880) 2,782; (1890) 2,780.

Editor of "Echo."

Guilford, Simeon Hayden: Professor of Dentistry; b. Apr. 11, 1841, in Lebanon, Pa.; educated at Franklin and Marshall Colleges; Professor of Operative and Prosthetic Dentistry in Philadelphia Dental College; author of *Manual of Nitrous Oxide* (1886); *Orthodontia* (1888), both generally used as text-books in the dental colleges in America; contributed the articles on *Orthodontia, Dental Anomalies, Malformations,* and *Excementosis* to *System of Dentistry* (Philadelphia, 1885). C. H. T.

Guilford Court-house, Battle of: an engagement during the Revolutionary war; occurred Mar. 15, 1781, some 5 miles from Greensboro, N. C. This battle was fought between the armies of Gen. Greene and Lord Cornwallis. The army of Gen. Greene, to which he had succeeded a short time previous, had been re-enforced by militia from Virginia and North Carolina, until it numbered nearly 4,500 men, of whom nearly more than half were inexperienced militia. With this force he started in pursuit of Cornwallis, whose army comprised some 2,500 veteran British troops, and whom he overtook at Guilford Court-house. The North Carolina militia were the first to receive the charge of the British troops, before which they gave way; the Virginia troops, next in line, held out for a time and did effective service, but in turn fell back. The pursuing British were met by the Continentals in the third line, and before a destructive fire of the First Maryland, followed by a charge of the cavalry, were in turn repulsed. Not wishing to risk another attack with his disorganized militia, Greene withdrew his army, but such was the damage inflicted upon the British army that Cornwallis fell back upon Wilmington.

Guillaume, gē-yōm', Jean Baptiste Claude Eugène: sculptor; b. at Montbard, in the department of Côte-d'Or, France, Feb. 3, 1822; educated at Dijon; studied the art of sculpture in Paris under Pradier; gained the Prix de Rome in 1845 by his *Theseus*, and was in 1863 appointed professor in the School of Fine Art; director of same 1865–75. Those of his works which have attracted most attention are *The Tomb of the Gracchi* (1862); *Napoleon I.* (1867); the monument of Colbert in Reims, etc. Of Napoleon I. he made seven busts. He is now (1893) head of the French Art School at Rome.

Guillaume de Champeaux, shaañ pō: ecclesiastic and author; b. at Champeaux, near Melun, in France; studied dialectics under Anselm of Laon (1030–1117); became Archdeacon of Notre Dame; founded in 1113 the Abbey of St. Victor, which became a famous scholastic center; was made Bishop of Châlons-sur-Marne in 1113; was a realist, and the instructor, and afterward the adversary, of Abelard. He wrote a number of treatises.

Guillaume IX., Count of Poitiers and Duke of Aquitaine: See William IX. of Poitiers.

Guillaumet, gē-yō-mā', Gustave Achille: landscape and genre painter; b. in Paris, Mar. 26, 1840. Pupil of Picot and Barrias; second Prix de Rome 1863; medals, Salons, 1865 and 1872; third-class medal, Paris Exposition, 1878; Legion of Honor 1878. A painter of great merit, whose pictures of Eastern subjects are finely composed and beautiful in color. Among these are *Evening Prayer in the Sahara* (1863) and *Lagouat* (1879), in the Luxembourg Gallery, Paris. D. in Paris, Mar. 14, 1887. W. A. C.

Guillemet, gē-ye-mā', Jean Baptiste Antoine: landscape-painter; b. at Chantilly, France, in 1842. Pupil of Corot and Oudinot; second-class medals, Salon, 1874, and Paris Exposition, 1889; Legion of Honor 1880. His pictures are remarkably truthful, and generally incline to fine grays in their color schemes. One of his best works, *Bercy in December* (1874), is in the Luxembourg Gallery, Paris. Studio in Paris. W. A. C.

Guillemot, gil'le-mot [Fr.; Breton, *gwelan*, gull (: Corn. *gullan*, whence Eng. *gull*) + Fr. *mouette*, sea-mew]: popular name for several of the auks (see Auk), but preferably restricted to those of the genus *Cepphus*. The guillemots are birds from 12 to 15 inches long, and in full plumage are almost completely black. The common guillemot (*Cepphus grylle*), found in high latitudes on both sides of the Atlantic, has a conspicuous white patch on the wing; the sooty guillemot (*Cepphus carbo*) has a white ring about the eye. This species is somewhat rare, being restricted to a limited area on the coast of northeastern Asia. The mottled black and white plumage, borne in winter and by the young, has suggested the name of sea-pigeon, which has been applied to these birds by the fishermen. F. A. Lucas.

Guillotine, gil'lō-tēen [= Fr., named from Dr. J. I. Guillotin, who first proposed a more speedy method of execution]: a machine for inflicting capital punishment by decapitation, which acquired a terrible fame during the first French Revolution. A somewhat similar instrument had, however, been employed at times in various parts of Europe (Naples, Germany, Holland, Scotland) for more than 500 years. In Scotland it was called the "maiden," in France the "demoiselle." In this machine a heavy blade of steel falls in a grooved frame upon the neck of the victim. The inclined edge of the blade constitutes mainly the superiority of the guillotine over its predecessors. As a machine, the guillotine does its work with more certainty than the axe of the headsman.

Guilmant, gēēl'maañ', Félix Alexandre: organist and composer; b. at Boulogne, France, Mar. 12, 1837; when sixteen years old was organist of the St. Joseph church there. In 1871 he became organist of La Trinité in Paris. He is one of the leading French organists, and an able composer of organ music. In 1893 he visited the U. S., playing in New York, Chicago and other cities with great success. Among his vocal compositions are a fine mass and a lyric cantata entitled *Balthazar* (Belshazzar). D. E. Hervey.

Guimarães: town of Portugal; in the province of Minho; 12 miles S. E. of Braga (see map of Spain, ref. 14-B). It is one of the oldest and most beautiful cities of Portugal, interesting for its architectural monuments and for the beauty of its surroundings. Its most remarkable buildings are a church dating from the fourteenth century and the palace or castle from the twelfth. In the neighborhood are several warm springs much used for bathing. Pop. 8,205.

Guinea, gin'ēē [named from the country *Guinea*, on the west coast of Africa, because first coined of gold brought from there]: a coin struck in England in 1664 and issued from the mint until 1817. Subscriptions, professional fees, and the like are still estimated in guineas. The guinea was coined for twenty shillings, but passed for twenty-one up to twenty-eight shillings, the value varying considerably.

Guinea: the large gulf of the Atlantic washing the western coast of tropical Africa, between lat. 4° N. and 1° S. The western part is called the Bight of Benin, and lies between the Slave Coast and Calabar river; the eastern portion is called the Bight of Biafra. (See Biafra, Bight of.) The name Guinea is found on a map as early as 1351, and is said to be derived from an interior city in the Niger valley called Jinni. As applied to the coast it is somewhat vaguely used, and is falling into disuse. In general, Upper Guinea was the Atlantic African coast from the equator northward to 10° or 15° N. lat., and Lower Guinea the same coast southward from the equator to 15° or 20° S. See Angola, Cameroons, Congo Free State, Dahomey, Gaboon-Congo, Gold Coast, Liberia, Niger Territories, Senegambia, Sierra Leone, and Togoland. M. W. Harrington.

Guinea-fowls [named from *Guinea*, on west coast of Africa, whence they were first taken to Europe]: various gallinaceous birds, found with one or two exceptions in Africa. The exceptions are residents of the adjacent island of Madagascar. The birds are mostly of a blue-gray color, spotted with white. The common species, *Numida meleagris*, has been extensively domesticated both in the Old and New World, and is said to protect other poultry from hawks. Their eggs are very good, and so is their flesh when young. Their cry is harsh and disagreeable. F. A. L.

Guinea-pig [prob. changed from *Guiana pig* by analogy of *Guinea* and *Guinea hen*]: the "restless cavy". See CAVY), the *Cavia aperea* of Linnæus; or, more strictly, the domesticated variety of the same species, known to some systematists as *C. cobaya*. It is a rodent, and has no affinity with the pig, which it very faintly resembles in its grunting voice. Neither is it a native of Guinea, but is found wild only in South America, where its range is extensive. It is bred for its gentleness and for the pretty coloring of some examples. It is quite defenseless, and seems too stupid to fear anything, but its unpleasant odor may protect it to some slight degree, although its chief defense against extermination lies in its marvelous fecundity. The time of gestation is three weeks; there may be a dozen young at a birth, and in about six weeks the young may be fecundated. There is an incorrect belief that the guinea-pig kills or drives away rats. Its flesh and fur are useless, and the principal use thus far found for guinea-pigs is as subjects for vivisection; for this they are extensively used, being cheap and non-resistant; and it is probable that their sufferings under the knife are small, since during and after extensive mutilation they commonly give little evidence of pain.

Guinea-worm [named from *Guinea*, on west coast of Africa]: the female of *Filaria medinensis* or *F. dracunculus*; a nematode entozoic worm inhabiting the flesh of men and other animals, as dogs and horses. It is from 6 inches to 4 feet in length, and about one-ninth of an inch in diameter. It prevails in many parts of Africa, India, Sumatra, Persia, Arabia, and the island of Curaçoa. Probably it enters the flesh through the skin, where it lives till its young are matured, which takes from eight weeks to two years. Small ulcers appear on the surface of the skin, caused by the inflammation, and when these open the worm may be extracted, though with great difficulty. As many as fifty have been known to infest a single person. In some cases they cause much pain and inconvenience, in others none. Death has sometimes resulted from them. The little tank-worm of East Indian fresh waters and of wet soils is believed to be the larval form of the guinea-worm.

Güines, or **San Julian de los Guines**, saan´chooleĕ-aăn´-dā-lōs-gweenās: a city of Cuba; on a plain, 29 miles S. E. of Havana (see map of West Indies, ref. 3–B). It is a station on the railway from Havana to Matanzas and Cardenas, is the center of an important grazing and agricultural district, and has a considerable trade. Güines dates from the eighteenth century, but only became important after the building of the railway. Pop. about 10,000. H. H. S.

Guinicelli, gweĕ-neĕ-chel´leĕ, GUIDO: Italian poet. Little is known of his life beyond the facts that he belonged to the noble Bolognese house of the Principi, begins to be mentioned as early as 1266 in public documents, later with the title *judex* (i. e. jurisconsult), and died young in 1276. He seems to have taken an active part in the public life of Bologna, and in 1274 he was banished with other Ghibellines of the party of the Lambertazzi. He is chiefly important for the decisive *rôle* he played in the history of early Italian poetry. Dante calls him

> il padre
> Mio e degli attri miei miglior, che mai
> Rime d'amore usăr dolci e leggiadre. —*Purg.*, xxvi., 97.

This is another way of saying that Guinicelli was the first to point out that new, deeper, and more spiritual manner of singing of love, which Dante elsewhere (*Purg.*, xxiv., 57) calls *il dolce stil nuovo*—a style that was adopted by the group of Florentine poets to which Dante belonged, and that Dante himself carried to its highest perfection. When Guinicelli began to write, Italian lyrical poetry was little more than a pale and tiresome reflection of the forms and ideas of the Provençal troubadours. The so-called Sicilian poets had nothing original to say, and consequently their artificial phrases about *madonna* and love and courtesy and service and reward are frigid in the extreme. In his early youth Guinicelli wrote in the same fashion, and a considerable part of his verse is as dull as any ever penned by amatory versifier. Later, however, he became interested in the philosophical revival brought about in Italy by the great scholastics, notably St. Thomas Aquinas and St. Bonaventura; and the speculations of these men he undertook to introduce into poetry. He began to work out a new mystical theory of love, explaining its effects upon the spirit in essentially philosophical terms, as best appears in the famous canzone beginning *Al cor gentil ripara sempre amore*. This was the conception that so powerfully attracted Dante and his friends, and that is carried out to its logical consequences in the *Vita Nuova* and the *Divina Commedia*. See Casini, *Le Rime dei Poeti Bolognesi del secolo XIII.* (Bologna, 1881); Grion, *Guido Guinicelli e Dino Compagni*, in *Propugnatore*, ii. 2, p. 274, *seq.*; Fantuzzi, *Notizie degli Scrittori Bolognesi*, vol. iv. (1784), p. 345, *seq.*; Lamma, *Saggio di un commento alle rime di Guido Guinicelli con un discorso sugli scrittori bolognesi del secolo XIII.*, in *Propugnatore*, xvii. 2, p. 174, *seq.*; Gaspary, *Geschichte der italienischen Literatur*, vol. i., p. 102, *seq.* (Berlin, 1885). A. R. MARSH.

Guipuzcoa, gweĕ-pooth kō-ăă: the smallest but one of the most densely peopled provinces of Spain; bordering on the Bay of Biscay, and traversed by several branches of the Pyrenees. It is one of the Basque provinces, and is rich in minerals. Mining and fruit-culture are the chief industries. Area, 728 sq. miles. Capital, San Sebastian. Pop. (1887) 181,856.

Guiraud, gĕĕ´rō´. ERNEST: opera-composer; b. at New Orleans, La., June 23, 1830; received his first musical education from his father. His first opera, *Le Roi David*, was produced in New Orleans when he was fifteen years old. He then went to Paris and entered the Conservatory, gaining the Prix de Rome in 1859. His first work there was the one-act opera *Sylvie*, produced May 11, 1864. He followed this with many works, among which the most noticeable were *Gretna Green*, ballet (1873); *Piccolino* (1876; this is considered his best work); and *Le Kobold* (1870). He was decorated with the cross of the Legion of Honor in 1878; appointed Professor of Advanced Composition in the Conservatory in 1880, succeeding Victor Massé, having been a professor since 1876. He composed many orchestral works, and at his death, on May 6, 1892, left unfinished an opera, *Brunehilde*. D. E. HERVEY.

Guiscard, gĕĕs´kăăr´, ROBERT: Duke of Apulia and Calabria; sixth son of Tancred of Hauteville, a Norman baron with twelve sons; b. about 1015; went with his brothers about 1053 to Apulia in Italy; captured Pope Leo IX. at Civitella 1053, and in 1057 succeeded his brother Humphrey as count. In 1059 his new title of Duke of Apulia and Calabria was confirmed by Pope Nicholas II. He assisted his younger brother Roger (1031–1101), afterward Grand Count of Sicily, in his conquests. In 1074 Gregory VII. excommunicated him for trespassing upon the papal rights in Benevento, but in 1080 the pope was reconciled by Robert's submission. He next (1081–82) gained a series of victories in the Epirus over the Byzantines, but led the forces by which (1082–84) the pope resisted Henry IV., the emperor; delivered the pope from the Castle of St. Angelo and sacked Rome 1084; carried the pope to Salerno 1084; defeated the combined Greek and Venetian fleet and raised the siege of Corfù 1084. D. at Cephalonia, July 17, 1085. Robert and his brother Roger founded the kingdoms of Naples and Sicily. Revised by C. H. THURBER.

Guise, geez, or gweez: a fortified town of the department of Aisne, France; on the river Oise; 23 miles N. of Laon (see map of France, ref. 2–G). It has woolen and cotton manufactures, and a large foundry for manufacturing stoves, conducted on the profit-sharing plan. Pop. (1891) 8,153.

Guise, gweez, CARDINALS OF, or **Cardinals of Lorraine**: members of the Guise family, whose devotion to the Roman Catholic religion caused their promotion to the cardinalate. Prominent among them was CHARLES OF GUISE, b. at Joinville, Feb. 17, 1524; became Archbishop of Reims in 1538, and cardinal in 1547; went to the Council of Trent in 1562; was learned, affable, and politic, but cowardly, hypocritical, and licentious. His great ambition was to become pope, and to make his brother, the second Duke of Guise, King of France. He founded the University of Reims, and died at Avignon, Dec. 26, 1574.—JEAN OF GUISE, b. in 1498, was made cardinal in 1518, and died May 18, 1550. He held three archbishopries, six bishoprics, and many abbeys, and was famous for his large charities and his many amours; and when a beggar in those days received large alms, he would say to the giver, "Thou art either Christ or the cardinal."—LOUIS I., brother of Cardinal Charles (1524–74), b. Oct. 21, 1527; d. at Paris, Mar. 24, 1578. He became cardinal in 1553, and was chiefly noted for convivial habits, on account of which the people called him "the bottle cardinal," but he possessed fine natural abilities.—LOUIS II., a brother of the third Duke of Guise, b. at Dampierre, July 6, 1555; became Archbishop of Reims in 1574 and cardinal in 1578. He was put to death by order of Henry III. (who

feared his power) on the same day that the Duke of Guise, his brother, was murdered, Dec. 24, 1588. The cardinal left a natural son, Louis de Guise, Prince of Falzburg. Louis III., brother of the fourth duke, b. Jan. 22, 1575; became Duke-Archbishop of Reims without consecration, and was made a cardinal in 1615; was fond of military pursuits, and once attempted to settle a difficulty about an investiture by a duel, but was arrested on the field, and sent for a time to the Bastile. He left five children by the Countess of Romorantin, mistress of Henry IV. D. at Saintes, June 21, 1621.

Guise, Dukes of: a cadet branch of the house of Lorraine. The first duke was Claude, Duke of Aumale, b. Oct. 20, 1496; married Antoinette de Bourbon 1513; wounded at Marignano 1515; became Count of Guise 1520 (the first count was Charles of Anjou, 1414); fought the Germans under Charles V. successfully, and became Duke of Guise 1527; conquered Luxembourg in 1542, and died at Joinville in Apr., 1550.—Francis, second duke, b. at Bar, Feb. 17, 1519; rose by his own abilities as a general and the aid of his niece Mary, afterward Queen of Scots, to a high place in public affairs; became lieutenant-general in 1552, and won renown by his defense of Metz 1552–53, and by his conduct at Renti 1554; unsuccessfully commanded in Italy 1557; served brilliantly in command against the English and Germans 1557–58, taking Calais, Guisnes, Ham, and Thionville; exercised the chief power under Francis II.; renewed the war with the Protestants by the massacre of Vassy, Mar. 1, 1562; defeated and captured Condé at Dreux Dec. 19, 1562; was assassinated by a Huguenot named Poltrot de Méré, and died Feb. 24, 1563.—Henry (*Le Balafré*), third duke and Prince de Joinville, b. Dec. 31, 1550, gained great distinction in the service against the Turks and the Huguenots; was the leading spirit in the massacre of St. Bartholomew, and was afterward "head and soul" of the League; was forbidden to come to Paris by Henry III., who well knew the ambition of Guise, but he entered the city in triumph, virtually imprisoned the king in the Louvre, and demanded of the States-General the office of constable. He was assassinated by order of the king Dec. 23, 1588, and on the same day the Cardinal Guise, brother of the duke, was also murdered by the king's command.—Charles, the fourth duke, Prince de Joinville and Duc de Joyeuse, b. in 1571, became governor of Provence, and was an able general; banished by Richelieu in 1631. D. at Cuna, near Siena, 1640.—Henry, fifth duke, Prince de Joinville and Comte d'Eu, b. at Blois, Apr. 4, 1614, became Archbishop of Reims when fifteen years old; entered upon a life of licentiousness; in 1640 abandoned the Church; in 1641 was banished as a conspirator by Richelieu; married and became a soldier of fortune, distinguished for reckless valor. In 1647 he made himself generalissimo of Naples, but was given up to the Spaniards, and kept a prisoner four years; in 1655 became grand chamberlain of France. D. at Paris, June 2, 1664.—Louis Joseph, sixth duke, was born Aug. 7, 1630, and died of smallpox July 30, 1671.—Francis Joseph, seventh and last duke, Prince de Joinville, Duke of Guise, Alençon, Joyeuse, Angoulême, and Count of Aleth, son of the preceding, was born Aug. 28, 1670, and died Mar. 16, 1675.

Guitar [from Fr. *guitare* < O. Fr. *guiterre* (also *guiterne*, whence Eng. *gittern*) < Lat. *cithara* = Gr. κιθάρα, kind of lyre (whence Eng. *cithara*, *zither*]: a stringed instrument in size between the violin and the violoncello, and in shape similar to them. Its construction is simple: it consists of a hollow body like a violin, but flat in floor and cover, the latter having in the center a large round hole for resonance; a long wide neck, serving as a keyboard; and six strings of wire and catgut, attached to a low wooden bridge below the sound-hole, are stretched along the instrument, and are slackened or tightened by screws at the end of the keyboard. Across the neck, beneath the strings, are ridges of metal at unequal distances, pressure on which modulates the tone. The instrument is played with the fingers, the right hand touching the strings, the left making the modulations. In 1788 the Duchess Amalia of Weimar introduced it in Germany as a new Italian instrument. The Italians had it from the Spaniards; the Spaniards had it from the Moors; and they brought it from the East, where it, or something very much like it, had been known from a great antiquity. Instrument-makers have attempted improvements on the guitar. A German artist in London invented a method of keys by which the instrument could be played more easily, and be made to produce a fuller and steadier tone. Staufer of Vienna devised the guitarrencello and the guitarre d'amour; Birnbach tried to combine the guitar and violin by substituting a bow for the twanging of the strings. There have been other modifications, but none have met with favor, and the instrument remains essentially unchanged. As a distinct instrument the guitar is seldom used, although difficult pieces may be performed on it, and as an accompaniment to the voice it has been generally superseded by the piano.

Guittone d'Arezzo, goo-ĕet-tō'nā-dăă-ret'sō: poet; b. at Santa Firmina, near Arezzo, Italy, between 1220 and 1230. The hints of Dante (*Purg.*, xxiv., 56, and xxvi., 124; *Vulg. Elog.*, i., 13, and ii., 6) show that he was generally esteemed one of the chief of Italian poets before the rise of the *dolce stil nuovo*. (See Italian Literature.) His life and his poems fall into two sharply marked divisions. As a young man he was enamored of the service of Love after the fashion of the troubadours, studied the poetic art under the older poet Bandino, and wrote verses full of the most conventional sentiments. When about thirty years old, however, he suddenly abandoned all he had before affected, and, leaving his wife and three children, he became a member of the Ordine de' Cavalieri di Sta. Maria, the so-called *frati gaudenti*. From this time on he bitterly condemned all he had hitherto praised, and in harsh verses and in letters uttered his opinions upon the political and religious questions of his time. He acquired great influence, however, becoming provincial of his order. In 1293 (1295?) he gave a large part of his property for the establishment of the monastery Degli Angeli in Florence. D. 1294 (1296?). See Valeriani, *Rime di Fra Guittone d'Arezzo* (Florence, 1828; reprinted Florence, 1867); Bottari, *Lettere di Fra Guittone d'Arezzo* (Rome, 1745); Romanelli, *Di Guittone d'Arezzo e delle sue opere* (Campobasso, 1875); Koken, *Guittones von Arezzo Dichtung und sein Verhältniss zu Guinicelli von Bologna* (Leipzig, 1886); A. Bartoli, *Storia della Letteratura italiana* (vol. ii., Florence, 1879). Lucy A. Paton.

Guizot, gē'zō', François Pierre Guillaume: statesman and historian; b. at Nîmes, France, Oct. 4, 1787. His father, an eminent lawyer, was a victim of the Revolution in 1794. His mother had him educated in the Protestant faith and in classical learning at Geneva. He established himself in Paris in 1805, and began writing for the public in 1809. In 1812 he married Mlle. Pauline de Meulan (1773–1827), author of several books and editor of *Le Publiciste*, and the same year was appointed Assistant Professor of History at the Sorbonne. His political career began with the fall of Napoleon in 1814, when he was appointed Secretary-General of the Interior. In 1815 he was transferred to the Department of Justice, was made master of requests in 1816, and Councilor of State in 1817. He belonged to the constitutional party, and in his writings represented the views of the Doctrinaires, so called. On the fall of the Decazes cabinet in 1820 he resigned the position of director-general of the communal and departmental administration, and, having lost his seat in the Council of State, resumed his historical lectures at the Sorbonne. His course on the *History of Representative Government* attracted great attention, and in 1822 his lectures were suppressed on account of their radical tendencies. He then gave himself to literary work, and in 1828 established the *Revue Française*. The same year he married his second wife, a niece of the first, and also an author, by whom he had one son, who survived him. In that year also he was restored to his chair at the Sorbonne and to his seat in the Council of State. His lectures during the next two years on the *History of Civilization in Europe* and the *History of Civilization in France* were received with great favor, and gained for him his highest distinction. In Jan., 1830, he was elected to the Chamber of Deputies, and favored the measures which led to the revolution of July. Louis Philippe called him into his first cabinet as Minister of the Interior, but he soon resigned and resumed his place in the Chamber. In 1832 he took the Department of Instruction in Marshal Soult's ministry, and for four years did much to organize the system of primary education. On the dissolution of that ministry in 1836 he retired, and except for a few months, when he again occupied his post in connection with the ministry of Molé, acted with the opposition party. In Feb., 1840, he was sent as ambassador to England, where he was received with marked attention on account of the favor with which in his lectures he had spoken of the Brit-

ish constitution. In October of the same year he entered the cabinet again as Minister of Foreign Affairs, and for more than seven years was really the head of the Government. In that position he maintained steadily and persistently the policy of resisting the revolutionary spirit prevalent in the country, and establishing on a secure basis a constitutional monarchy like that of Great Britain. His wise and able administration did much to form a healthy political sentiment in the nation, and to secure the largest liberty compatible with a stable government. But his policy favored peace with all other European states. This was interpreted by the opposition as involving a subordination to the influence of Great Britain and Russia, and the party which had inherited the ideas and spirit of the Great Revolution, restless and active, though comparatively small in numbers, used this plea effectively to make the ministry unpopular, especially in Paris. Yet Guizot had the full confidence of the king, and was sustained by the Chamber of Deputies to the end.

In the latter part of the year 1847 an agitation for electoral reform created excitement throughout France. So-called reform-banquets, in which the Government was insulted and defied, were organized to discuss the proposed measures. Guizot proposed to the king that the cabinet should retire and open the way for a change of policy. But to this the king objected so long as the administration had the support of the Chamber of Deputies. The attempt subsequently made to suppress the banquets brought on the Revolution of 1848, when Louis Philippe was dethroned and Guizot took refuge in England. After a year's absence he returned, and as a candidate for the Chamber of Deputies was defeated. The remainder of his life was passed in retirement from direct concern with politics. He was, however, an interested observer of passing events, and occasionally gave public expression to his opinions. Thus in 1861 he startled his Protestant friends by declaring himself in favor of continuing the pope's temporal power; and in 1870 he sustained the administration of Ollivier. During his later years he published many volumes embodying his mature judgment on religious and historical subjects. He died at his villa in Valricher, near Paris, on Sept. 13, 1874.

As a statesman Guizot must be ranked among the great and good men of France. He was a consistent advocate of constitutional monarchy, but the nation, especially as represented by the population of the capital, was not prepared to adopt his views. His highest and most enduring reputation rests on his historical writings, in which he evinced accurate knowledge of facts, clear discernment of causes and governing principles, and great power for comprehensive and well-balanced generalization. The purity of his private life and the simplicity and strength of his Christian faith add a crown of solid worth and shining grace to his noble character. He was honored with membership in three of the five academies which make up the Institut de France. He was elected to the Academy of Moral and Political Science in 1832, to that of Inscriptions and Belles-Lettres in 1833, and to the French Academy in 1836. In 1872 he received the chief prize of the Academy.

The following is a list of Guizot's most important published writings: *A Dictionary of French Synonyms* (1809); *Annals of Education* and *The State of the Fine Arts in France* (1810); an annotated translation of Gibbon's *Decline and Fall of the Roman Empire*, *Lives of the French Poets of the Age of Louis XIV.* (1813); an *Essay on Representative Government* (1816); *Conspiracies and Political Justice, Means of Government in France* (1821); *History of Representative Government* (lectures at the Sorbonne, 1822); *An Introduction to a Revised Translation of Shakspeare*, *Essays on the History of France from the Fifteenth to the Eighteenth Centuries*, *Notes to Memoirs respecting the English Revolution*, *Notes to Memoirs respecting the History of France down to the Thirteenth Century*, *History of the English Revolution* (1827); *General History of Civilization in Europe* (1828); *General History of Civilization in France* (1830); *Fall of the Republic and Restoration of Monarchy in England* (1850); *Corneille and his Times*, *Shakspeare and his Times* (1852); *History of the English Republic and the Protectorate of Cromwell* (1854); *History of the Protectorate of Richard Cromwell and the Restoration of the Stuarts* (1856); *Memoirs on the History of my Own Time* (1856–68); *The Church and Christian Society* (1861); *Meditations on the Essence of the Christian Religion* (1864); *Meditations on the Present State of the Christian Religion* (1865); *History of France, for my Grandchildren* (1870, *seq.*); *History of Four Great French Christians* (1873–74). His *Study of Washington*, written as a preface to the life and writings of the great President, is a charming monograph. Most of his works have been translated into English. Revised by C. K. Adams.

Gujarat: See Guzerat.

Gujranwa'la: a district and city of Lahore division, the Punjaub, British India. The district is between the parallels 31° 32′ and 32° 33′ N., and the meridians 73° 11′ and 74° 28′ E., just S. of the river Chenab. Area, 2,587 sq. miles. It is the central part of the region called Rechna Doab, intermediate between the fertile foot-hills and plains of Sialkot and the deserts of Jhang. It is bare of trees, tame, and monotonous, but is fertile where it can be reached by water. The chief product is wheat, but other grains, oil-seeds, and sugar-cane are raised. The railway from Lahore to Peshawar passes through the district. The climate is healthful; the rainfall 24 inches. A great religious fair is held at Dhonkal. In mediæval times this district contained a metropolis called Taki, the ruins of which have been identified. At the time of the Mohammedan invasions it had disappeared. Under Mohammedan rule it revived, but later was abandoned. It revived again under Sikh rule, but is now of little importance. Pop. upward of 600,000, mostly Mohammedans. The chief town and capital is Gujranwala, in lat. 32° 10′ N., lon. 74° 14′ E., on the Grand Trunk and Northern State Railway, 40 miles N. of Lahore (see map of North India, ref. 4–D). It was the capital during the Sikh power. Pop. about 25,000. M. W. Harrington.

Gujrat: a district and town of Rawal Pindi division, Punjaub, British India. The district is between the parallels 32° and 33° N., and meridians 73° 20′ and 74° 31′ E. It is S. W. of Kashmir and between the rivers Jhelum and Chenab. Area, 1,973 sq. miles. It is a submontane district, and is fertile where supplied with water. Wheat is the staple product, but other grains, oil-seeds, and cotton are raised. The climate is healthful; the rainfall is 28·5 inches. The Northern State Railway traverses the district. Numerous relics of antiquity stud this area. Among them are the ruins of Nicæa, built by Alexander the Great on the field of his victory over Porus. Gujrat was the seat of bloody battles during the Sikh war. Pop. 700,000, mostly Mohammedans. The chief town and capital is Gujrat, in lat. 32° 34′ N., lon. 74° 7′ E., and is, according to tradition, the third city on this site (see map of North India, ref. 3–C). The trade is inconsiderable. Pop. 19,000.
M. W. Harrington.

Gules [M. Eng. *goules*, from O. Fr. *gueules*, gules, liter., plur. of *gueule*, mouth, jaws, referring to the color of the inside of the mouth]: in heraldry, a tincture; the color red. In modern engravings and drawings it is represented by fine perpendicular lines.

Gulf of Carpentaria: See Carpentaria, Gulf of.

Gulf of Guinea: See Guinea.

Gulf Stream: the best known of the ocean currents. The oceanic circulation of the Atlantic is of two kinds, one part consisting of a general drift at the surface from the equator toward the poles, compensated by a reflux of water from the poles toward the equator, chiefly below the superficial stratum. The other portion comprises limited bodies of water, whose motion, relatively to the general mass, is so rapid and whose direction is, on the whole, so constant, that they become individualized as currents of the ocean, comparable to rivers on the land. The most widely known and most thoroughly studied of all ocean currents is that which forms the subject of this article. It has received its name from the important part taken by the waters of the Gulf of Mexico in its formation, but in popular usage the name has been employed to designate not merely the Gulf Stream proper, but much of the oceanic drift of the North Atlantic which moves in harmony with the stream throughout its course, but at a much slower rate, and is extended over a vast area eastward and northward from the Gulf Stream, where the latter is unknown. The differences of opinion which appear in the literature as to the limits of the Gulf Stream are chiefly due to such a confusion of terms.

Origin.—The origin of the Gulf Stream, as of other great ocean currents, is due to the reaction of the atmospheric upon the oceanic circulation; that is, it is caused by the winds and modified by the form of the continental shores and the differences of rotational diameter of the earth between the equator and the poles, which last, as shown by

Ferrel, tend to deflect to the right any moving body in the northern hemisphere. Minor modifications of its force and volume are brought about by differences of atmospheric pressure at different portions of its course and by the solar and lunar tides.

Course.—In the tropical regions of the Atlantic the northeast and southeast trade winds are continually blowing, with a belt of calms between them. The southeast trades impel upon the coast of South America a mass of water which is divided at Cape San Roque, that portion which follows the coast northward being known as the Guiana current, which sets toward the Windward islands northward from Tobago with a course about N. N. W. or N. W. of Barbados; this is re-enforced by the current due to the northeast trades, and the flow thus originated pours through the passages between the islands, being strongest in that just S. of Santa Lucia and weakening in those northward. In addition to this, a vast body of even warmer water, due to the northeast trades, passes outside the West Indian islands, and later joins the Gulf Stream after it issues from the Straits of Florida. Having entered the Caribbean Sea, the current is in a measure confined by the adjacent shores, and the force exerted by the wind being for the most part steadily in one direction, the water acquires a constantly increased velocity, and in the western part of the sea is running more strongly than anywhere in the previous part of its course. This water enters the Yucatan channel between that peninsula and the island of Cuba, and from that channel is discharged into the Gulf of Mexico, raising the level of the surface above that of the Atlantic. The currents in the gulf proper are feeble and variable; in general the motion of the water is from the northern end of the Yucatan channel directly toward the Straits of Florida across the southern margin of the gulf. With a high declination of the moon, inducing stronger tidal influences, the tendency toward the straits is from a more northward region of the gulf. Passing through the straits the axis of the stream is at first near its southern edge, but after turning the Florida reefs this axis shifts to the westward, being there from 5 to 12 miles seaward from the 100-fathom curve along the continental shore. At the northern entrance of the Straits of Florida, between Gun Cay and Fowey Rocks, a careful study has been made by the U. S. Coast Survey of a section of the stream through which, according to Lieut. J. E. Pillsbury, U. S. navy, the hourly flow is 89,872 million tons of water, the rate at the surface being more than 3½ miles per hour in the axis of the stream, with a gradual diminution laterally and vertically. The mind can better appreciate the immensity of these figures by considering that if one hour's flow were evaporated, the salt thus produced would require more than 100 times the number of sea-going vessels now afloat to carry it. The water of the Gulf Stream is characterized by a deep-blue color, great clearness, and high temperature. When it meets the greener ocean water of the north the line of distinction is often absolutely distinct.

After leaving the strait the stream is re-enforced by the Windward current from the eastern margin of the Antilles, which, by passing over many shoals, has become very warm, but is not of great velocity. The resulting stream pursues a general northeasterly direction, passing close to Cape Hatteras and thence in a northeasterly direction between Bermuda and Nova Scotia, eastward of which it gradually loses its distinct character and becomes merged in the general oceanic drift promoted by the constant westerly winds known as the anti-trades.

Secular Variations.—The velocity, direction, and temperature of the Gulf Stream vary almost as regularly as do the tides in a harbor, being dependent as they are upon the influence of the sun and moon. The tidal wave, passing at right angles through the Gulf Stream toward the coast, temporarily checks the velocity of the current, and during this diminution of rate the temperature tends to fall and the directions of the marginal parts of the stream become less regular. There are diurnal variations corresponding in succession (though not in actual time) with the tidal variations, and a monthly series due to the changes in lunar declination. These changes, especially the diurnal ones, are more marked when the current runs near the shore; in the more open sea the solar influence is more distinct, and the monthly fluctuations more prominent.

General Characteristics.—The width of the Straits of Florida near the exit of the Gulf Stream, between Jupiter Inlet and Little Bahama Bank, is 48 miles, the greatest depth 439 fathoms, the area of the cross-section about 430 million sq. feet, and at 3 knots, the average velocity here, the amount of water passing through would be about 436 million million tons a day. The width of the stream varies from 45 to nearly 100 miles, the velocity of the axial part being greater than that of the lateral portions. The axis is about the same width off Hatteras that it is where the stream leaves the Florida Straits. The temperature of the current in the early part of its course rarely exceeds 83° F. in June and July, except under a hot sun in very calm weather. The Windward current, being slower and passing over many shoals and banks, is more thoroughly warmed by the sun than the part which comes through the straits; therefore, after the two currents combine, the greatest temperature is not in the axis of greatest velocity. The temperature at different depths preserves about the same relations to that at the surface in different parts of its course, heat being gradually lost as the stream advances northward and eastward. The average rate of flow may be 2½ miles per hour, in many places it is less, and in some it reaches 5 miles per hour. Fluctuations of a pronounced character have been shown to follow barometric changes in the gulf or elsewhere, greater pressure increasing or diminishing the rate of flow according to the point where it is applied; pressure near the sources of the stream increasing its rate and *vice versa*. The Gulf Stream in passing over the submarine border of the land known as the Continental Plateau has its inner edge near, but not rigorously continuous with, the 100-fathom curve. The edge of the plateau drops suddenly to about 2,000 fathoms, and makes its nearest approach to the coast at Cape Hatteras. The cold Labrador current runs outside of and along this bank, and when the Gulf Stream pours over it causes a tumult in the waters. Whether the cold current follows the margin of the plateau to the equator, or whether a portion of it, rising in temperature but retaining its motion, passes over the plateau inside of the Gulf Stream is yet to be determined, but it is not improbable that this is the origin of some of the cooler water found between the Gulf Stream and the southern coast. Marked variations in the temperature at the surface, known as "cold bands," have been noted in the Gulf Stream by many investigators. They form streaks trending with the current, and are apparently formed by cooler water from below displacing the warmer fluid at the surface. This is explained by the fact that while the warm water from its heat is less dense than the polar water, yet its excess of salt makes it of nearly equal specific gravity. If it cools at any time sufficiently to overcome the difference, even though still remaining warmer than the polar water, its weight may cause the stream water to sink below the former. Small differences of density under variable conditions will determine when the waters are adjacent which shall override the other, and thus produce the observed alternations of temperature. Gales, storms, changes in barometric pressure and in the season of the year, besides other factors yet unknown, all combine to produce in direction, temperature, and velocity fluctuations of a minor kind, while the general features of the stream remain fairly constant from year to year.

Exploration of the Gulf Stream.—The first navigators who explored the Caribbean and gulf regions necessarily had the strong currents forced upon their attention. Ponce de Leon observed the current in the Straits of Florida in 1513. Sixty years later Sir Humphrey Gilbert wrote in a manner which showed him to be acquainted with the general course of the Gulf Stream in the sub-tropical part of its course. In 1663 Vossius particularly and correctly described its course and the character of the circulation of the currents in the North Atlantic. But in the map of Kircher (1678) and that of Happelius (1685), on which the currents are delineated, no indication of the Gulf Stream proper appears except that portion of it outside of the Straits of Florida which is represented as continuous with the Windward current due to the northeast trades. The first to bring this great current to the notice of the learned world on a chart correctly representing its origin, and to publish the name by which it had already become known to some of the navigators of New England, was Benjamin Franklin in 1770. Attention had been called to the fact that the mail-packet ships between Falmouth, England, and New York were generally a fortnight longer in crossing than the private merchant vessels between London and Newport, R. I.; Franklin, being concerned in the management of the North American postal system and at that time in London, was consulted, and found that the difference was due to the knowledge of the Gulf

Stream possessed by the Rhode Island navigators, which, though brought to the attention of the masters of the royal packets, was disregarded by them. He therefore had the position and rate of the current engraved on a small chart, which was afterward reprinted in France. He also correctly referred the generation of the current to the action of the trade-winds. From the time of Franklin to 1845 numerous observations were made on the Gulf Stream, and its extent, direction, and force became generally known to hydrographers, while the whole question of its origin, characteristics, and variability, though much discussed, was still involved in great obscurity. In 1845 Prof. Bache, the head of the U. S. Coast Survey, inaugurated systematic exploration of the stream under Lieut. C. H. Davis, U. S. navy. This investigation was carried on more or less continuously by the hands of various naval officers attached to the survey. It was, however, only when the application of steel wire to sounding work was begun by Sir William Thomson and perfected by Belknap and Sigsbee that accurate observations became possible and genuine progress began. This came about in 1875–82, under Platt, Howell, Sigsbee, and especially Bartlett, of the navy, acting under the direction of the survey, and assisted by Mitchell, Pourtalès, Agassiz, and other men of science. In 1883 the plan of observing the currents from a vessel anchored at sea, first attempted by Platt in 1877, was applied by the survey to the Gulf Stream in the schooner Drift, commanded by Lieut. Fremont. In 1884 a deep-sea current meter, invented by Lieut. J. E. Pillsbury, U. S. navy, was put in use, and observations by that officer during five years in command of the Coast Survey steamer Blake were extremely fruitful in results.

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W. H. Dall.

Gulf-weed: the popular name applied to large seaweeds found floating in the ocean, sometimes covering large areas,

Fig. 1.—Gulf-weed, *S. bacciferum*, somewhat reduced in size.

especially in the so-called Sargasso Seas, the most noted of which is in the mid-Atlantic. Gulf-weeds are species of the genus *Sargassum* of the family *Fucaceæ* and order *Fucoideæ*. (See Fucoids). They are characterized by their branching stems, which bear distinct leaves with a midrib, and stalked one-celled air-bladders. There are about 150 species, which are mainly inhabitants of the warmer waters of the globe. *S. bacciferum* is found floating in great quantities in the tropical and sub-tropical waters of both hemispheres. It is

Fig. 2.—*Sargassum vulgare*.

occasionally washed ashore as far north as the coast of New England. Its near relative, *S. vulgare*, is found along the eastern coast of the U. S. from Cape Cod southward to the West Indies, and also on the European and African coasts.

Charles E. Bessey.

Gull [from Corn. *gullan*; cf. E. *guillemot*]: a water-bird of the family *Laridæ*, or rather of the sub-family *Larinæ*, the members of the sub-family *Sterninæ* being popularly known as terns or sea-swallows. Gulls are web-footed birds, having the hind toe rudimentary or small, the horny sheath of each mandible in a single piece, the wings long, and flight protracted and graceful. Of the seventy or more species, some are found in Arctic seas and others in tropical waters, while they are equally at home on the ocean or on inland lakes. They range in size from the great black-backed gull (*Larus marinus*), with a spread of 5 feet or more, to the little *Larus minutus*.

Gulls are gregarious, breed in colonies, and make their nests on the ground, or, like the kittiwake, build on some precipitous rock overlooking the water. The pear-shaped eggs are generally three in number, and are taken in quantities by dwellers in high northern latitudes, where the species of the north temperate zone mostly breed. They feed on fish, crustaceans, cuttle-fishes, and animal matter generally; are tame wherever protected, shy and suspicious where persecuted by man. The gulls form a very compact body of birds, and although they have been divided into numerous genera, *Larus*, *Rissa*, *Xema*, *Chroicocephalus*, etc., the distinctions between them are slight. The great black-backed gull (*Larus marinus*) is white, the mantle, as the back and upper part of the wings are collectively called, of so dark a slate color as to appear black; primaries, secondaries, and tertials tipped with white. This bird is 2½ feet long and 5 feet from tip to tip of wing. It is found on both sides of the North Atlantic, and has the habit of helping itself to the eggs and young of birds nesting in its vicinity. The glaucous gull, or burgomaster (*Larus glaucus*), is as large as the

preceding, but the mantle, as in many other species of gulls, is a beautiful pearly blue. The burgomaster is circumpolar and breeds in the far north. Although the gulls, as a group, are world wide in their distribution, some species are very much restricted in their range. Thus the ivory gull (*Pagophila eburnea*), so called from the pure white color of the old birds, is confined to the Arctic seas, and the fork-tailed gull (*Creagrus furcatus*) is limited to the Galapagos islands, and is so rare that very few specimens are preserved in museums. The rosy gull (*Rhodostethia rosea*) is another Arctic species, and although it has been taken by various polar expeditions, its breeding-place is still unknown, although supposed to be in the vicinity of the north pole. See also Gaviæ, Herring-gull, Kittiwake, Longipennes, Jaeger, and Tern.

F. A. Lucas.

Gull, Sir William Withey, Bart., M. D., D. C. L., F. R. S.: b. in Thorpe-le-Soken, Essex, England, Dec. 31, 1816; passed M. B. in 1841 and M. D. in 1846 at the University of London; was Professor of Physiology at the Royal Institution 1847–49, and for many years was a lecturer at Guy's Hospital; won a baronetcy by his skill in attending the Prince of Wales in 1871; published *Gulstonian Lectures on Paralysis*, *Hypochondriasis*, *Reports on Epidemic Cholera*, the Hunterian oration in 1861, and the Harveian oration in 1870; *Alcohol as a Medicine and as a Beverage*, and many addresses and papers. D. in London, Jan. 29, 1890.

Gulliver, John Putnam, D. D., LL. D.: b. in Boston, Mass., May 12, 1819; graduated at Yale in 1840 and at Andover 1845; held a Congregational pastorate at Norwich, Conn., 1846–65, and in Chicago 1865–68; president of Knox College, Galesburg, Ill., 1868–72; pastor of the First Presbyterian church, Binghamton, N. Y., in 1872–78, and since 1878 Professor of the Relations of Christianity and Science in Andover Seminary. D. in Andover, Jan. 25, 1894.

Gum [M. Eng. *gumme*, from O. Fr. *gomme*: Ital. *gomma* < Lat. *gummi*, from Gr. *κόμμι*, gum, a foreign word of unknown origin]: a name somewhat vaguely applied to many vegetable juices and to some animal juices, chiefly to such as are neither oily nor resinous. The gums proper consist (according to Guérin) essentially of arabin ($C_{12}H_{22}O_{11}$, found in gums arabic and senegal), of cerasin (cherry, plum, and peach gum), of bassorin (the mucilaginous principle of Bassora gum and of tragacanth). *Arabin* has mildly acid properties; is soluble in hot or cold water, forming mucilage; is precipitated by alcohol or subacetate of lead; is coagulated by borax; and is believed to exist in gum arabic in combination with small proportions of alkalies and alkaline earths. It is isomeric with cane-sugar. *Bassorin* swells, but does not perfectly dissolve, in water, with which, however, it may be rubbed into a very adhesive paste, which can not be called a solution. *Cerasin* much resembles it, but has somewhat different chemical reactions. The principal gums are the following: Gum Arabic is mainly the product of *Acacia vera*, but is in part the product of *A. nilotica* and other thorny trees and shrubs of the genus, found throughout a very large part of Africa and in portions of Asia. That from the Nile valley is the Turkey gum of commerce; Barbary gum comes mostly from Mogadore, and is of two kinds—one (identical with Turkey gum) grows in Morocco, etc., and the other is brought from the Sudan by caravans. Gum Senegal is closely allied in character to the above, is identical in its uses, and is the product of several trees of the genus *Acacia*, growing in Western Africa. *Galam gum* is a name given to some of the best varieties of gum senegal. Much of the gum arabic of commerce is really from Senegal. *India gum* is mostly produced in Africa and Arabia, and finds its way to Bombay in Arab vessels. *Cape gum* was formerly brought from South Africa, and Australia has supplied some of the gum of commerce. Gum Mezquite, from *Algarobia glandulosa*, a thorny leguminous shrub of the dry regions of Mexico and the adjacent parts of the U. S., is closely analogous to gum arabic, but its principle is not precipitated by borax. Tragacanth is the gummy exudation which appears spontaneously or upon the incised bark of *Astragalus verus* and other species of that genus, family *Leguminosæ*. Bassora gum, from Persia, combines the principles arabin and bassorin. The plant which produces it is not known, but is supposed to be an *Astragalus*. Besides the true gums, many other somewhat similar products are popularly known as gums. See Gum Resins.

Uses.—The true gums above enumerated are used in the arts as sources of Mucilage (*q. v.*); in medicine they are demulcent; they are employed in pharmacy in making troches and pills; in confectionery for the basis of many pastes and confections; in calico-printing, in preparing inks, in making sizes, and other stiffening preparations, they have also an extended use; but Dextrin (*q. v.*), or British gum, has in part taken their place. Most experimenters have concluded that the gums are entirely innutritious, but this conclusion is perhaps open to some question.

Gum Benjamin: See Benzoin.

Gumbinnen, goom-bĕĕn'en: a garrisoned town of Prussia in the province of East Prussia, on the Pissa; 72 miles by rail E. of Königsberg (see map of German Empire, ref. 1–K). It was founded in 1724, and in 1732 Frederick William I. received and settled here the Protestants from Salzburg who emigrated on account of religious persecutions. It has two gymnasia, a branch of the imperial bank, a hospital, an iron-foundry, machine-works, brick-kilns, and various manufactures. Pop. (1890) 12,213.

Gumbo (*Gombaud*, *Okra*): the *Hibiscus esculentus*, a plant of the family *Malvaceæ*; native of the West Indies, and cultivated in the U. S., especially in the Southern States, also in most warm countries, for its mucilaginous pods, which are excellent in soup, and are often cooked and served up with butter or pickled. It is extensively raised in the vicinity of Constantinople, also in Egypt. The seeds are in many places used as a substitute for coffee, and the leaves are put to manifold uses on account of their demulcent qualities. The *Gombo musqué* is the *Hibiscus moschatus*, cultivated in many warm countries, and prized for its reputed medical virtues. Its seed, known as ambrette, is employed by perfumers.

Gum Dragon: See Dragon's Blood.

Gum Elastic: See Caoutchouc.

Gum Lac: See Lac.

Gumma: See Syphilis.

Gummere, Francis Barton, A. B., Ph. D.: author and teacher; b. at Burlington, N. J., Mar. 6, 1855; educated at Haverford College, Harvard College, and Freiburg University; was teacher of English in the Friends' School, Providence, R. I., 1875–79; instructor in English, Harvard College, 1881–82; head master, Swain Free School, New Bedford, Mass., 1882–87; became Professor of English, Haverford College, 1887. He has published *The Anglo-Saxon Metaphor* (Halle, 1881); *Handbook of Poetics* (Boston, 1885; 4th ed. 1893); *Germanic Origins: a Study in Primitive Culture* (New York, 1892); and miscellaneous essays and papers, mainly in Germanic philology and English literature.

Gum Resins: a group of vegetable products consisting of a mixture of gum and resin. They are obtained by allowing milky exudations from certain plants to evaporate spontaneously. Their chief use is in medicine. The principal gum resins are included in the following list:

Ammoniacum.—Two varieties are recognized—the *Persian* and the *African*. The former has been an article of commerce for ten centuries. The latter is mentioned by Dioscorides and older writers.

Asafœtida.—This is the dried juice of two plants found in Thibet, Afghanistan, and Turkestan. They are *Ferula narthex* and *Ferula scorodosma*. Asafœtida is used in medicine as a nervous stimulant and antispasmodic, and in the East as a condiment.

Bdellium.—This is mentioned in the Bible. It is obtained from India, and is used principally to adulterate myrrh.

Euphorbium.—This is very little used.

Galbanum.—This has been used from the earliest times as an ingredient of incense and in medicine. It is mentioned by the oldest writers. It is not certain from what plant it is derived.

Gamboge is obtained from Cambodia, Siam, and Cochin China. It is used in medicine as a drastic purgative.

Ivy gum resin is obtained from the old trunks of the common ivy.

Myrrh has been used from the earliest times as an ingredient of incense, and also in embalming. It is obtained from a shrub or small tree (*Balsamodendron myrrha*) which grows on the Somali coast of the Gulf of Aden and on the Red Sea coast of Arabia.

Olibanum, or *frankincense*, has always been the favorite ingredient of incense and, like myrrh, has been used for embalming from the earliest times.

Other gum resins are *opopanax sagapenum* and *scammony*.

Ira Remsen.

Gumri: See ALEXANDROPOL.

Gums: See GUM.

Gum'ti: two rivers of British India; the larger is an affluent of the Ganges, flowing through Oudh, passing Lucknow, and emptying into the Ganges near Benares. The other rises in Hill Tipperah, flows westward through Chittagong, Bengal, and empties into the Barak near its mouth on the Megnah. M. W. H.

Gum-tree: a name given in the U. S. to several trees: (1) The black or sour gum, pepperidge, or tupelo (*Nyssa sylvatica*), a large tree growing in most of the States E. of the Mississippi, produces a firm, hard timber, used for bowls, hat-blocks, windmill shafts, hubs, cart-lining boards, etc. It is grown in Europe. *Nyssa uniflora* and *aquatica*, the water-tupelos of the South, have soft, light wood, and their roots have been recommended as substitutes for corks. The *Nyssa capitata* of the Gulf States bears a sour edible fruit, the Ogeechee lime. The above trees belong to the family *Cornaceæ*. (2) The sweet gum, bilsted, or liquid-ambar (*Liquidambar styraciflua*), of the family *Hamamelaceæ*, grows from New England to Mexico. It is a fine large tree, well known by its star-like leaves and furrowed bark. Its wood is soft, but firm and fine-grained, and used in making furniture. In the warmer latitudes it yields an abundant balsamic resin called American storax. Its bark is very useful in the treatment of diarrhœa and dysentery. This tree grows well in Europe. *L. imberbe* of the Levant yields styrax or storax, and so does *L. altingia*, a very lofty tree of Farther India, having a very hard, heavy, fragrant red timber. (3) Very different from either of the foregoing are the *Eucalyptus*, or gum-trees of Australia (see EUCALYPTUS); (4) in different British colonies still other trees with gummy or viscid juice are called by this name.

Revised by CHARLES E. BESSEY.

Gun: See ARTILLERY and SMALL ARMS.

Guṇa [Skr. *guṇá-*, property, peculiar quality, used of the properties of vowels]: a technical term of the Hindu grammarians denoting the apparent modifications of vowels by the prefixing of *a*; thus the *guṇa* of *i* is *ē* (*ay*) = *ăi*, of *u* is *ō* (*av*) = *ău*, of *ṛ* is *ar*, of *ḷ* is *al*. This view of the relation between the weaker and stronger form of vowels is based solely upon appearances in Sanskrit. Modern comparative grammar shows that the phenomenon of ablaut which is here involved was of Indo-European origin, and not a product of the individual languages; furthermore that the fuller vowel is not to be regarded as developed from the weaker, but rather the reverse; thus Skr. *bōdh-* (<*bheudh-*): Gr. *πευθ-* are the normal forms of the root, and not the strengthened forms of *budh-* and *πυθ-*. In distinction from *guṇa*, the still stronger form of the root (*āi*, *āu*, *ār*, etc.), was called *vṛddhi*.

BENJ. IDE WHEELER.

Gun'boat: a war-vessel of relatively small dimensions, usually propelled by steam and carrying a small number of guns, often of heavy caliber. Gunboats are of especial service on rivers and for in-shore duty, such as blockading service and the like. They are constructed by nearly every naval power of any importance. See SHIP-BUILDING.

Guncotton: See EXPLOSIVES.

Gunduck: same as GANDAK (*q. v.*).

Gundwa'na, gŭnd-waa'na: a former province of Central India, now mostly contained in the Nagpur district. It takes its name from the GONDS (*q. v.*), one of the most important of the native races. Their portion of this highland region is almost entirely a wild jungle.

Gunmaking: See ORDNANCE.

Gunnel, or **Butterfish**: popular name of certain small eel-like marine fishes of the blenny family, found often in

The spotted (European) gunnel.

tide-pools and under seaweed along the shore. Among the species are *Murænoides mucronatus* of the Atlantic coast of the U. S., and the *Murænoides gunnellus* of Europe. They are covered with mucus, and are caught for fish-bait.

Gunnery: the science which treats of the motion, and the cause of motion, of projectiles fired from cannon or small-arms; also the art of using artillery and the implements pertaining thereto. The motion of a projectile from the instant it starts from its seat in the gun until it strikes the object aimed at, and comes to rest, passes through three distinct stages, giving rise to as many different branches of the subject, called, respectively, *interior ballistics*, *exterior ballistics*, and *penetration of projectiles*. These divisions will be considered separately in the order named.

Interior ballistics treats of the phenomena which take place in the chamber and bore of a gun from the time of ignition of the charge until the projectile leaves the muzzle, expelled by the expansion of the highly elastic gas furnished by the combustion of the powder. It determines, among other things, the proper relations of weight of charge to weight of projectile and length of bore; the proper size, shape, and density of the powder-grains which make up the charges for different guns, and the effect of each of these qualities upon the pressures exerted upon the walls of the gun; the velocity of recoil and the strength of the carriage necessary to sustain the strains it suffers. It is by a careful study of all these points that the great superiority of guns manufactured since 1870 has been effected. Among many others who have worked successfully in this department of gunnery may be mentioned Noble and Abel in England and Sarrau in France. The two former, working together, studied the phenomena produced by the explosion of gunpowder in a closed vessel sufficiently strong to resist the expansive force of the gas, thus enabling them to collect the whole of the complex products of combustion and examine them at their leisure. Their results have an important bearing upon interior ballistics, since they help to determine the temperature of combustion of fired gunpowder, the mean specific heat of the products of combustion, the ratio of solid to gaseous products, and what is technically known as the force of the powder—all of which are important factors in determining the work done by the gas in the bore of a gun. Sarrau, in a series of memoirs upon the effects produced by fired gunpowder in the bore of a gun, has deduced practical formulas for calculating pressures and muzzle velocities to a remarkable degree of approximation. In these investigations Sarrau took into account, for the first time, the progressive burning of the charge under the influence of the variable pressure to which it is subjected in the gun, and was thus able to introduce into his formulas the characteristic elements of each powder employed—that is, the density, form, and size of grain—and thence determine the effect which each of these elements produces upon the maximum pressure and muzzle velocity.

Though the time that elapses between the ignition of the powder-charge in the chamber of a gun and the rush of the projectile from the bore is too short for the senses to take cognizance of, yet in this short interval many phenomena take place in orderly sequence within the bore. Imagine a modern seacoast gun—say, the breech-loading 12-inch steel rifle, model of 1891, adopted by the U. S Government—mounted upon its proper carriage, and loaded with the service charge. This gun is 40 feet long, nearly 4 feet in diameter at the breech, and weighs 57 tons. It is loaded with a charge of 520 lb. of brown prismatic powder (see GUNPOWDER), and an oblong, pointed projectile weighing 1,000 lb. (See PROJECTILES.) The charge of powder occupies the chamber—an enlargement of the bottom part of the bore—and completely fills it, though the air-spaces in the interstices between the powder-grains aggregate about two-fifths the volume of the chamber. The piece is discharged by the pulling of a lanyard, or small cord, attached to the eye of a friction primer inserted in the vent, or small cylindrical canal conducting to the chamber, and by a simple arrangement detonates a small quantity of fulminate of mercury placed in the head of the primer, and this in turn ignites a larger quantity of fine sporting powder with which the tubular body of the primer—projecting into the vent—is filled. The combustion of this powder sends an intensely hot tongue of flame downward through the vent into the powder-chamber, igniting at once several of the coarse grains of which the charge is composed, and the inflammation spreading with great rapidity from grain to grain through the interstices of the charge, the whole is almost instantly ignited.

The first gaseous products formed by the combustion of the grains expand into the vacant spaces (air-spaces) of the chamber, and, filling them, soon acquire sufficient tension to start the projectile and force the copper band which encircles it near its base into the grooves. The projectile once in motion encounters no further resistances so great as those which opposed its start; and as it moves along the bore, its velocity rapidly increases under the continued pressure of the gas. The pressure also increases at first, but soon attains its maximum (in the gun selected for illustration) of 37,000 lb. per square inch when the projectile has moved but a short distance, and then decreases, but much more slowly than it increased, until, when the projectile leaves the bore after traveling 30·41 feet from its seat, the pressure is only about one-fourth of its maximum. This variation of pressure is due to several causes. At first the surfaces of inflammation, that is, of the grains of powder, are relatively large, and the emission of gas correspondingly great; and, besides, the combustion of the charge is accelerated by the increase of pressure nearly in the ratio of its square root. Both of these causes raise the pressure in the chamber enormously before the projectile has been forced into the grooves and fairly started. On the other hand, the motion of the projectile along the bore affords an increasing space for the gas to expand in, and this, together with the less abundant disengagement of gas as the grains are more and more consumed, and its cooling by conduction to the walls of the gun, speedily relieves the pressure. As the friction of the projectile against the grooves remains practically constant, and the resistance of the air in front of the projectile rapidly increases with its velocity, it is evident that if the gun were sufficiently long the projectile would not leave the bore; while, on the other hand, if the gun terminated at the point where the velocity of the projectile was greatest, the charge of powder would be best utilized.

In the case of the 12-inch breech-loading rifle under consideration the projectile would emerge from the gun in about $\frac{1}{36}$ of a second from the time it started from its seat with a velocity of translation of 2,100 feet per second, and a rotation about its axis of 84 revolutions per second. These velocities represent energies of 30,610 and 242 foot-tons respectively, or a total of 30,852 foot-tons, to produce which would require a constant effective pressure of about 20,000 lb. per square inch upon the base of the projectile acting through the distance it travels from its seat to the muzzle, which is 30·41 feet: while, as has been seen, the actual pressure varied from zero to a maximum of 37,000 lb. per square inch at a short but unknown distance from the seat of the projectile, and then diminished to about 10,000 lb. per square inch at the muzzle. A constant pressure in the gun represents an ideal condition which could it be attained would render the manufacture of guns a comparatively simple operation, since their outward form would be cylindrical with the trunnions midway between the breech and the muzzle, while the muzzle velocities that could be obtained would be much greater than those given by the best modern guns. But though this ideal can never be reached, great progress has been made toward it chiefly by employing increased charges of large-grained, slow-burning powder in chambered guns of great length.

The work expressed in the motion of a projectile as it emerges from the bore (motion of translation and of rotation) is called the useful work of the powder-charge, and, as is readily seen, is not the whole work done by the gas. It is very difficult to determine the total force of fired gunpowder, since no experiment has given its value directly and with certainty. Indirect methods have been employed, but as they make use of hypothetical data they leave a margin of uncertainty in the result. From a comparison of the work utilized by the best ordnance in the U. S. (taking into account only the powder actually burned in the gun) with the experiments made by MM. Sarrau and Roux at the Dépôt des Poudres et Salpêtres, in France, it would appear that but 77 per cent. of the total force of the powder is expended in doing useful work. The remaining 23 per cent. is wasted in heating the gun, in giving motion to the charge itself and to the gun and carriage, and in overcoming passive resistances, such as the forcing of the projectile and its friction against the grooves, the friction of the gas, and the resistance of the air. Capt. Noble, C. B., F. R. S., determined by experiments made in England with 12-cm. quick-firing guns that the total loss of energy arising from the fouling of gunpowder and from the friction due to rifling (increasing twist) together amounted nearly to 7 per cent. of the whole energy developed.* This leaves 16 per cent. to cover the other sources of waste mentioned above. In making these calculations we are confined to the work done by the gas while the projectile is in the gun; but, as has been seen in the case of the 12-inch breech-loading rifle, the pressure upon the base of the projectile as it leaves the muzzle is 10,000 lb. on each square inch, or about 500 tons on the entire base, and this high-grade motive force can only be utilized by increasing the length of the gun. This may not be practicable for heavy guns, but the quick-firing guns have shown what can be done by lengthening the bore and thus utilizing more of the force of the powder. As an example, take the Canet 2¼-inch quick-firing gun, which at a trial in France gave a muzzle velocity of 3,324 foot-seconds, with a maximum pressure of 36,980 lb. per square inch, which is well within the limit of safety. This gun was 80 calibers long, which is twice the relative length of the 12-inch breech-loading rifle.† On Jan. 23, 1893, a 6-inch gun, which had been lengthened to 100 calibers by screwing an additional piece on the muzzle, was fired at Elswick, England, and gave to a 70-pound projectile the enormous velocity of 3,711 foot-seconds. This is the highest velocity yet obtained.

The most important results furnished by interior ballistics from the known data are the muzzle velocity and the maximum pressure upon the breech of the gun. The formulas chiefly used for computing these elements were deduced by Sarrau, and have already been alluded to. They are the following:

For muzzle velocity,

$$V = 845{\cdot}07\alpha \frac{\hat{\omega}^{\frac{3}{4}} u^{\frac{3}{4}}}{(Cdw)^{\frac{1}{4}}} \left\{ 1 - 0{\cdot}0204\beta \frac{(uw)^{\frac{1}{2}}}{d} \right\}.$$

For maximum pressure on breech

$$P = 493290\alpha^2 \frac{\hat{\omega}^{\frac{7}{4}} w^{\frac{1}{4}}}{Cd^2}.$$

In these formulas—

$\hat{\omega}$ is the weight of powder-charge in pounds.

w is the weight of projectile in pounds.

u is the length of travel of projectile in the bore in inches.

d is the diameter of bore in inches.

C is the volume of powder-chamber in cubic inches.

α and β are coefficients called the characteristics of the powder. Their values depend upon the nature and composition of the powder and the size and shape of the grains. Their values must be determined by experiment for each different kind of powder.

V is the muzzle velocity in foot-seconds, and P the maximum pressure upon the breech in pounds per square inch.

The characteristics of any particular powder (α and β) are generally determined by firing suitable charges of the powder in two guns of similar construction, but of different calibers, and therefore differing from each other in all the elements entering into the equation for the muzzle velocity. The muzzle velocity is carefully measured for each gun and substituted in the above formula, which evidently establishes two equations of the form

$$V = A\alpha(1 - B\beta),$$

by means of which α and β can be easily found, since A and B contain only known quantities. In the following tables, taken from *Notes on the Construction of Ordnance*, No. 36 (Washington, April 28, 1886), are given, in the first, the principal data relating to the most important powders made in the U. S., and in the second data relating to a few typical guns required in the velocity and pressure formulas. To these are added columns showing the agreement between the computed and measured muzzle velocities and maximum pressures:

TABLE I.—CHARACTERISTICS OF DIFFERENT POWDERS.

BRAND OF POWDER	Form of grain.	N.‡	Specific gravity.	Log α.	Log β
IKD	Granulated	2,200	1·725	0·30115	0·13851
LXB	Square prism	270	1·706	0·34940	0·15243
KHC	Sphero-hexagonal	123	1·775	0·18257	1·89521
EVF	Hexagonal	72	1·750	0·18232	1·86037
Cocoa	Pierced hexagonal prism	114	1·863	$\bar{1}$·95292	1·39892

* *Notes on the Construction of Ordnance*, No. 60 (Washington, May 11, 1892).

† See London *Engineering*, June 10, 1892, p. 713.

‡ Number of grains in a pound of powder.

TABLE II.*

CALIBER OF GUN	Travel of projectile in bore.	Weight of projectile.	Weight of charge.	Volume of chamber	MUZZLE VELOCITIES.		MAXIMUM PRESSURES.	
					Computed.	Measured.	Computed.	Measured.
d	u	w	ω	C				
3·2....	73·2	13	3·5	113·01	1,630	1,630	29,010	29,100
3·2....	73·2	13	3·5	113·01	1,726	1,713	34,601	36,500
12	91·6	610	52	1,686·4	953	993	23,574	25,000
8 ..	98·5	183	15	1,572·7	1,188	1,188	32,630	32,050
12 ..	273·5	750	265	8,882·2	1,761	1,761	29,114	32,000

* The horizontal lines in these tables go together.

The muzzle velocity of a projectile may be determined in two ways:

1. By measuring the projectile's momentum or quantity of motion, from which its velocity may be deduced by the principles of mechanics. The first instruments employed for this purpose were the ballistic-pendulum invented by Robins and the gun-pendulum of Count Rumford. The idea involved in both instruments is the changing of the elements of the projectile's momentum from a small mass and high velocity to a large mass and correspondingly low velocity, which can be more easily measured. These pendulums did good service for gunnery, but were discarded for the less expensive and more accurate electro-ballistic machines.

2. By measuring the time required by the projectile to pass over a certain short but known space. The velocity is then determined by dividing the space by the time. A great variety of instruments have been devised for the purpose of measuring this small interval of time, differing from each other in the more or less indirectness of the measurement. Those in use are classed under the general head of electro-ballistic machines (chronographs, chronoscopes, etc.), and act as follows: Two vertical target-frames or screens are placed perpendicular to the plane of fire, the first as near the gun as possible without being sensibly affected by the blast (from 150 to 200 calibers), and the second a certain known distance farther from the gun, say 150 feet. Each of these targets is connected electrically with the electro-ballistic machine, and these connections are successively severed by the projectile as it passes through the targets. The interruptions thus caused are instantly recorded by the machine in such a manner as to give the interval of time between these occurrences, and this is manifestly the time consumed by the projectile in traversing the distance between the screens.

The electro-ballistic machines most in favor which differ from each other chiefly in their manner of registering the passage of the projectiles through the screens are the Boulengé chronograph, the Bashforth chronograph, and the Schultz chronoscope. The first, invented by Capt. Le Boulengé of the Belgian artillery, is generally employed the world over for determining muzzle velocities. In this instrument the time is measured by the distance a heavy rod falls while the projectile is passing between the screens. This rod, which is suspended vertically from the pole of an electro-magnet, is released when the projectile cuts the first screen, and the distance it has fallen when the projectile pierces the second screen is marked by a cutter on the rod itself, and can be measured by a rule furnished for this purpose.

To ascertain the maximum pressure in the chamber of a gun the Noble crusher gauge, devised by Capt. Noble—already referred to—is universally employed. This consists essentially of a small hollow steel cylinder closed at one end by a steel anvil. At the open end a movable piston fits accurately, any ingress of gas to the space within the hollow of the cylinder being prevented by a gas-check. Between the movable piston and the anvil is placed a small cylinder of pure copper about an eighth of an inch in diameter and four-tenths of an inch long, whose axis is held in the axis of the hollow cylinder by a spring. The apparatus when properly prepared for an experiment is either placed in the bottom of the cartridge bag or screwed into the breech-block with the movable piston flush with its face. It may also be screwed into the base of the projectile when the latter is fired, so that it can be recovered. We may also use two crusher gauges at the same time, one in the breech-block and one in the projectile, and their indications would show the difference between the maximum pressure upon the breech and the base of the projectile, which is supposed to be considerable. When the gun is fired the powder-gas, pressing in all directions, forces the movable piston against the copper cylinder, which yields and becomes shorter longitudinally, expanding laterally, and receives a permanent set. The cylinder on being removed from the gauge is measured, and its compression compared with that given by experiments which have been tabulated for ready reference.

Exterior ballistics treats of the circumstances of motion of a projectile from the time it leaves the gun until it reaches the target, or, in case of shrapnel, bursts in the air at any desired point. This branch of the science of gunnery takes the projectile where interior ballistics leaves it—at the muzzle of the gun—with a known velocity, both of translation and of rotation. In one of the most important applications of exterior ballistics to the problems of actual warfare, the given data are the form, dimensions, and weight of the projectile, its muzzle velocity, the density of the atmosphere, and, lastly, the distance to the target—technically called the range. From these data modern ballistic formulas and tables afford a ready means of determining with great accuracy not only the proper elevation and direction to be given to the gun in order that the projectile may hit the target, but also the time of flight, the steepness of descent of the trajectory, and the striking velocity, the two latter determining the effect of the projectile upon the target, and the former the allowance to be made when firing at a swiftly moving object, as a ship.

There are two forces which act upon a projectile during its flight through the air, and which together determine the shape and dimensions of its trajectory. These are the force of gravitation, which is a constant downward pull, and the resistance of the air, which is a variable push against the head of the projectile in a direction opposite to that of its motion. If we ignore at first this latter force, or, what is the same thing, imagine the projectile to be fired in a vacuum with any given angle of projection, the curve or trajectory it will describe is a parabola, having its axis vertical and vertex at the highest point, or summit, of the trajectory. As a parabola is symmetrical with respect to its axis, it follows that the ascending and descending branches of a trajectory *in vacuo* are similar to each other, and that the angle of fall with reference to a horizontal plane passing through the muzzle of the gun is equal to the angle of departure. Moreover, the striking velocity of the projectile—that is, its velocity when it returns to the level of the gun—is the same as its initial velocity, and greater than the velocity at any intermediate point. From this it will be seen that the downward pull of gravity restores to the projectile in the descending branch all the motion it took from it in the ascending branch, but in reverse order, so that at any two points of the trajectory, one in the ascending and the other in the descending branch, at equal altitudes, the velocities are equal; and therefore the velocity at the summit is less than at any other point. Another fact worthy of notice is that the horizontal velocity of a projectile moving *in vacuo* is constant. Introducing now the other force acting upon the projectile—the resistance of the air—which gives in connection with gravity the actual trajectory with which alone gunnery is concerned, all the simplicity and symmetry of the trajectory *in vacuo* disappear, and we have a curve which all the resources of mathematics are unable to express rigorously. There are certain characteristics of this trajectory, however, which are evident without the aid of mathematics. For example, the maximum altitude, the horizontal range, and the striking velocity are less, and the angle of fall greater, than in the trajectory *in vacuo*, while the horizontal velocity continually decreases; and all these on account of the constant and permanent loss of motion given up by the projectile to the air. It can also be shown that, whatever may be the law of resistance of the air—so long as there is any resistance at all—the point of minimum velocity is not at the summit of the trajectory, but at some point farther along in the descending branch.

The effect of the resistance of the air upon the motion of a projectile is greater than is generally supposed. As an illustration, consider the trajectory of a 1,000-pound projectile fired from the 12-inch breech-loading rifle, with a muzzle velocity of 2,100 foot-seconds and angle of projection of 5°. The horizontal range in this case is 6,220 yards—a little more than 3½ miles; the maximum altitude, 457 feet; angle of fall, 6° 15′; striking velocity, 1,493 foot-seconds; and time of flight, 10·6 seconds. *In vacuo* any projectile fired with the same initial velocity and angle of departure as the above would have a horizontal range of 7,937 yards, a maximum altitude of 521 feet, while the striking velocity and angle of fall would be the same as their initial values. That is, the

resistance of the air in this case reduces the horizontal range nearly a mile, and robs the projectile of 607 foot-seconds of velocity. This loss of motion can be better appreciated by reducing to energy. The muzzle energy of this projectile is 30,610 foot-tons, and striking energy 15,463 foot-tons; and the difference, 15,147 foot-tons, has been given up to the air in the short space of 10·6 seconds. For lighter projectiles the shortening of the range by the resistance of the air is still greater. For example, if we suppose the 13·5-pound projectile of the 3·2-inch steel field-gun to be fired with a muzzle velocity of 2,100 foot-seconds and angle of departure of 5°, its horizontal range would be but 3,604 yards and striking velocity 894 foot-seconds.

It has been established by numerous experiments that the resistance of the air to the motion of an oblong projectile moving steadily point foremost (which is practically the case with modern projectiles) is proportional to the normal area presented to the air, that is, proportional to d^2, d being the diameter of the base. The resistance is also proportional to some function of the velocity; and we may, therefore, write the expression for the resistance, ρ, as follows:

$$\rho = Ad^2 f(v).$$

With regard to $f(v)$ it is impossible with present knowledge to determine its general form. It has been shown, however, by Bashforth and other experimenters that for velocities greater than 1,330 foot-seconds and less than 790 foot-seconds the resistance is very nearly proportional to the square of the velocity, but for velocities between these limits the resistance varies more rapidly than the square. It is customary to assume

$$f(v) = v^n,$$

and therefore

$$\rho = Ad^2 v^n,$$

and then determine the values of the coefficient A and the exponent n by suitable experiments.

The most satisfactory experiments yet made for this purpose are those conducted by the Rev. Francis Bashforth while Professor of Applied Mathematics to the advanced class of artillery officers at Woolwich, England. These experiments were made principally at the English proving-ground, Shoeburyness, between the years 1865 and 1879, with the aid of a chronograph of Mr. Bashforth's own invention, which is probably the most complete and accurate instrument for this purpose yet invented. His measurements of the times occupied by a projectile in passing a series of equidistant screens are fairly correct to the thousandth of a second; but an additional decimal is still a desideratum. For a complete account of his labors, see his work entitled *The Bashforth Chronograph*, published at the University Press, Cambridge, England, 1890.

A discussion of Bashforth's results, made by the author of this article in 1883, gave the following as the most probable expressions for ρ, employing only integral powers of the velocity:

Velocities greater than 1,330 foot-seconds:

$$\rho = [1{\cdot}64521 - 10]d^2v^2.$$

1,330 f.-s. $> v >$ 1,120 f.-s.:

$$\rho = [1{\cdot}52912 - 10]d^2v^3.$$

1,120 f.-s. $> v >$ 990 f.-s.:

$$\rho = [2{\cdot}37919 - 20]d^2v^6.$$

990 f.-s. $> v >$ 790 f.-s.:

$$\rho = [1{\cdot}36817 - 10]d^2v^3.$$

790 f.-s. $> v >$ 100 f.-s.:

$$\rho = [1{\cdot}23607 - 10]d^2v^2.$$

In these expressions d is the diameter of the projectile in inches, v the velocity in feet per second, and ρ the resistance in pounds. The logarithms of A (inclosed in brackets) are given for convenience.

The reader must not infer from these expressions that the resistance actually varies as the square of the velocity from 100 foot-seconds up to 790 foot-seconds, and then passes *per saltum* to the third power of the velocity, and then at 990 foot-seconds to the sixth power, and so on. There is undoubtedly a law of resistance which is a continuous, though very complicated, function of the velocity, having variable exponents as well as coefficients. But owing to the difficulties with which the subject is surrounded, both experimental and analytical, the most that can be done is to express the resistance by integral powers of the velocity so chosen as to best represent the mean resistance over a certain range of velocity determined by experiment.

The elevations given to modern high-power guns are generally quite moderate, rarely exceeding 5°, though the carriages upon which the guns are mounted usually admit of elevations up to 20°, or even more. But most engagements between ships and forts, or between ships, will be fought at distances not exceeding 3 or 4 miles, and for these (and indeed for much longer) ranges the ballistic tables and formulas now in use give very accurate information to the artillerist. The ballistic formulas universally employed were first published by Maj. F. Siacci, of the Italian artillery, in the *Giornale d'Artiglieria e Genio* (Rome, Apr., 1880), and within a year were adopted by the artillerists of the U. S. and of most of the leading nations of Europe. The most important of these formulas—those relating to the fighting range—as modified by Capt. Braccialini Scipione, also of the Italian artillery, are the following:

$$C = F\frac{w}{cd^2}. \tag{1}$$

$$X = C[S(v) - S(\mathrm{v})]. \tag{2}$$

$$\sin 2\phi = AC. \tag{3}$$

$$\tan \omega = \frac{B}{A}\tan \phi. \tag{4}$$

$$T = C[T(v) - T(\mathrm{v})]. \tag{5}$$

In these equations—

w is the weight of the projectile in pounds.

d is the diameter of the projectile in inches.

c is a coefficient depending upon the form of the projectile.

F is a factor depending upon the density of the air, as shown by the thermometer and barometer.

C is called the ballistic coefficient, and expresses the ability of the projectile to overcome the resistance of the air. It has been called the "ranging power" of the projectile.

v is the muzzle velocity in feet per second.

v is the striking velocity in feet per second.

X is the horizontal range in feet.

T is the time of flight in seconds.

ϕ is the angle of departure.

ω is the angle of fall.

$S(\mathrm{v})$ and $S(v)$ (called space-functions) and $T(\mathrm{v})$ and $T(v)$ (called time-functions) are functions, respectively, of the muzzle and striking velocities.

A and B are functions of the range divided by the ballistic coefficient, and of the muzzle velocity.

All these functions have been tabulated, and will be found in Ingall's *Handbook of Problems in Direct Fire*.

As a simple illustration of the use of these formulas, consider the following example:

What is the horizontal range and what the time of flight of a service projectile fired from the 8-inch breech-loading rifle with a muzzle velocity of 1,950 foot-seconds and angle of departure of 5°?

The given data for this example are: $d = 8$ inches; $w = 300$ lb.; $c = 0{\cdot}9$; $\mathrm{v} = 1{,}950$ foot-seconds; and $\phi = 5°$, with which to compute X and T. The first step is to compute C, which depends upon the projectile and the density of the atmosphere. By equation (1)

$$C = \frac{300}{0{\cdot}9 \times 64}F = 5{\cdot}20833F.$$

For simplicity, suppose the temperature of the air to be 60° F. and height of barometer 30 inches, in which case the factor F is unity, and therefore $C = 5{\cdot}2083$. For other atmospheric conditions the value of F must be taken from the ballistic tables above cited. Next, from equation (3),

$$A = \frac{\sin 10}{5{\cdot}2083} = 0{\cdot}03334,$$

and with this, table A gives $\frac{X}{C} = 2{,}923$, and therefore

$$X = 5{\cdot}2083 \times 2{,}923 = 15{,}224 \text{ feet}.$$

Equation (2) and the ballistic tables give

$$S(v) = 2{,}923 + S(\mathrm{v}) = 5{,}469{\cdot}4,$$

and therefore v or the striking velocity $= 1{,}287$ foot-seconds.

Lastly, from equation (5) and the tables,

$$T = 5{\cdot}2083\,[2{\cdot}954 - 1{\cdot}096] = 9{\cdot}68 \text{ seconds}.$$

By means of the ballistic formulas and tables, *range tables*, or *tables of fire*, as they are sometimes called, may be easily and accurately prepared in advance for each gun in service, showing for any range how the gun must be aimed in order to hit the target, and also the probable effects of the shot.

In what precedes the term "angle of departure" has been used whenever the initial direction of the projectile with reference to a horizontal plane has been referred to. This

angle is always greater than the angle of elevation given to the gun in aiming by a small angle called the "jump," so called because at the instant of firing, and before the projectile leaves the bore, the muzzle apparently jumps upward slightly, but enough to vitiate the aim and cause the projectile to pass over and beyond the target, unless the jump had been provided for in aiming. The maximum pressure upon the bottom of the chamber of the gun, already referred to, is more than 1,800 tons, and this pressure is generated in less than the one-hundredth part of a second, and has therefore much the effect of a blow. This tremendous shock is taken up by that part of the cheeks of the carriage in rear of the trunnions, which transmits it to the chassis-rails upon which the carriage slides during the subsequent recoil. Before the enormous friction of the carriage upon the chassis-rails can be fairly overcome and sliding motion begin, the "give" of the rails under the rear part of the carriage where the pressure is much the greatest, together with the compression of the rear part of the cheeks, and possibly a slight elevation of the front part of the carriage, all conspire to tilt the carriage to the rear and downward, with the effect of momentarily increasing the angle of elevation of the axis of the gun, by depressing the breach. At the moment of maximum pressure on the bottom of the bore the projectile has moved but a short distance, and therefore the elevation of the axis must take place before the projectile reaches the muzzle.

The jump of a gun must be determined experimentally in each case. One way to do this is to prolong the axis of the bore until it pierces a paper screen placed perpendicular to the plane of fire, and far enough in front of the gun to avoid the blast. This can easily be done with a breech-loader by placing in the muzzle and breech cross wires accurately centered—in other words, making a telescope of the gun. Through the point thus determined, draw a horizontal line across the screen as a datum line. Since we know the muzzle velocity of the projectile, its ballistic coefficient, and the distance to the screen, the time of flight can be computed by equation (5), and then the distance through which the projectile falls while passing from the gun to the screen. Draw another horizontal line across the screen at this computed distance below the first one. Now if there were no jump the center of the round hole made by the projectile in passing through the screen would be on this second horizontal line; but it is found in practice that it is nearly always above the *first* line. The data secured in this way is easily reduced to angular measure with reference to the axis of the trunnions. The jump has not been determined experimentally for any of the new guns adopted by the U. S. Government. Some experiments made by the author at Fort Monroe in the summer of 1890 show that the jump of the 8-inch converted rifle varies from 15 to 30 minutes of arc, increasing with the angle of elevation up to 6° elevation, the limit of the experiments.

An oblong projectile fired from a rifle gun has a rapid rotary motion about its longer axis imparted to it by the spiral grooves, or rifles, cut in the walls of the bore. Thus the 12-inch projectile, with a muzzle velocity of 2,100 foot-seconds, makes eighty-four revolutions per second as it emerges from the gun, and this rapid rotation is undoubtedly kept up during the whole period of its flight. The effects of this rotation are to give stability to the projectile by overcoming the perturbating effects of the resistance of the air-variations of density, winds, etc., and to keep it moving point foremost, that is, in the direction in which it meets with the least resistance from the air, and does the greatest damage on striking. Another effect of the projectile's rotation is to cause it to move out of the plane of fire with an increasing velocity toward the side corresponding to the direction of rotation, a phenomenon called drift. Nearly all modern guns have what is termed a right-handed twist—that is, the rifles are cut in such a way as to give the projectile a rotation from left to right, or in the direction of the hands of a watch, as seen by a person standing in rear of the gun, and therefore the drift is to the right. For moderate ranges the drift is comparatively small, but it increases rapidly for longer ranges. For example, the drift of the service projectile fired from the 8-inch converted rifle is 1 yard for a range of 1,500 yards, 4·4 yards for a range of 3,000 yards, and 15·1 yards for a range of 4,500 yards. In aiming a rifled gun the drift, which is constant for the same gun and range, is allowed for by pointing to the left of the target by a distance equal to the drift.

The most troublesome deviation to which a projectile is subject is caused by the wind, on account of its varying and uncertain character, and its modifying effect upon the drift. Fortunately the effect of a moderate wind upon the flight of the heavier projectiles is slight for all ranges for which superior accuracy of fire is expected, both on account of the great mass of the projectile and the short time to which it is subject to the action of the wind. The amount of deviation due to the wind and drift combined can generally be inferred from the observed deviations of lighter and less expensive projectiles fired from the quick-firing guns. These shots, in connection with a range table, can also be utilized for determining the range in the absence of range-finders.

The laws which govern the penetration of projectiles are still very obscure, and little has been done save the determination of empirical formulas, which satisfy with more or less exactness the observed penetrations upon which the formulas are based.

The most reliable experiments for determining the penetration of spherical shot into different kinds of wood, masonry, and earth were made at Metz in 1834 and 1835 by a commission appointed by the French Minister of War. The conclusions arrived at were that the resistance of the same substance to spherical shot of different diameters varies as the square of the diameter; and that the resistances of different substances to the same shot vary as $\lambda + \mu v^2$, where λ and μ are constant for each substance, and v is the velocity at any instant after striking. The retarding force is therefore expressed by $\frac{\pi}{w} d^2(\lambda + \mu v^2)$. We therefore have the differential equation,

$$\frac{v dv}{ds} = -\frac{g d^2}{w}(\lambda + \mu v^2),$$

whence integrating between the limits v, the striking velocity, and zero, we have for the depth of penetration S,

$$S = \frac{1{\cdot}1513 w}{d^2 g \mu} \log_{10}\left\{1 + \left(\frac{v}{u}\right)^2\right\},$$

in which

$$u = \left(\frac{\lambda}{\mu}\right)^{\frac{1}{2}}.$$

The following are the values of λ, μ, and u as given by Didion, and adapted to English units—that is, d is in inches, w in pounds, v in feet per second, and S in feet.*

SUBSTANCES.	λ	μ	u
Oak, beech, and ash	2,329·4	·004328	734
Elm	1,787·5	·003322	734
Fir and birch	1,296·0	·002408	734
Poplar	1,217·7	·002263	734
Sand, mixed with gravel	486·0	·009031	232
Earth, mixed with sand and gravel	670·3	·012456	232
Clayey soil	1,167·5	·003799	554
Earth from an old parapet	782·0	·004360	424
Damp clay	296·2	·002209	367
Moistened clay	102·4	·000762	367
Masonry of good quality	6,166·9	·008595	847
Masonry of medium quality	4,915·7	·006851	847
Brickwork	3,530·4	·004920	847

Many formulas have been given for computing the penetration of oblong pointed projectiles into wrought iron and steel armor. Those generally employed in France and the U. S. were deduced by Capt. Jacob de Marre, of the French naval artillery. They are as follows:

For wrought-iron plates—

$$e^{0{\cdot}65} = [7{\cdot}03738 - 10]\frac{w^{\frac{1}{2}}v}{d^{\frac{3}{4}}}.$$

For mild steel plates—

$$e^{0{\cdot}7} = [6{\cdot}99066 - 10]\frac{w^{\frac{1}{2}}v}{d^{\frac{3}{4}}}.$$

In these formulas e is the penetration in inches, w the weight of projectile in pounds, d its diameter in inches, and v the normal striking velocity in feet per second. The logarithms of the numerical coefficients are given for convenience, placed in brackets. JAMES M. INGALLS.

Gunnison: city; capital of Gunnison co., Col. (for location of county, see map of Colorado, ref. 4–C); on the Gunnison river and the Denver and Rio Grande, and the Union Pac. Railways; 170 miles W. by N. of Pueblo. It is in an agricultural, mining, and stock-raising region, and its prin-

* From Bashforth's *Motion of Projectiles*, p. 75.

cipal industries are gold, silver, iron, and coal mining. Pop. (1880) 888; (1890) 1,105.

Gunny, or **Gunny Cloth** [from Hind. *gunni*, from Bengalese *goni*, gunny-bag, sacking]: a kind of coarse, strong sacking made of jute, and used for covering cotton-bales and as bags for wheat, rice, coffee, pepper, saltpeter, and many other commodities. Gunny cloth is manufactured chiefly in Southeastern Bengal. But little machinery is used in the business, which employs vast numbers of people during their leisure from other employments. The work is very largely domestic in character. Immense quantities are exported to all parts of the globe; indeed, few articles of commerce are so widely diffused as the gunny-bag. When worn out the material makes a good stock to be used for the manufacture of wrapping paper. See FIBER.

Gunong, or **Gunung**: a Malay word for mountain, often applied to volcanoes and to the islands on which they exist, or the town or district near them. Thus the village Gunung Agong, in Sumatra, is at the foot of the volcano Gunong Dempo. Gunung Api is the name of three separate Malayan islands with volcanoes. M. W. H.

Gunpowder: an explosive substance, formed by an intimate mechanical mixture of potassium nitrate (niter), sulphur, and carbon (in the form of charcoal), in certain proportions, called its *composition*, depending upon the use for which it is intended. It is principally used in firearms and for mining purposes, though for the latter object it has been to a great extent superseded by other explosives of greater power, such as guncotton and the various preparations of nitroglycerin. For more than five hundred years gunpowder has been used almost exclusively as the propelling agent in firearms; but there is good reason to believe that it may yield its supremacy to other explosives, differing widely in their composition, which will give to projectiles velocities greatly exceeding those produced by gunpowder, and with less strain upon the gun. Prominent among the explosives of the future stand the various kinds of smokeless powders, and those having nitrocellulose as the active principle. Among the valuable qualities of gunpowder for war purposes may be mentioned the following: It ignites easily without deflagration, burns quickly, leaves but little residuum, and liberates a large quantity of gas at a high temperature. Its effects are regular and sure, its manufacture economical, rapid, and comparatively safe. Finally, it keeps well in transportation, and indefinitely in properly ventilated magazines. It is on record that experiments made with gunpowder more than two centuries old showed that it had lost none of its ballistic qualities. The earliest known composition of gunpowder corresponds nearly to that of the best modern powders, and differs but little from that called for by the theory of combining equivalents, as shown in the following table (see EXPLOSIVES):

By atomic theory	74 815 niter,		13 333 carbon,		11 852 sulphur.	
For U. S. military service	76 000	"	14 000	"	10 000	"
For sporting	78 000	"	12 000	"	10 000	"
For blasting	62 000	"	18 000	"	20 000	"

In blasting-powder the proportion of niter is reduced both to make it cheaper, and also because a weak or slow-burning powder is the most effective in removing large masses of earth or rock. Moreover, the residuum resulting from the incomplete combustion that follows a variation of the theoretical composition is not so objectionable in mining as in firearms. A very strong and cheap powder can be made by substituting sodium nitrate for potassium nitrate; but as it has a strong affinity for moisture, it will not retain its strength long. The most important ingredient in the composition of gunpowder is the niter, which is a compound substance consisting of one equivalent of potassium, one of nitrogen, and three of oxygen (KNO_3). It decomposes readily by heat giving off a large volume of oxygen which unites with a portion of the carbon of the charcoal, forming carbon dioxide (CO_2). The potassium unites with the carbon and suiphur, forming solids, while the nitrogen, having but feeble affinity, does not enter into new combinations. The mechanical effects are produced chiefly by the expansion of the carbon dioxide and nitrogen, whose elastic force is enormously increased by the high temperature of combustion, which, according to the experiments of Noble and Abel, is about the melting-point of platinum.

The principal source of the supply of niter is India, where it occurs as an efflorescence on the surface of the ground. In the condition in which it is imported it is called "grough" niter, and contains about 4½ per cent. of impurities, consisting chiefly of the chlorides of potassium and sodium, and the sulphates of potash, soda, and lime, together with sand and organic matter. These impurities are separated from the niter at the powder-mills by the process of refining. Nations whose supplies of niter are cut off during war are mainly dependent on artificial niter-beds, as was the case during the French Revolution and in the Confederacy during the civil war in the U. S. These beds are formed of a collection of earth, ashes, calcareous matter, refuse from stables and slaughter-houses, etc., piled in heaps exposed to the sun and air, and moistened from time to time to assist the change. Niter is also made from sodium nitrate, an extensive natural product of the district of Tarapaca, Northern Chili, by the action of potassium chloride.

Charcoal for gunpowder is obtained by charring certain kinds of wood in iron retorts. The woods most used in the U. S. are willow and alder. In Europe dogwood or alder-buckthorn is generally used for all military small-arm powders as well as for the best sporting powders. For gunpowders for heavy ordnance alder and willow charcoal is generally employed, as the action of these powders is less violent than that made from dogwood charcoal. The sticks should be of small size, from 1 to 5 inches in thickness for military powder, while still smaller sticks are employed for sporting powders. The wood should be cut in the spring when filled with sap, that the bark may be peeled off easily, and it should be well seasoned before charring. The quality of charcoal for powder depends upon the temperature at which the wood is charred. If the temperature be about 1,800° F., or sufficiently high to drive off all the volatile matter in six hours, the result is *black* charcoal: while if the wood is charred at a temperature of 500° F., or only sufficient to drive off the volatile products in twelve hours, the result is a *brown* charcoal. Brown charcoal makes a stronger and more inflammable powder than black charcoal, but it is a powder more liable to absorb moisture and can not be so well preserved. Black charcoal is generally used for all military powders.

Sulphur is mostly procured from Sicily, where it occurs as a volcanic product. It is imported in a crude state, containing some 6 or 8 per cent. of earthy matter. It may be obtained, but not as cheaply, in the U. S. from metallic ores. For powder crude sulphur is purified by distillation and melting, and appears in the form of roll brimstone. The flowers of sulphur produced by sublimation contain more or less sulphurous and sulphuric acids, and are consequently not suited to the manufacture of powder. The tests for sulphur as a suitable ingredient for gunpowder are (1) burning a small quantity on porcelain, when the amount of residuum should not exceed 0·25 per cent.; (2) boiling with water and testing with blue litmus-paper, which it should only very feebly redden. Prof. Bloxam states that "sulphur is valuable as an ingredient in gunpowder on account of the low temperature (560° F.) at which it inflames, thus facilitating the ignition of the powder. Its oxidation by niter appears also to be attended with the production of a higher temperature than is obtained with charcoal, which would have the effect of accelerating the combustion, and of increasing by expansion the volume of gas involved." Sulphur also favors the preservation of the powder, as it has less affinity for water than the other components and gives hardness to the mixture, and consequently more body to the grains.

The necessary operations in making gunpowder are: (1) *Refining and pulverizing the ingredients.* The charcoal and sulphur are first broken up in mills. The charcoal is pulverized by rolling it in cast-iron barrels with zinc balls. The same method is pursued with sulphur, except that the barrel is made of leather stretched over a wooden frame. The niter is generally sufficiently pulverized as it comes from the refinery.

(2) *Incorporation*, the object of which is to bring the particles of the ingredients into close contact with each other, thus producing a homogeneous mass in which the decomposition of the constituents of the powder shall be complete. The process consists of two operations—mixing the pulverized materials in a rolling barrel, and then grinding them under two heavy cast-iron wheels, following each other in a circular cast-iron trough. The quantity of mixture constituting a charge varies with the size of the wheels and duration of the operation. In Great Britain the charge is limited by law to 50 lb., in order to prevent accidents; but in the U. S. a charge of 150 lb. is not uncommon. The time required for thorough incorporation varies from three to four hours,

though for certain fine sporting powders the operation is continued as long as twelve hours. This operation is one of the most important in the manufacture of powder, since the more thoroughly the ingredients are mixed the more complete will be the combustion.

(3) *Compression*, to give the necessary density to the mass and strength to resist the shocks of transportation. The fragments of mill-cake as they come from the incorporating mill are broken up into fine meal by passing between two pairs of gun-metal rollers set in a strong frame of the same material. The meal is then spread out into layers about 4 inches thick, separated by copper or brass plates. These are brought under a powerful hydraulic press, which compresses the layers to a thickness of an inch, forming what is called press-cake.

(4) *Graining*, the operation of breaking up the press-cake into small fragments or grains for the purpose of regulating the combustion. It is performed in what is called a corning or granulating machine by passing the cake between fluted rollers, and separating the fragments thus produced by means of sieves.

(5) *Glazing*, effected by rolling the grains in a barrel. The attrition of the grains against each other and the sides of the barrel wears away the sharp corners and hardens the surfaces, thereby preventing the formation of dust during transportation. A high polish is sometimes given to the grains by adding powdered blacklead to the charge; but this is objectionable, as it retards ignition and inflammation.

(6) *Drying*, the object of which is the removal of the moisture that is purposely introduced during the several stages of manufacture. It is done by spreading out the powder on shelves in a room heated by steam to a temperature of from 140° to 180° F.

(7) *Dusting*, the object of which is the removal of the dust and fine grains, which would otherwise fill up the interstices and retard inflammation. It is done by means of fine sieves and bolting-cloths.

The *explosion* of a charge of powder may be divided into three distinct stages, viz., *ignition*, *inflammation*, and *combustion*. Ignition is the setting on fire of a particular grain; inflammation is the spreading of the flame over the surface of the grain from the point of ignition, or, in the case of a charge made up of many grains, it is in addition the spreading of ignition from one grain to another; combustion is the burning up of each grain. Ignition is produced by the sudden elevation of the temperature of a grain or part of a grain to about 570° F., either by contact with a heated body, by mechanical shock or friction, or by detonation of a fulminate. Small angular grains ignite more easily than large, round grains. The velocity of inflammation of a charge of powder depends not only upon the inflammability of the grains of which the charge is composed, but also upon the facility with which the gas first generated is able to penetrate the charge. This velocity is therefore small in mealed powder, and generally increases with the size of the grains. The velocity of inflammation of a charge also depends upon the pressure to which it is subjected. Thus while the velocity is about 8 foot-seconds in a train of powder laid loosely upon a board, it is 28 foot-seconds when confined in a canvas hose placed in a trough. It is believed that in firearms the velocity of inflammation of the charge is as great as 80 and even 100 feet per second, which is practically instantaneous. Too much compression or ramming of a charge of powder retards the inflammation. If compression be carried to the extent of reducing the charge to a single mass, the case becomes one of simple combustion. The combustion of a grain takes place in successive concentric layers, and in free air equal thicknesses are burned in equal times. The velocity of combustion is independent of the section of the grain, and is inversely proportional to its density. It varies with the composition of the powder and with the process of manufacture. It is greater with black charcoal than with brown; greater the more perfect the incorporation; and, finally, it increases with the dryness of the powder. For most military powders the velocity of combustion in free air is about 0·4 inch per second. If a grain of powder is angular the salient parts burn up more quickly than the plane or rounded parts, and thus an angular grain soon takes a spheroidal or ovoidal form similar to a water-worn pebble, which it retains until consumed. Thus it may be assumed that an angular grain is consumed in the same time as its inscribed sphere; and therefore all the grains of a charge may be considered as equal grains provided they have the same minimum dimension—that is to say, if they were made from press-cake of the same uniform thickness. The velocity of combustion also increases with the pressure of the surrounding medium. If this were not so only a small portion of the charges of cannon would be consumed during the very short time the projectile remains in the bore after the gun is fired. Sarrau considers that the velocity of combustion varies with the square root of the pressure; thus if the velocity of combustion in free air is 0·4 inch per second for the maximum pressure in a gun of 37,000 lb. per square inch, the velocity would be about fifty times as great, or about 20 feet per second.

The most complete experiments upon the explosion of gunpowder were made in Great Britain by Noble and Abel, and were published to the world in two memoirs, which were read before the Royal Society in the years 1874 and 1879. They fired by electricity, in a closed vessel made of mild steel and sufficiently strong to resist the expansion of the gases, many charges of gunpowder, varying in weight from $3\frac{1}{2}$ oz. to 1 lb. 10 oz.* The following are some of the more important of their deductions from these experiments. Only 43 per cent. by weight of the powder is converted by explosion into gas, chiefly carbon dioxide (CO_2) and nitrogen. The remaining 57 per cent. is inert, solid matter (probably in a liquid state at the temperature of combustion), and consists principally of potassium carbonate (K_2CO_3), potassium sulphate (K_2SO_4), and potassium sulphide (K_2S). When the charge of powder completely fills the vessel without pressure save by its own weight the mean tension of the gases at the temperature of explosion is 43 tons (96,320 lb.) per square inch. In this case the density of loading is said to be unity, while if the charge fills but one-half the chamber the density of loading is one-half, and so on. If the density of loading is represented by Δ, and the corresponding pressure on the sides of the closed vessel by p, then, according to Noble and Abel,

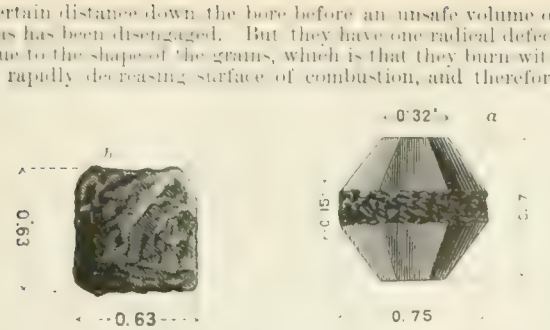
$$p = \frac{41{,}418\Delta}{1-0{\cdot}57\Delta},$$

a formula showing that the pressures in a closed vessel for densities of loading of $\frac{1}{20}$, $\frac{1}{10}$, and $\frac{1}{4}$ are 2,028, 4,390, and 28,960 lb. per square inch respectively; while the absolute force of the powder—or the force which it exerts when it exactly fills the space in which it is exploded—is, as has been stated, 96,320 lb. per square inch. This is what the expression for p gives when $\Delta = 1$.

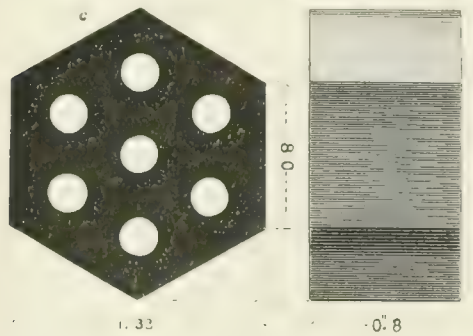
If the combustion of a charge of powder in the chamber of a gun were instantaneous, the initial pressure upon the walls of the chamber evidently would approximate toward that which obtains in a closed vessel, and probably would burst any gun yet made. Such would undoubtedly be the fate of most large guns if they should be loaded with a full charge (density of loading approximately unity) of fine sporting powder. In this case the powder would be consumed and the whole expansive force of the gases brought to bear upon the walls of the chamber before the projectile had had time to move sufficiently to relieve the pressure materially. The most obvious way to overcome this difficulty and reduce the initial pressure is to increase the size of the grains, and thus diminish the area of burning surface and consequently the emission of gas. Gen. Rodman, of the U. S. Ordnance Department, was the first to bring this idea into practice by the adoption of what is called mammoth powder, consisting of large and irregular-shaped grains from 0·6 to 0·9 of an inch in diameter, and of increased density, by which the rate of combustion was retarded. Lately a very great improvement has been made in mammoth powder by pressing it into grains of uniform size. In shape they are composed of the frustra of two hexagonal pyramids separated at their bases by a prismatic space left rough. The illustration *a* on page 82 represents the full size of the grain. In other forms of this powder the hexagonal frustra are changed to hemispheres, in which form it is known as sphero-hexagonal powder. A powder much used in Great Britain for heavy guns is known as "pebble powder." Its normal shape is that of a cube, about 0·63 inch on the edge for the smaller guns and $1\frac{1}{2}$ inches for the largest guns. In breaking down the press-cake to form the grains the edges of the cube are left in a more or less broken condition, as shown in the illustration *b*. The improvements in the powders above described materially lessen the initial strain by giving time for the projectile to move a

* In their latest experiment the authors succeeded in absolutely retaining the products of combustion of a charge of 23 lb. of gunpowder. See Capt. Noble's *Greenock Lecture*, p. 12, Apr., 1882.

certain distance down the bore before an unsafe volume of gas has been disengaged. But they have one radical defect due to the shape of the grains, which is that they burn with a rapidly decreasing surface of combustion, and therefore



the emission of gas is very much greater at the beginning of combustion than toward the end, which is just the reverse of what it should be, since by the motion of the projectile along the bore the space occupied by the gases continually increases. These considerations led Gen. Rodman as early as 1860, when he was experimenting with his 15-inch cast-iron gun, to use disks of compressed powder from 1 to 2 inches thick and of a diameter to fit the bore, pierced with holes parallel to the axis of the gun. "He showed mathematically that such an arrangement of the charge would relieve the initial strain by exposing a minimum surface at the beginning of combustion, while a greater volume of gas would be evolved from the increasing surface of the cylindrical holes as the space behind the projectile became larger; this would tend to distribute the pressure more uniformly along the bore. The results of experiment perfectly bore out his theory, but he found it more convenient for several reasons to build up the charge in layers of hexagonal prisms of comparatively small size, fitting closely to one another, instead of having the cakes or disks as large as the bore." Prismatic powder, as the foregoing is now called, was first made on a large scale in Russia, and in the form and dimensions given in the accompanying figure (*c*). Each cake is 0·8 inch thick, and has seven holes,



each 0·2 inch diameter, extending through it in the direction of its axis. This grain has only about one-seventh the initial surface of combustion that it would have if made up into spherical grains a tenth of an inch in diameter. An objection to this form of grain is its liability to break up in the gun in consequence of the weakening effect of so many perforations. To avoid this objection prismatic grains are generally made with but one central perforation.

All gunpowder made for the U. S. Government is subjected to rigid inspection and proof, and must meet certain specified requirements before it is accepted. Rules for the inspection and proof of granulated powder for the military service require that the grains should be rounded and of uniform size, that they should be hard, have a certain density and strength, and be free from dust. The size of the grains is determined by passing a certain quantity through two or more sieves, which gives the proportion of different sized grains. The density is ascertained by the "densimeter," an apparatus which utilizes the property of mercury of filling the interstices between the grains without penetrating into the pores. The strength of powder was formerly determined by firing a given charge and ball of given weight from an *éprouvette*, or small mortar, at an angle of elevation of 45°, and noting the distance to which the ball was thrown. But this method has been abandoned, and the powder to be tested for strength is now always fired from the gun for which it was manufactured and with the service projectile. The muzzle velocity is ascertained by the Boulengé chronograph and the maximum pressure by the pressure gauge. See GUNNERY.

JAMES M. INGALLS.

Gunpowder Plot: a conspiracy entered upon by several Roman Catholics to put to death King James I. of Great Britain, and his ministers, and to blow up the Parliament building by gunpowder, which they had stored in the vaults under the Parliament House. The plot was to be executed Nov. 5, 1605, but was detected on the preceding day by means which are not now well understood, though it is commonly stated that one of the conspirators, Francis Tresham, gave a clew to the plot by a letter to his relative, Lord Monteagle, whom he warned not to attend Parliament on the fatal day. The famous Guy Fawkes was to be the immediate agent of the conspirators. Nov. 5 is still celebrated in many English towns by the burning in effigy of Fawkes.

Güns: a free city of Western Hungary; on the Güns; 57 miles S. S. E. of Vienna (see map of Austria-Hungary, ref. 5–F); famous for the persistent and successful defense of its fortifications against the Turks in 1532. It contains a castle of Prince Esterházy, a military school, a Roman Catholic sub-gymnasium, a school for teachers, a Benedictine convent, an orphan asylum, and manufactures of cloth, leather, wine, brandy, and potash. Pop. 7,305.

Gunsaulus, FRANK WAKELEY, D. D.: clergyman; b. at Chesterville, O., Jan 1, 1856; graduated at Ohio Wesleyan University 1875; pastor of the Brown Memorial church, Baltimore, for four years; since 1887 pastor of the Plymouth church (Congregational), Chicago. He is the author of *The Transfiguration of Christ* (1886); *Monk and Knight* (a novel, 1890); *Phidias and other Poems* (1892).

GEORGE P. FISHER.

Gunshot Wounds: wounds produced by balls or other projectiles propelled by the force of an explosive, such as gunpowder, guncotton, or the like. They differ in some essential points from other wounds; generally they are accompanied by shock, and complicated by the presence of foreign bodies in the wound, such as the ball or projectile itself and pieces of clothing or accoutrements which the ball had carried with it and before it. Another element of their danger consists in the fact that they generally occur in large numbers—i. e. in war—when the accumulation of a large number of suppurating wounds gives rise to dangerous complications, such as erysipelas, pyæmia, and hospital gangrene; besides, in protracted wars the constitution of the men has already suffered by camp-life, bad diet, and exposure, producing typhus, dysentery, scurvy, etc. When, after the discovery of gunpowder, gunshot wounds first became known, surgery being then in its infancy, these wounds were looked upon as the result of some supernatural and maleficent agency, and were often treated by incantations and the like, or they were looked upon as poisoned either by the powder or the ball, and were treated with a view to destroy the poison—for instance, by pouring boiling oil into the wound. The treatment of gunshot wounds has become more simple and rational; even the extraction of the ball is no longer looked upon as of absolute necessity. At one time it was maintained that the wound of exit of a ball was always larger than that of entrance—a question which might be of importance in a legal point of view, whereas the converse is true, the wound of entrance often being larger than that of exit. Another mistaken idea prevailed with regard to what was called the "wind of the ball." A round shot frequently will crush the parts under the skin without wounding the skin; this was ascribed by some writers to the compression of the air, by others to the vacuum which the ball leaves behind it in its passage, and again by others to electricity, thought to be acquired by the ball by friction through the gun and its rapid passage through the air. Investigations have proved that a spent round shot may roll over a part of the body when it touches at an obtuse angle, crushing everything beneath the skin without breaking or wounding the skin itself.

The practice of the best informed modern surgeons with regard to gunshot wounds is quite at variance with older methods. It is now regarded as not only unnecessary but usually injurious to probe for a bullet; it is not usually thus found; it has done all the harm it is capable of before the case comes under treatment; if it has done any serious harm this will be manifest by other signs or symptoms; and the very act of probing disturbs protective blood-clot and often serves to introduce septic germs from without. Con-

sequently the best treatment of gunshot wounds is simply to protect and lightly occlude them, unless fracture, bleeding, paralysis, or indications that some of the hollow viscera (bowels, etc.) are wounded make it necessary to intervene at once and perform some serious operation.

The number of those killed outright on the field of battle to those wounded is about in the proportion of 1 to 5; of the wounded about 14 to 15 per cent. die of their wounds. Thus the number of killed in battle in the U. S. army during the civil war was 59,850. The number of gunshot wounds from May 1, 1861, to June 30, 1865, was 235,585; of the latter, 33,653, or 14·2 per cent., died of their wounds. The Confederate army lost 57,425 killed in battle, and had 227,871 wounded. In protracted wars internal diseases incidental to warfare carry off a by far larger number of men than all the engines of death. See WOUNDS and SURGERY.

Revised by ROSWELL PARK.

Gun'ter, EDMUND: mathematician; b. in 1581 in Hertfordshire, England; educated at Westminster and Christ Church, Oxford, where he passed M. A. in 1606; in the same year invented the sector; took orders in the Church, and in 1619 became Professor of Astronomy in Gresham College, London; made use of a logarithmic scale before 1624. His works best known are *Canon triangulorum* (1620); *Of the Sector, Cross-staff*, etc. (1624); *Description of His Majesty's Dial* (1624). He is best known by the chain, scale or lines, and quadrant which bear his name. D. in London, Dec. 10, 1626.

Gunter's Chain: the invention of Edmund Gunter; a chain 66 feet in length, used in land-measuring. It is composed of 100 links; consequently, 10 square chains, or 100,000 square links, are contained in an acre. See CHAIN.

Günther, gün'ter, ALBERT CHARLES LEWIS GOTTHILF, M. D., F. R. S.: zoölogist; b. at Esslingen, Würtemberg, Oct. 3, 1830; educated at Tübingen, Berlin, and Bonn, and in 1858 became connected with the zoölogical department of the British Museum. He is author of several valuable works on fishes, reptiles, and batrachians, of which the most important is the catalogue of the fishes in the British Museum (8 vols., 8vo, 1859–70), and edited the *Record of Zoölogical Literature* from 1864 till 1870.

Günther, MARTIN: Lutheran theologian; b. in Dresden, Germany, Dec. 4, 1831; educated in the institutions of the Missouri Synod; Professor of Theology in the Seminary at St. Louis, Mo., since 1873. Author of a widely circulated *Populär Symbolik* (1872, 1881). H. E. J.

Guntur': the capital of the Kistna district, Presidency of Madras, British India; 252 miles N. of Madras; on the Grand Trunk Railway (see map of S. India, ref. 4–F). It has a considerable trade in grain. Pop. 20,000.

Gurdaspur': a district of the Amritsar division, Punjaub, British India; between 31° 36′ and 32° 30′ N. lat., and 74° 56′ and 75° 45′ E. lon., forming the submontane district between the Bias and Raví rivers, and bounded on the N. by Kashmir. Area, 1,822 sq. miles. It is one of the most fertile parts of the Punjaub, and requires the least irrigation. The staple productions are wheat, rice, barley, cotton, and sugar-cane. The average rainfall is 31 inches, and large swamps make certain districts unhealthful. Within the district is the sanitary station of Dalhousie, 7,687 feet above the sea. Pop. nearly 1,000,000, comprising Mohammedans and Hindus in nearly equal numbers, with a less number of Sikhs and pagans. It contains six towns with a population exceeding 5,000. The town Gurdaspur is the capital, but has a pop. of only 4,700. It is on a branch railway from Amritsar. MARK W. HARRINGTON.

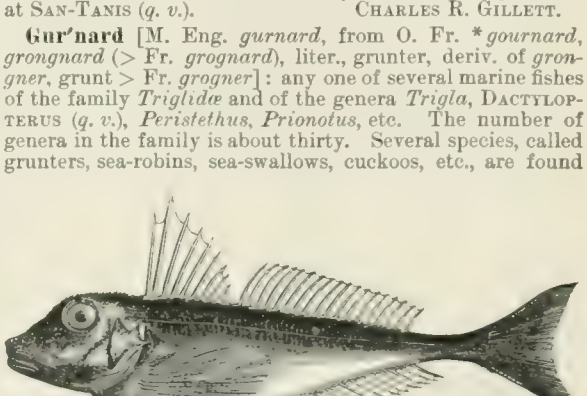
Gurgaon, goor-gaa'on: a district of the Delhi division, Punjaub, British India, forming the S. E. angle of the Punjaub, W. of the Jumna river and S. of Delhi. Area, 1,938 sq. miles. It is nearly all under cultivation, but owing to the deficiency of irrigation it is subject to drouth, seven periods of which have occurred since 1783, some of them very destructive. The principal productions are wheat, barley, other grains, oil-seeds, cotton, and tobacco. The average rainfall is 24 inches. The Rajputana State Railway passes through the district. Pop. 650,000. The capital is Gurgaon, with a pop. of about 4,000. The trade center is Rewari (24,000), in the western part of the district. This is one of the chief trading emporiums in the Punjaub.

MARK W. HARRINGTON.

Gurhwal: same as GARHWAL (*q. v.*).

Gurnah, Kurnah, or **Qurna**: a name attached to a temple, and more or less loosely to a series of tombs on the western bank of the Nile at Thebes. The temple is the most northerly of the series erected by various kings, and its ruins lie at the edge of the cultivated land. It consisted of a colonnade of ten pillars facing the east, and three series of halls and chambers in the rear. Its construction was begun by Seti I. in memory of Ramses I., and it was decorated with figures and hieroglyphs in bas-relief. The structure was extended on a larger scale by Ramses II., who was compelled to adopt the less costly method of incised hieroglyphs. Unlike most temples, it was a cenotaph, on a plan totally at variance with the ordinary arrangement of the tomb. (See MASTABA.) Its inscriptions and paintings are noteworthy for their great beauty and delicacy of execution. The tombs in the northern portion of the area covered by the Theban necropolis are those of Drah Abul Neggah, Asasif, and Sheik Abd-el-Gurnah. Deir el-Bahri and Biban el-Moluk are farther to the west. Those situated nearest to the temple are known as Drah Abul Neggah, and belong to the eleventh, seventeenth, and eighteenth dynasties. They have practically disappeared. The Turin and other legal papyri have reference to thievish depredations committed here. (See EGYPTIAN LANGUAGE AND LITERATURE and EGYPTOLOGY.) The others belong to the eighteenth dynasty mainly, and contain the sepulchers of the nobility of that period. They are of great value for their portrayal of the manners as well as the history of the time. The other tombs were those of Deir el-Medineh and the tombs of the queens, situated at the extreme south, and belonging to the eighteenth dynasty, and Kurnet Murraï of the seventeenth and eighteenth dynasties. The inscriptions in the last show a thoroughly organized native rule at the time when the Hyksos were still powerful at SAN-TANIS (*q. v.*). CHARLES R. GILLETT.

Gur'nard [M. Eng. *gurnard*, from O. Fr. **gournard*, *grongnard* (> Fr. *grognard*), liter., grunter, deriv. of *grongner*, grunt > Fr. *grogner*]: any one of several marine fishes of the family *Triglidæ* and of the genera *Trigla*, DACTYLOPTERUS (*q. v.*), *Peristethus*, *Prionotus*, etc. The number of genera in the family is about thirty. Several species, called grunters, sea-robins, sea-swallows, cuckoos, etc., are found



The red gurnard.

in American waters. These fishes have the head, or in some genera the whole body, covered with hard plates. They often have numerous sharp spines and fantastic-looking appendages, which give them a singular appearance, but their flesh is generally very good. The red gurnard, found on both sides of the Atlantic (*Trigla enculus*), and the sapphirine gurnard of Europe (*T. hirundo*) are among the most important species.

Gurney, Sir GOLDSWORTHY: chemist; b. in England in 1793; was educated for the medical profession; became early absorbed in the study of practical chemistry; in 1822 delivered a course of lectures on chemical science at the Surrey Institution, which were published in 1823; was the inventor of the lime light, the magnesium light, the Bude and the oil-gas lights; also of the high-pressure steam-jet and the tubular boiler; and in 1829 drove a steam-carriage from London to Bath over the turnpike road at a speed of 14 miles per hour. By means of his high-pressure steam-jet, first applied to locomotives Oct., 1830, the rate of speed was increased from 12 to 30 miles an hour; subsequently it was used to ventilate coal mines and extinguish fires in them; it was further applied in 1849 to the exhaustion and consumption of the poisonous gases from the sewers of London. In 1852 he was appointed to assume charge of lighting and ventilating the new houses of Parliament, which he accomplished by a method of his own. In his early lectures he

claimed to have been the first to observe the deflection of the magnetic needle, the basis of the electric telegraph. He was knighted in 1863. D. Feb. 28, 1875.

Gurney, Joseph John: philanthropist; b. at Earlham, near Norwich, England, Aug. 2, 1788; was educated at Oxford without formally entering the university, and in 1818 became a preacher of the Society of Friends. He was distinguished for labors in behalf of prisoners, which he carried on in conjunction with his sister, Elizabeth Fry, and was also an active friend of the abolition of slavery. His ample wealth was freely used in benevolent causes. He traveled extensively in the U. S., the West Indies, continental Europe, etc., while prosecuting his charitable enterprises. D. at Earlham, Jan. 4, 1847. Among his quite numerous works are *Notes on Prison Discipline* (1819); *On the Religious Peculiarities of the Society of Friends* (1824); *Portable Evidences of Christianity* (1832); *Sabbatical Verses* (1837); *A Winter in the West Indies* (in letters to Henry Clay, 1840); and other books of much value. Mr. Gurney's doctrinal views called forth some opposition in the U. S., and the resulting controversy led to the separation of the party called Wilburites from the main body of Orthodox Friends in 1843. See his *Life* by J. P. Braithwaite (Norwich, 1884; 2 vols., 2d ed. 1854; rep. Philadelphia, 1854), and by John Alexander (1847).

Gurow'ski, Adam, de, Count: Polish revolutionist and author; b. at Kalisz, Sept. 10, 1805. In youth his sympathy with the Polish cause resulted in his expulsion from school, and in 1820 he went to Germany, where he pursued his studies until 1825, when he returned to Poland. He was on several occasions imprisoned for his active sympathy with the opponents of Russia. He was a prominent instigator of the revolution of 1830, and acted as agent of the republicans in France, where he remained in exile after the insurrection was suppressed. In 1835 he published a work (*La vérité sur la Russie*) advocating Panslavism, and was in consequence recalled to Russia and employed in the service of the emperor. Here he remained till 1841, when he secretly left Russia on account of troubles at court, and went to Berlin; there and at Heidelberg he pursued his studies, delivering lectures in the meantime at the University of Berne, Switzerland, on political economy. In 1849 he went to the U. S., and was for a time professor of languages; from 1861 to 1863 he was a translator in the Department of State at Washington. He was the author of numerous works in various languages. Among his published works are *Russia as it Is* (New York, 1854); *America and Europe* (1857); and *My Diary* (notes on the civil war, 2 vols., 1862–66). D. at Washington, D. C., May 4, 1866.

Gurteen, Stephen Humphreys Villiers, M. A., LL. B.: b. at Blean House, near Canterbury, Kent, England, June 9, 1840; educated at Jesus College, Cambridge (prizeman and scholar), and at Paris and Berlin; ordained deacon Feb. 21, 1875; priest the following year; acting Professor of Latin at Hobart College, and in charge of Trinity church; associate rector Trinity church, Buffalo; rector Trinity church, Toledo, O.; dean St. Paul's cathedral, Springfield, Ill. During his residence in Buffalo he introduced into the U. S. the English plan of charity organization. He has published *Phases of Charity* (Buffalo, 1877); *Provident Schemes* (1879); *What is Charity Organization?* (Buffalo, 1879; reprinted 1880, 1881; rep. Chicago, 1882); *Hints and Suggestions to the Visitors of the Poor* (1879); *How Paupers are Made* (Chicago, 1883); *Handbook of Charity Organization* (1882); *Historical Sermon Fiftieth Anniversary St. Paul's Parish, Springfield, Ill.* (1886); and a work on *Casuistry*.
W. S. Perry.

Guspini, goos-pee'nē: town; in the province of Cagliari, Sardinia; 34 miles N. W. of Cagliari (see map of Italy, ref. 8–B). In its neighborhood are the ruins of Neapolis, an ancient and important town mentioned by Ptolemy, which was destroyed by the Saracens. Other antiquities exist in the vicinity, among them several *nuraghi*, or round towers of a peculiar construction, the origin and purpose of which are doubtful. With the exception of its archæological interest, the city is of small importance. Pop. about 6,000.

Gusserow, goo'se-rov, Adolf Ludwig Sigismund, M. D.: obstetrician; b. July 8, 1836, in Berlin; educated at Universities of Berlin, Würzburg, and Prague; professor at University of Utrecht 1866–67; at the University of Zurich 1867–72; at University of Strassburg 1872–78; Professor and Director of Gynæcological Clinic in University of Berlin since 1878. He is author of *Die Neubildung des Uterus* (2d ed. 1885) and of numerous professional papers. Since 1884 he has been editor of *Archiv für Gynäkologie*. C. H. Thurber.

Gusta'vus I. Va'sa: King of Sweden; the son of Eric, Duke of Gripsholm; b. at Lindholm, May 12, 1496; was descended lineally from the old Swedish kings; educated at Upsala, he entered the public service (1514) at a time of general discontent with the Danish domination, a large party having openly pronounced for independence. Vasa was one of the hostages sent in 1518 to warrant the safety of the Danish king, and was treacherously sent in irons to Denmark; escaped in 1519; listened to Luther's preaching, and became his correspondent; returned to Sweden, where his father was killed in 1520; headed an insurrection of Dalecarlians in 1521; gained the battle of Westeraas (1521); was made administrator of Sweden, of which he became king in 1523; openly professed Lutheranism in 1527; and in 1528 made it the state religion. His reign was disturbed by domestic wars with the peasants and with the reactionary party, and by contests with Russia. D. at Stockholm, Sept. 29, 1560.

Gustavus II. (Gustavus Adolphus): King of Sweden; grandson of Gustavus Vasa; b. at Stockholm, Dec. 9, 1594 (old style); succeeded Charles IX., his father, Nov. 8, 1611. Charles had been raised to the throne in 1604 by the Swedish estates, Sigismund of Poland, his nephew and the rightful heir, having been deposed because he was a Roman Catholic. In consequence, Sweden became involved in war with Poland, Denmark, and Russia. Gustavus detached Denmark from the alliance by a treaty in 1613; gained great advantages over Russia, and forced the czar to a disadvantageous peace in 1617; overran Polish Prussia, and was wounded at Dantzic; and though the Poles were sustained by the Emperor Ferdinand, who put Gustavus under the ban, he made an advantageous truce of six years, and landed again at Usedom in 1630. His greatest work was the leadership of the Protestant forces in the Thirty Years' War (*q. v.*); and the last two years of his life were the most glorious of all. The great battle of Leipzig, Sept. 7, 1631, Tilly's first defeat, established the fame of Gustavus; the victories of Würzburg and the Lech (Apr. 10, 1632), where Tilly received his death-wound, added to that fame. The generalship of Wallenstein drew him into Saxony, and the foes met at Lützen Nov. 6, 1632, where Wallenstein was defeated and Gustavus at the moment of victory fell covered with wounds. The first tactician and the first disciplinarian of his age, a man of large ambition for military glory, his most marked trait was nevertheless his profoundly religious spirit. As a ruler he showed what he might have been by the improvements introduced in the industrial, commercial, and mining interests of Sweden, and by the valuable changes he made in the internal economy of his Government. See his *Life and Times* (1884). Revised by C. K. Adams.

Gustavus III.: of Sweden; b. at Stockholm, Jan. 24, 1746; succeeded his father, Adolphus Frederick, in 1771. His reign was much disturbed by conspiracies, the machinations of the Hat and Cap factions, and wars with Denmark and Russia. Gustavus was a man of ability and ambition, but his vacillating and perhaps treacherous disposition, and his disregard of the constitutional limits of his power, bred much discontent, and he was shot by an emissary named Ankarstroem at a masked ball, and died of the wound Mar. 29, 1792.—His son, Gustavus IV., b. Nov. 1, 1778, succeeded to the crown in 1792; was robbed of Pomerania by Napoleon, and of Finland by the Czar Alexander; was forced to abdicate in 1809; was succeeded by Bernadotte (Charles XIV). D. at St. Gall, Feb. 7, 1837.

Gustavus Adolphus Society: a society of German Protestants, organized in 1832 in consequence of resolutions adopted on the two hundredth anniversary of the death of Gustavus Adolphus (which occurred Nov. 16, 1632, new style). This society is very popular in Germany, and also in the Netherlands and Sweden. Its object is the assistance of weak congregations of evangelical Protestants in all parts of the world.

Güstrow, güs'trov: town of Mecklenburg-Schwerin; on the left bank of the Nebel; 70 miles E. by S. of Lübeck by rail (see map of German Empire, ref. 2–F). It has a Gothic cathedral, a stately palace completed in 1565, formerly a ducal residence but now a workhouse, a gymnasium, a Real-gymnasium, a trade school, and an orphan asylum. It is an important wool-market, and has breweries, machine-works, foundries, and a large sugar-factory. Pop. (1890) 14,568.

Gutenberg, goo'ten-bĕrch, Henne, or Johann: printer; b. at Mainz, Germany, about 1400; was the son of Friele zum Gänsfleisch, a patrician, but took the name of his mother's family; removed in 1420 to Strassburg, where in 1436 he took several partners for the practice of wonderful secret arts invented by him. Of these arts, that of printing with movable types was the most important. Books printed before this time are all of the class called block-books, printed from engraved plates of wood or metal. It is certain that Gutenberg and his associates had a printing-press, with other apparatus for practicing the new art, as early as 1438, but it is not known that any books were printed until after the formation of his partnership with Faust, or Fust, at Mainz in 1450. (See Faust.) In 1455 the partnership was dissolved, and Peter Schöffer became Gutenberg's partner. In 1465 Gutenberg, who had for some years been carrying on printing by himself, left the business and entered the court of the Elector of Nassau. D. at Mainz, Feb. 24, 1468.

Guthrie: city (founded Apr. 22, 1889); capital of Oklahoma Territory and of Logan County (for location of county, see map of Oklahoma, ref. 2–D); on the Cottonwood river and near the Atch., Topeka and S. Fé Railroad. On Apr. 21, 1889, the day before the formal opening of the Oklahoma strip to settlement, the site of Guthrie was a bare prairie. On the 23d 8,000 people were encamped in tents within its limits. Within a week a church, public school, bank, and newspaper were established. In 1890 Guthrie won an exciting struggle with Oklahoma city for the location of the territorial capital, and since then its development has been rapid. It contains 8 churches, several public schools, waterworks, electric-light plant, 3 banks, board of trade, 3 daily, 6 weekly, and 3 monthly periodicals, flour and planing mills, ice-factory, cotton-gin, carriage and furniture factories, and other industries. Pop. (1890) 2,788.

Guthrie Board of Trade.

Guthrie, Thomas, D. D.: pulpit orator and philanthropist; son of a banker; b. at Brechin, Forfarshire, Scotland, July 12, 1803; graduated at the University of Edinburgh; studied medicine in Paris; was settled at Arbirlot, in his native county, in 1830; in 1837 removed to Old Grey Friars church in Edinburgh, and in 1840 to St. John's, a new church built for him in the same city; in 1843 took a prominent part in the establishment of the Free Church; encouraged the building of manses; became in 1847 the "Apostle" of the Ragged School system; was moderator of the General Assembly in 1862; was compelled to give up public speaking in 1864, when he began to edit *The Sunday Magazine* (Edinburgh and London). He was an earnest philanthropist and social reformer, and a very brilliant orator. Among his humanitarian publications may be named *A Plea for Ragged Schools* (Edinburgh, 1847); *A Plea on Behalf of Drunkards* (1850); *The City, its Sins and Sorrows* (1857). He published also *The Gospel in Ezekiel* (1855); *Christ and the Inheritance of the Saints* (1858); and *The Way to Life* (1862). D. at St. Leonard's, Fifeshire, Feb. 24, 1873. His sons issued his *Autobiography and Memoir* in 1874 and 1875 (2 vols., London).

Revised by S. M. Jackson.

Guthrie, Thomas Anthony: English author; publishes under name of *F. Anstey*; b. at Kensington in 1856; educated at Trinity Hall, Cambridge; called to the bar 1880, but never practiced; published short stories for various magazines 1878–81; author of *Vice Versa* (1882), which was very successful and was dramatized; *The Giant's Robe* (1883); *The Black Poodle* (1884); *The Tinted Venus* (1885); *The Fallen Idol* (1886); *The Pariah* (1889); *Vox Populi* (1892); *The Traveling Companions* (1892). C. H. T.

Guthrie Centre: town; capital of Guthrie co., Ia. (for location of county, see map of Iowa, ref. 5–F); on the Chi., R. I. and Pac. Railway; 50 miles W. of Des Moines. It is an agricultural and stock-raising region, with valuable tracts of coal and timber land; has 5 churches, 2 schools, and 2 weekly newspapers, and contains iron-bridge works, novelty-works, brick-works, and flour-mills. Pop. (1880) 571; (1890) 1,037; (1895) 1,141.

Editor of "Guthrian."

Gutta-percha [from Malay *gutah*, gum + *pertja*, the gutta-percha tree]: the hardened milky juice of the *Isonandra percha* or *I. gutta*, a large tree, which grows in Malacca, Borneo, and other islands of the Indian Archipelago, and also, according to Bleekrode, is procured from *Sapota mulleri*. The milky juice exudes from incisions in the bark made after the tree is cut down, and is inspissated by boiling. Crude gutta-percha is purified either by rasping in water to remove soluble impurities, and then heating to 230° F. to reduce to a compact mass, or by dissolving in bisulphide of carbon and evaporating the filtered solution. The purified gutta-percha has a brownish-red color, and a specific gravity of 0·979. It becomes electrical by friction, and is a very poor conductor of electricity; hence it is used for forming insulating supports for electrical apparatus and for covering telegraph wires which are to be immersed in water. At about 115° F. it softens and becomes pasty, without losing its tenacity. At 104° F. it may be easily spread out in sheets, drawn into tubes, applied to any surface, or worked into any desired form. It will take the finest impressions from a mold. It is used for water-pipes, moldings, and mixed with linseed oils for the molds employed in making electrotypes. It is insoluble in water, and but slightly soluble in alcohol and ether. Boiling olive oil dissolves a little of it, but deposits it again on cooling. It is readily soluble in bisulphide of carbon, benzol, chloroform, and oil of turpentine, especially when heat is applied. Alkalies and hydrofluoric acid have no action upon it. Bottles and other vessels for the latter acid are made from it. Oil of vitriol carbonizes it, and strong nitric acid converts it into a yellow resin. It yields volatile oils by dry distillation

Gutta-percha consists of

1. Pure gutta	$C_{10}H_{16}$	78 to 82 per cent.
2. Fluavil	$C_{25}H_{32}O$	6 " 4 "
3. Alban	$C_{20}H_{32}O_2$	16 " 14 "

The fluavil and alban are products of the oxidation of the gutta. The fluavil is a yellow resinous body, soluble in cold alcohol; the alban, a crystalline substance, insoluble in cold but soluble in boiling alcohol. The gutta is insoluble even in boiling alcohol. Pure gutta is obtained by exhausting gutta-percha with water and hydrochloric acid, dissolving in boiling ether, pressing the substance which separates on cooling, repeating the operation as long as anything is taken up by the ether. The pure gutta is perfectly white, cakes together at 212° F., and begins to melt at 300° F. Gutta-percha is strongly attacked by ozonized oxygen and by strong hydrochloric acid. It rapidly deteriorates by oxidation when exposed to the air, especially in warm climates. It loses its flexibility, tenacity, and extensibility, and becomes very brittle and entirely useless for industrial purposes. Mixed with sulphur or certain sulphides, and heated to 260° or 300° F., the gutta-percha undergoes a change similar to that which occurs during the vulcanizing of caoutchouc. (See India-rubber.) Gutta-percha is chiefly employed for coating submarine telegraph-wires. For further details, see Ure's *Dictionary of Arts, Manufactures, and Mines*; Muspratt's *Chemistry*; articles by T. M. Blossom, M. E., in *The American Chemist* (vol. ii., 1871, p. 81, *seq.*); and *Dictionary of Applied Chemistry*, I. E. Thorpe (1891).

Revised by Ira Remsen.

Gut'ta Ro'sea [Lat., rosy drop]: a name somewhat vaguely applied to skin diseases in which some of the sebaceous glands of the nose and face become the seat of inflammatory action, often of a very obstinate kind. The name includes often those cases of acne so common among young persons of either sex just as they are coming to years of maturity. The whelks or tubercles which appear upon the faces of hard drinkers come under the same general name. Regulation of the habits in any case is the most essential condition of cure. Mild lead lotions, with iron, are useful.

Gut'ta Sere'na [Lat., clear drop, so called in distinction from *gutta opaca*, or cataract, it being the belief of the ancients that drops of some humor of untoward quality fell into the eye and quenched the sight]: an old synonym for amaurosis (see Blindness); the "drop serene" of Milton.

Gutturals [from Lat. *guttur*, throat]: sounds formed between the back of the tongue and the soft palate. To distinguish them more distinctly from the palatals formed between the body of the tongue and the hard palate they are often called *velars*. Guttural vowels are *a* (as in *father*), *o* (as in *rose*), *u* (as in *rule*). Guttural explosives are *k* (as in *cot*), *g* (as in *got*). Guttural spirants are *ch* in Germ. *ach*, its corresponding voiced consonant, as in Germ. *sagte*, and the uvular *r*, as in the "Northumbrian burr" and the Parisian *r*. Guttural nasal is the sound indicated by the two letters *ng* in *song*.

Benj. Ide Wheeler.

Gutzkow, Karl Ferdinand: novelist and writer; b. in Berlin, Germany, Mar. 17, 1811; studied philosophy and theology; became an acknowledged head of the Young Ger-

many party. His *Wally die Zweiflerin* (a novel, 1835) caused his imprisonment for three months, its tendency being considered atheistical and destructive to social order. He afterward attained very great popularity as a novelist, dramatist, and journalist, but he never achieved a really artistic effect by any of his numerous writings. He lived in various German cities, and from 1870 at Berlin. Noteworthy among his works are *Zur Philosophie der Geschichte* (1836, written against Hegel); *Blasedow*, a satirical tale (1838–39); *Zopf und Schwerdt* (1844) and *Uhlald der Tartüffe* (1847), comedies; *Uriel Acosta* a tragedy, 1847; *Die Ritter vom Geiste* (1850–52); *Der Zauberer von Rom* (1859–61); *Fritz Ellrodt* (1872), and many other novels. While the influence of Gutzkow's literary activity upon the political and mental development of Germany must not be underestimated, his writings are not of permanent value. His talent, like that of all the members of Young Germany, was chiefly critical and journalistic. His efforts in the fields of the drama and the novel lack artistic form, and frequently offend by the author's undisguised intention of winning one over to the cause he is representing. D. Dec. 16, 1878. See J. Prölss, *Das junge Deutschland* (1892).

Revised by JULIUS GOEBEL.

Gützlaff, güts'läf, KARL FRIEDRICH AUGUST: missionary; b. at Pyritz, 24 miles S. E. of Stettin, Prussia, July 8, 1803; went in 1823 as a missionary of the Dutch Church to Singapore, and showed wonderful proficiency in the acquisition of languages; went to Java in 1826, to Siam in 1828, and to China in 1831; became in 1834 interpreter and secretary of the British legation; sustained himself without connection with any missionary society, and was beloved by the Chinese, among whom he practiced medicine with great success. Among his works are *Journal of Three Voyages along the Coast of China* (London, 1834); *Chinese History* (in English, 1834; in German, 1847); *China Opened* (1838); *Life of Taou-Kwang, late Emperor of China* (1852); and numerous papers on the geography, social life, and religion of the Chinese, into whose language he translated the New Testament. D. at Hongkong, Aug. 9, 1851. See his *Life* in German (Berlin, 1851). Revised by S. M. JACKSON.

Guy, THOMAS: founder of Guy's Hospital, Southwark, London (1724); b. at Horselydown, Southwark, in 1644; carried on business first as a bookseller, importing English Bibles from Holland; then as a financier, buying prize-tickets of seamen at a large discount and investing the money thus obtained in stocks. By this means he amassed a fortune of nearly £500,000. He sat in Parliament for Tamworth 1695–1707. He built and furnished three wards in St. Thomas's Hospital, gave liberally to the Stationers' Company, and founded and endowed different charitable institutions at Tamworth, his mother's birthplace. Nearly half of his fortune was bequeathed to the hospital which he had founded. (See GUY'S HOSPITAL.) D. in London, Dec. 27, 1724. Revised by S. M. JACKSON.

Guyon, gē'ōn', Madame JEANNE MARIE BOUVIÈRES DE LA MOTHE: mystic; b. at Montargis, France, Apr. 13, 1648. In 1664 she married the wealthy Jacques de la Mothe-Guyon, a tyrannical and irreligious man, who late in life was converted to her religious views. He died in 1676, leaving his wife free to foster that state of spiritual exaltation to which from infancy she had been inclined. Severe penances, untiring labors for the spiritual good of others, the abandonment of her property for the use of her three children, the guardianship of whom she surrendered, led her to a state in which she believed herself to be the bride of Christ, united in soul with God, having daily and hourly communication with heaven. She was much with one Lacombe, a Barnabite of mystical views, a devout man who was long her confessor, and who died insane, and Mme. Guyon's enemies spread many scandalous rumors regarding this relationship, but no one who knew her ever believed any of these reports. She was (1688–89) confined as a Quietist in the Visitation Convent of Paris, was liberated through the agency of Madame de Maintenon, and for a time lived at the French court. She was (1695–1702) confined at Vincennes and in the Bastile. When released she retired to her daughter's house at Blois, where the rest of her life was spent in works of charity, and there she died June 9, 1717, in full fellowship with the Roman Catholic Church, which she had never forsaken. She left a considerable number of volumes containing hymns, letters upon spiritual questions, and devotional treatises, some of them of a highly mystical character. The best *Life* is that by T. C. Upham (2 vols., New York, 1848–50). Probably the so-called autobiography is not altogether her own. Revised by S. M. JACKSON.

Guyon, RICHARD DEBAUFRE: a general in the Hungarian army during the revolution of 1848–49; of English descent; b. at Wolcott, near Bath, in England, Mar., 1813. In 1832 he entered the Austrian service, but after marrying the Countess Splényi, in 1838, he lived as a private citizen on his estates near Comorn. As soon as the revolution broke out he offered his services to the national Government, and accompanied Görgei as a brigadier-general on his victorious march to Buda and on his unfortunate retreat to Temeswar. After the battle of Temeswar (Aug. 9, 1849) he escaped to Turkey and entered the service of the sultan. Under the name of Kourshid Pasha he was governor of Damascus, and during the Crimean war he organized the army of Anatolia. D. in Constantinople, Oct. 12, 1856.

Guyot, gē'ō', ARNOLD HENRY, Ph. D., LL. D., M. N. A. S.: geographer; b. near Neuchâtel, Switzerland, Sept. 28, 1807; was educated at Neuchâtel, Stuttgart, Carlsruhe, and at the University of Berlin, where he graduated Ph. D. in 1835; continued his studies in Paris 1835–39. Though at first a student of theology, he gave especial attention to the natural and physical sciences. With Agassiz, his early associate, he accepted in 1839 a professorship in the Academy of Neuchâtel, just founded, to carry on a post-graduate course of higher studies, and filled the chair of Universal History and Physical Geography from 1839 to 1848. During these years he studied the structure and physics of the modern and the extent of the ancient glaciers of the Alps. He discovered the laminated character of the ice glaciers and the fact that the movement of the glacier is due to molecular displacement, mainly under the action of gravity, explaining thereby the principal laws of glacier motion which he had found and pointed out. He then investigated the subject of the transportation of Alpine bowlders around the Central Alps, determined for the first time the real limits of each erratic region in Switzerland, Savoy, and Lombardy, as well as the vertical limits of the phenomenon, and demonstrated the identity of the laws of the distribution of erratic *débris* with those of moraines of glaciers. His observations were to have been published in full in the *Système Glaciaire* of Agassiz, Guyot, and Desor (Paris, 1848), of which, however, only the first volume was printed; but the most important results are found in the *Bulletin of the Society of Natural Sciences* of Neuchâtel, and in *Archive d'Histoire de la Géologie*, vol. ii. (Paris, 1848). He removed in 1848 to the U. S.; delivered (1849) the lectures in French, translated by President Felton of Harvard College, and published as the *Earth and Man* (1849). These lectures gave rise to the movement of reform in geographical teaching, and he was employed for six years by the Massachusetts board of education as a lecturer on physical geography. He organized for the Smithsonian Institution a system of meteorological observations, superintended the construction of improved instruments; became in 1855 Professor of Geology and Physical Geography in the College of New Jersey, Princeton; published *Directions for Meteorological Observations* (1850); a volume of *Meteorological and Physical Tables* (1851–59); a paper on the *Physical Structure of the Appalachian Mountains* in *Silliman's Journal of Science* (1861); the treatise on physical geography in *Johnson's Family Atlas of the World*; a series of school geographies (1866–75), and a series of wall-maps for schools; and a *Memoir* of Louis Agassiz (1883). In 1884 appeared his *Creation, or the Biblical Cosmogony in the Light of Modern Science.* In 1873 his geographical works received the medal of progress at the Vienna Exposition, and a gold medal at Paris 1878. He received the honorary degree of LL. D. from Union College; was one of the original members of the National Academy of Sciences created by Congress, and was member of many other scientific societies. D. at Princeton, N. J., Feb. 8, 1884.

Guysborough, gīz'bŭr-rŭ: port of entry and capital of Guysborough County, Nova Scotia; on the west side of Milford Haven and about 120 miles E. N. E. of Halifax (see map of Quebec, etc., ref. 2–C). It was settled in 1783. Its harbor is commodious. Fishing and gold-mining are among its most important industries. Guysborough is the seat of a large academy. Pop. 1,703.

Guy's Hospital: a great charitable institution of Southwark, London; named from its founder, Thomas Guy, a London bookseller, who began its erection in 1722, and at his death in 1724 most liberally endowed it. In 1829 it re-

ceived large benefactions from a Mr. Hunt. It was opened in 1725. New wards were built in 1852, and a chemical laboratory in 1872. Besides the hospital there are a dental school, and a residential college for the accommodation of fifty students and the junior medical staff. The hospital admits over 5,000 patients yearly; its annual income is about £40,000. New laboratories were opened in July, 1893.

Guyton-Morveau, gē tōn mōr vō', Louis Bernard: chemist; b. at Dijon, France, Jan. 4, 1737. He had become an attorney, when he determined to devote himself exclusively to the study of natural science, especially chemistry. At his suggestion chairs of chemistry, mineralogy, and medicine were erected at the Academy of Dijon, and he filled the first-mentioned one till 1790. During the Revolution he was active as a politician, and voted for the immediate execution of Louis XVI. He contributed much to the erection of l'École Polytechnique in Paris, at which he became a professor. From 1800 to 1814 he was director of the mint. His chief merits as a chemist are his discovery of the disinfecting qualities of chlorine, made in 1773, and his establishment of a new and simpler chemical terminology, the idea of which he conceived in 1783, and in the execution of which he was aided by Lavoisier. But his experiments and researches also have been of great influence in the manufacture of saltpeter, gunpowder, Prussian blue, etc., in the employment of cement for building under water, and in many other instances of practical application of chemical science. His principal works are *Dictionnaire de Chimie* (1786); *Methode d'une Nomenclature chimique* (1787); *Traité des moyens de désinfecter l'air* (1801); *Rapport sur la restauration d'un tableau de Raphaël* (1802). D. in Paris, Jan. 2, 1816.

Guzel-Hissar: See Aidin.

Guzerat, or **Gujarat**: the northern seaboard of the Bombay Presidency, British India. The name is geographical and not political, and is somewhat vaguely employed. It includes the British districts of Surat, Broach, Kaira, Panch Mahal, and Ahmedabad, and also the native states of Baroda and a dozen or more others. It sometimes also includes the peninsula of Kathiawar, with its 180 petty states. Defined thus it has an area of over 40,000 sq. miles. It has given its name to one of the great languages of Bombay, the Gujarathi. M. W. H.

Guzman, Nuño Beltran, de (Nuñez de Guzman according to some authors): lawyer and soldier; b. at Guadalajara, New Castile, Spain, about 1485. He was long a crown officer in Española, and in 1526 was appointed governor of Panuco in Mexico (a region about the present city of Tampico). Guzman was opposed to Cortés, and speedily quarreled with him on questions of boundary; he also encroached on the territory of Narvaez toward the N., and carried many Indians away into captivity. Notwithstanding these irregularities, the Council of the Indies made Guzman president of the first audience or high court of Mexico. He arrived at Vera Cruz with the other auditors in Dec., 1528, and by virtue of his office ruled, or rather misruled, New Spain until deposed by the arrival of a second audience in Jan., 1531. During this period the auditors made themselves wealthy by extortion and bribes; they were enemies rather than judges of Cortés in the proceedings against him, and the natives and Spaniards were oppressed in many ways. In 1530 Guzman led an expedition to the Pacific coast in Jalisco, opening up the region afterward known as Nueva Galacia. He was finally imprisoned, tried, and disgraced; in 1538 he was sent to Spain, and died in obscurity at Guadalajara (according to others at Torrejon de Velasco), 1544. Herbert H. Smith.

Guzman, Ruy Diaz, de: first historian of Paraguay; b. in that country in 1544. His father was one of the followers of Cabeza de Vaca in 1544, and the son early served in the numerous Indian wars; later he was military governor of Guayra. His *Histôria Argentina del descubrimiento, poblaciôn y conquista de las provincias del Rio de la Plata* was finished in 1612, but remained in manuscript until 1836, when it was published in the Angelis collection. The date and place of Guzman's death are unknown. H. H. S.

Guzman Blanco: a state of Venezuela, now called Miranda (*q. v.*).

Guzman Blanco, Antonio: statesman and soldier; b. at Caracas, Venezuela, Feb. 29, 1829. He studied law at Caracas, and subsequently held consular and diplomatic positions in the U. S. In 1859 he joined Falcon in the revolt, which, after many vicissitudes, was successful in 1863. Falcon was then elected president and Guzman Blanco became first vice-president, holding later the portfolios of the treasury and of foreign affairs. During his absence in Europe (1868) Falcon was deposed by a revolution; Guzman Blanco at once returned and headed a counter-revolution, which was successful in 1870. Falcon having died, Guzman Blanco became president, and by successive re-elections he retained the office until Feb., 1882; during this period he maintained peace and the country was prosperous, but his dictatorial acts aroused strong opposition. After his retirement from the presidency his influence was paramount in Venezuelan affairs until the election of Rojas Paul in 1888. Since then he has generally resided in Trinidad.

Herbert H. Smith.

Gwalior, gwaa'leĕ-ōr: a feudatory state in several detached districts of Central India; belonging to the family of Sindhia. Its northern part is low, occupying the basin of the Jumna; the middle part is hilly, and the southern is covered with branches of the Vindhyan and Santpura Mountains. Area, 29,067 sq. miles. Pop. 3,200,000.

Gwalior: capital of the state of Gwalior, India; on the Subanrika, an affluent of the Jumna, but with very little water in the dry season (see map of North India, ref. 6–E). In the midst of the city rises a rock, perpendicular, 300 feet high, 1½ miles long, and 300 yards broad. This rock has been used as a fortress for more than 1,000 years. At the foot of the rock stretches the city, built in the ancient Hindu style, hot, squalid, uninviting, but containing some of the most stupendous specimens of Hindu palace architecture, dating back to the fifteenth and sixteenth centuries. It also contains some very interesting temples of Jain origin. The most remarkable Jain remains, however, are the caves and rock-cut sculptures in the rock on which the fortress is built. Pop. 30,000.

Gwin, William McKendry: U. S. Senator; b. in Sumner co., Tenn., Oct. 9, 1805; was educated at Transylvania University; studied medicine and removed to Vicksburg, Miss.; became U. S. marshal 1833; was in Congress 1841–43; as commissioner of public buildings supervised the construction of the New Orleans custom-house 1847; went in 1848 to California; was in the constitutional convention 1849; U. S. Senator 1850–61; was imprisoned for disloyalty 1861–63; took part in a scheme for colonizing Sonora with people of Southern birth 1864–65; and, according to a report (officially denied by the imperial representative), was appointed prefect of Northern Mexico under the short-lived empire of Maximilian. D. in New York city, Sept. 3, 1885.

Gwin'iad [from Welsh *gwyniad*, whiting (a kind of fish), deriv. of *gwyn*, white]: a lake fish of Northern Europe, the *Coregonus fera*, of the salmon family, closely resembling the whitefish of the lakes of North America, though greatly inferior to it as food. It is caught in England and Wales in large quantities, and salted, and sold to the poor at very cheap rates.

Gwinnett, Button: patriot; b. in England about 1732; emigrated to Charleston, S. C., in 1770, and became engaged in agriculture (1772). He took an active part in the political questions of the time during the Revolution, was elected by the general assembly of the province a representative to the general Congress, and was a signer of the Declaration of Independence. He was killed in a duel by Gen. McIntosh, May 27, 1777.

Gwynn, Nell: actress; b. in London, in the most abject poverty, about 1650. She sold oranges in the taverns, and sang and danced for money, and in her sixteenth year went upon the stage, where she made a great hit in humorous and wanton *rôles*. She became the mistress of Lord Buckhurst, and in 1669 of Charles II.; in 1671 she was appointed a lady of the privy chamber to Queen Catharine, and received the name of Madam Ellen. But once arrived at this station, her pretty face, wit, and generosity made her popular. She helped her old friends among the actors and poets, was the first to propose the erection of Chelsea Hospital for disabled soldiers, and was generally believed to have exerted herself in support of the Protestant cause at court. She bore two sons to the king, of whom the one died early, and the other was created Duke of St. Albans. After the death of Charles II. she lived in retirement, and when she died (about 1690) her funeral sermon was preached by Dr. Tenison, afterward Archbishop of Canterbury. Two memoirs have

been published of her time one by John Seymour in 1752, *Memoirs of the Life of Nell Gwynn, Mistress to King Charles II.*, a metric panegyric, and another by Peter Cunningham in 1850.

Gya: See GAYA.

Gy'aros (n. Gr. ἡ Γυάρος, or τὰ Γυάρα): one of the Cyclades; now uninhabited and employed as a sheep pasture. It lies S. W. of Andros; was anciently proverbial for the poverty of its people (Strabo, I.); and was a most dreaded place of banishment for the Romans (Juvenal, i., 73). It is very small and rocky. Its present name is Goura, or Gioura.

Revised by J. R. S. STERRETT.

Gyges (n. Gr. Γύγης): a favorite officer of Candaules, King of Lydia. He expelled the Assyrian dynasty of the Sandonidæ (Heraclidæ) from Lydia, and founded the dynasty of the Mermnadæ, the last sovereign of which was the ever-famous Crœsus. At the suggestion of Candaules, who thought the queen's beauty was not fully appreciated by Gyges, the latter unwillingly concealed himself in her bedchamber in order to see her naked, but was discovered by the queen, who gave Gyges the choice of being put to death himself or of killing Candaules. He chose the latter, murdered Candaules, and became King of Lydia about 716 B. C. The Delphic oracle confirmed him in his new position, and in return he sent to Delphi an offering of immense value, including among other things six golden mixing-bowls (craters) that weighed thirty talents ($35,000). The story that Gyges came into possession of the throne by means of an enchanted ring is told by Plato (*de Rep.*, ii., 3), and the ring of Gyges was with the ancient Greeks a symbol of extraordinary good luck, like the lamp of Aladdin with the Arabs. D. 678 B. C. J. R. S. STERRETT.

Gyldén, HUGO: astronomer; b. at Helsingfors, Finland, May 29, 1841; was appointed astronomer at the Pulkowa Observatory, where he determined standard declinations with the vertical circle. In 1871 he removed to Sweden, as director of the observatory at Stockholm and professor in the university. Here he devoted himself principally to the mathematical theories of the planetary motions, having invented a new method of determining the perturbations of comets and planets, which is coming into wide use. D. in Stockholm, Sweden, Nov. 10, 1896. S. NEWCOMB.

Gylip'pus (in Gr. Γύλιππος): son of the exiled Spartan general Cleandridas by a Helot mother; he was therefore reckoned among the Mothaces (or Mothones), who, though they were not full citizens, were educated along with the Spartan youth, and might even attain the rank of full citizens in time. He was given the command of the allied forces sent in 414 B. C. to the relief of Syracuse, which was then being besieged by the Athenians. The force of Gylippus was so small that the Athenians did not take the trouble to annihilate it. He landed at Himera, marched across country to Syracuse, took command of the Sicilian land forces, captured the fortress Epipolæ, and conducted the campaign with such increasing success that the next year (413 B. C.) the Athenian army was utterly annihilated, when both Nicias and Demosthenes, the Athenian generals, were put to death by the Syracusans, against the wishes of Gylippus. The story of the siege of Syracuse, the retreat and capture of the Athenians, is told by Thucydides in the seventh book, which Lord Macaulay declared to be the finest piece of prose composition that ever issued from the pen of man. In 412 he returned to Sparta, though hard pressed by the Athenian fleet of observation. At the close of the Peloponnesian war Lysander sent him to Sparta in charge of great state treasure. Gylippus, following in the footsteps of his own father Cleandridas, stole a part of the treasure, was condemned to death for the crime, and escaped only by fleeing the country. Probably he died in exile.

J. R. S. STERRETT.

Gyllembourg-Ehrensvärd, gül'lem-boor'eh-ā'rens-värd, THOMASINE CHRISTINE (*née* BUNTZEN), Baroness: novelist; b. at Copenhagen, Denmark, Nov. 9, 1773; was married in 1790 to the political writer Peter Andreas Heiberg, by whom she had one son, the poet Johann Ludwig Heiberg. Her husband was banished in 1799 for his political views, but she did not accompany him in his exile. Obtaining a divorce, she married Baron Gyllembourg-Ehrensvärd, a Swedish political refugee living at Copenhagen. After his death in 1815 she lived with her son, at whose house in Copenhagen she died, July 2, 1856. Her first work, *The Polonius Family*, was published anonymously in her son's paper, *The Flying Post*, and it was followed by *The Magic Ring* (1828) and by *An Everyday Story* in the same year. The last was especially popular, and roused the curiosity of the public as to the identity of the author, but she kept the secret till her death. Among her other works are *Old and New Novels* (1833–34); *New Stories* (1835–36); *Montanus and Ricida* (1839); *One in All* (1840); *Near and Far* (1841); *A Correspondence* (1844); and *Two Generations* (1845).

Gymna'sium (Gr. γυμνάσιον, athletic ground, deriv. of γυμνάζειν, exercise, practice, athletic exercises, deriv. of γυμνός, naked, lightly clad]: among the Greeks a place for athletic exercises. In its simplest form the gymnasium was a vast hypæthral building with a colonnade around the four interior sides. To make provision in this interior court for all the various kinds of athletic exercises was a problem of great interest to architects, one of whom, Vitruvius (5,11), has given a complete description of the ideal gymnasium of the Græco-Roman period. Appropriate places had to be provided for running, jumping, wrestling, boxing, spear and discus casting, for warm and cold baths, for undressing, for anointing the body with oil and besprinkling it with sand. In addition to this, space had to be provided for the accommodation of the people, who were fond of witnessing the athletic exercises of the young. By degrees the gymnasium became a place to which people went for amusement and mental refreshment, and so the grounds of the gymnasium were provided with promenades, both covered and uncovered, with gardens and resting-places of various kinds in which men might lounge, converse, study, or receive oral instruction. In classical times there were three gymnasia in Athens—the Academia, the Lycæum, and the Cynosarges—but in later times there were more. Ancient gymnasia have been discovered by excavations at Olympia, Pergamon, Hierapolis, Aphrodisias, Alexandria Troas, Assos, and Delos. The literature of the gymnasium is vast, and merely the chief works will be cited: L. Grasberger, *Erziehung und Unterricht im klassischen Alterthum* (Würzburg, 1881); Mahaffy, *Old Greek Education* (London, 1883), based on Grasberger; Wilkins, *National Education in Greece* (1873); Capes, *University Life in Ancient Athens* (London, 1877); Krause, *Gymnastik und Agonistik der Hellenen* (Leipzig, 1841); Jäger, *Gymnastik der Hellenen* (Stuttgart, 1881); Blümner, *Leben und Sitten der Griechen*, ii., 95 ff.; E. Paz, *Histoire de la gymnastique depuis les temps les plus reculés jusqu'à nos jours* (Paris, 1886); Wiekenhagen, *Antike und moderne Gymnastik* (Rendsburg, 1891).

The gymnasium finally became merely a school. But except in Germany and some other European countries the name has reverted to its original sense. In Germany the gymnasia are the schools where young men are fitted for the universities. But those who intend to follow a technical profession, such as architecture, engineering, etc., study at the *Realschulen* and not at the *Gymnasia*, and after having passed through the Realschule they enter the Polytechnicum for their professional education. J. R. S. STERRETT.

Gymnastics [from Gr. γυμναστικός, gymnastic, from γυμνάζειν, exercise. See GYMNASIUM]: athletic or disciplinary exercises, designed to promote strength, including running, leaping, the use of parallel bars, and the lifting of weights. Among the ancient Greeks practice in the use of weapons was an essential part of gymnastic training. CALISTHENICS are light gymnastics designed to impart grace of movement as well as physical strength, and better adapted to women than ordinary gymnastics, as they do not subject the muscles to so violent a tension. The apparatus used chiefly consists of a light wooden staff, about 4 feet long, a pair of light dumb-bells, chest-weights, and parallel bars. Marching and other movements often are performed to the sound of music. See PHYSICAL EDUCATION.

Gymne'trus [Mod. Lat.; Gr. γυμνός, naked + ἦτρον, abdomen]: a genus of fishes of the family *Trachypteridæ*. They inhabit deep parts of the sea, and are seldom seen. *G.* or *Regalecus banksii* and *G. hawkenii* are found in the Atlantic waters. They are board-like in form, very much compressed, and from 6 to 20 feet in length. Their ventral fins are reduced to the form of oar-like filaments. These fishes are very delicate and fragile, and when found some of their parts are usually wanting.

Gymnoc'ladus [Mod. Lat.; Gr. γυμνός, naked + κλάδος, branch]: a genus of the order *Leguminosæ*, containing a single species, found in the U. S., the *G. canadensis*, called Kentucky coffee-tree, stump-tree, and chicot. Its range is from Western New York and Pennsylvania to Illinois and

southwestward. It is a handsome tree, with peculiar and very compound leaves, but in winter it appears as if dead, from the absence of small branches. Its wood is valuable to the joiner and furniture-maker, and the very hard seeds have been used for coffee.

Gymnodon'tes [Mod. Lat., plur. of *gymnodon*, liter., naked-tooth; Gr. *γυμνός*, naked + *ὀδούς, ὀδόντος*, tooth]: a sub-order of plectognath fishes, distinguished by a complete union of the bones of the upper jaw and the consolidation of their dental armature, as well as that of the lower jaw, in exposed, beak-like masses, with or without median sutures; the scapular arch is also characterized by the atrophy of one of its bones (the hypercoracoid). The various species are distinguishable by a greater or less eccentricity of form and deviation from the fish-like type, some having sac-like bodies, with the belly more or less distensible, and others by a truncation of the body behind, and a consequent absence of the caudal peduncle and true fin. Three families belong to this group—viz., *Orthagoriscidæ*, *Tetrodontidæ*, and *Triodontidæ*, whose representatives are known popularly as salt-water sunfishes, swellfishes, porcupine-fishes, etc.

Gym'nogens: a synonym for GYMNOSPERMS (*q. v.*).

Gymnono'ti [Mod. Lat., plur. of *gymnono'tus*; Gr. *γυμνός*, naked + *νῶτος*, back]: a sub-order of teleocephalous fishes, distinguished by the brain-case of the skull produced forward; symplectic bones present; pterotic normal; opercular all present; branchiæ normal; four anterior vertebræ, much modified and united in a single mass, with which are connected the ossicula auditus; air-bladder connected by a duct with the intestinal canal; and an anus far in front and in advance of the scapular arch, or even behind the symphysis of the lower jaw of a prolonged snout; the body is elongated and finless on the back, but with a long anal continued far forward. To this sub-order belong two families of South American fishes: (1) *Gymnonotidæ*, which includes a number of genera and species, and (2) *Electrophoridæ*, of which the only well-determined representative is the famous electrical eel, the *Electrophorus*, or *Gymnotus electricus*, which can give a shock sufficiently powerful to fell a man. The electric eel has a fin extending along the greater portion of the under side of the body, but none on the back; the vent is situated under the throat; the color is black. The animal attains a length of 6 feet, and inhabits the streams of Guiana and Brazil. The statement that the Indians drive horses into the waters inhabited by these eels, and capture them, after their electricity has been exhausted by repeated discharges directed against the horses, lacks confirmation. Revised by F. A. LUCAS.

Gymnophi'ona [Mod. Lat., from Gr. *γυμνός*, naked + *ὀφιόνεος*, serpent-like]: a name frequently used for the CÆCILIDÆ (*q. v.*), on account of their resemblance to snakes without scales.

Gymnosom'ata [Mod. Lat., neut. plur. of *gymnosomatus*, naked bodied; Gr. *γυμνός*, naked + *σῶμα, σώματος*, body]: a subdivision of the group of pteropodous MOLLUSCA (*q. v.*), in which the body is without a shell.

Gymnos'ophists [viâ Lat. from Gr. *γυμνοσοφισταί*, liter., naked philosophers; *γυμνός*, naked + *σοφισταί*, plur. of *σοφιστής*, sophist, professor, deriv. of *σοφός*, wise]: a name given by the Greeks of Alexander's time to the Fakirs of India. They were divided into two sects, the Brahmans and the Samanæans.

Gym'nosperms [*γυμνός*, naked + *σπέρμα*, seed]: a class (*Gymnospermæ*) of flowering plants characterized by having the seeds borne on the upper surface of an open leaf or scale, or on the margins of an open leaf, or even in open cup-shaped structures on modified branches. This fact, that the seeds are not inclosed in a folded leaf (pistil), but are naked, has given these plants their name. In fertilization the pollen falls directly upon the ovule, and, there germinating, sends its tube into its tissue and finally to its egg-cells. In all gymnosperms the prothallium is a well-developed cellular structure, and in it one or more archegones are developed. On this account they are regarded as the lowest of the flowering plants, and are unquestionably affiliated with the Fernworts (Pteridophytes). Three orders are usually recognized, viz., the CYCADS (*Cycadeæ*), the CONIFERS (*Coniferæ*), and the JOINT-FIRS (*Gnetaceæ*), to which the reader is referred for a fuller discussion. See also PLANTS, FOSSIL.

CHARLES E. BESSEY.

Gym'pie: a town of Queensland, Australia; in about lat. 26° S., lon. 152° 25′ E.; on the upper Mary river, and on the railway; 90 miles N. of Brisbane (see map of Australia, ref. 5–J). There are important gold-fields in the neighborhood. Pop. (1891) 8,449. M. W. H.

Gyöngyös, dyön-dyösh′: a well-built and beautifully situated town of Central Hungary; 44 miles N. E. of Budapest (see map of Austria-Hungary, ref. 6–H). It has mineral baths and a considerable trade in corn, fruit, wine, cattle, and horses. Pop. 15,896.

Gypsies [earlier *Gypsen*, *Gypcyan*, viâ Fr. from Lat. *ægyptius*, Egyptian]: a widely distributed and peculiar race of vagabond people. It was long assumed that the gypsies first appeared in Europe at Lüneburg, Hamburg, etc., in 1417, and that this must have been shortly after their migration from their fatherland, India; but more recent research indicates that numbers of them had been living as serfs and nomads in the Greek-speaking countries of Southeast Europe in all probability as early as the eleventh century. In 1417, however, they suddenly appeared in Germany in hordes amounting to perhaps 1,400 persons, which, twenty-one years later, swelled to thousands. The contemporary chronicler Korner describes how the "strange multitude of Oriental vagabonds came into Germany. . . . They went afoot, camped by night afield, being thieves, and fearing arrest in cities. They were about 300 in number, ugly, black as Tartars, and called themselves *Secani*. They had leaders, a duke and count, whose judgments they obeyed. They were great thieves, especially the women; many of them were in many places arrested and slain. They bore letters of commendation from the Emperor Sigismund, through which they were admitted to cities, princes, castles, towns, bishops, and prelates, by whom they were kindly treated. Some of them rode." Another contemporary writer shrewdly observes that those who rode changed their horses very frequently. "They said that the cause of their wanderings and pilgrimage was a penance for having relapsed to paganism after being converted to Christianity, and this penance of wandering had been enjoined on them by their bishops for seven years." Another writer says they appeared as "baptized heathens" in Switzerland, at Basel, Zurich, and other places. They appear to have been the same party seen at Hamburg with the duke and count, "who wore silver girdles and rode," bearing the imperial letter. In 1422 they appeared in Bologna, headed by a "duke of Egypt," named Duke Andrew. Inspired by the success of the letter from the Emperor Sigismund in Germany, they added to the old story of their being renegades and penitents by declaring that Hungary was their original country, the king of which, having conquered them in battle, had sent them on a seven years' penitential pilgrimage, and had granted them a decree, which they showed, "authorizing them to rob and steal without being amenable to justice." They remained in Bologna fifteen days, stealing freely. It would appear that faith and respect attached to their "license," since the authorities did not arrest them, but decreed that any one whom they had robbed might steal to an equal amount from them; and the Bolognese availed themselves of this to such an extent that the gypsies were glad to pass on to Rome. They were *la più brutta genia*—"the most beastly people ever seen in those parts. Black and lean, they ate like pigs. The women went in chemises."

Name and Origin.—The gypsies in different lands have received a great variety of names. Several of these refer to their supposed Egyptian origin, as *gypsy* itself, the Spanish *gitano*, the Modern Greek *gyphtos*, etc. Then we have the French *bohémien*, the Scandinavian *tatar*, and, above all, a multitude of such forms as the Turkish *tchinghiané*, the Italian *zingaro*, the Magyar *cigány*, and the German *Zigeuner*. An immense amount of learning and research has been devoted to the origin of this last name. But as it is given among the gypsies of Persia to a large class among themselves, the saddle-makers, or Zingari, which has given its name in turn to the Zinganeh, a Kurd tribe, supposed to be of gypsy origin, this is possibly the true root. Among themselves they never say gypsy, but always *Rommany*. There exist in India several kinds of wandering pariahs or outcasts, which are identical in all respects with gypsies, the latter, however, uniting in one the peculiarities which in India attach to different bodies. Prominent among them are the Doms, whose name, it is probable, is identical with that of *Rom*, by which gypsies distinguish themselves all the world over. The Hindu *d* generally changes to *r* in the Rommany or gypsy language—e. g. *doï*, a spoon, into *roi*; and as the words Dom, Domni, and Domnipana mean in Hindu, a Dom, a female Dom, and "the being a Dom," so

Rom, Romni, and Romnipen have precisely the same signification, and in common use as applied to a gypsy, his wife, and gypsydom. The antiquity of the Doms is indisputable, as they are mentioned in the Shasters, where they are called Sopuckh or "dog-eaters." In India they roam about, living in tents, eat swine which have died a natural death, carry out corpses, etc., and flay animals; all of which are habits or pursuits peculiar to gypsies, or were so when they first appeared in Europe. The Doms of India, like gypsies, make baskets and mats, which they sell while roaming about. Their women sing, play on musical instruments, and frequent weddings, as did the gypsy women of Italy and Spain. Unlike all other Hindus, the Doms are madly addicted to intoxication, being "so fond of drinking that they spend nearly the whole of their earnings on spirits." Even in Germany the excessive fondness of gypsies for spirits was observed in early times. The name Dom probably was the first type of that of Rom, but other causes may have helped to form it. In Hindu, as well as English, a similar word signifies roaming. Many gypsies passed through Egypt on their way westward, and in Coptic—which was more generally spoken in the eleventh century than at present—*Romi* means, as in gypsy, a man; and it is also probable that from their long sojourn in Roumania and among Greeks, who are generally called Rūmi in the East, being confounded at an early period with *Romans*, they spoke of themselves as Romani when they first appeared in Hungary. There is, however, in India another body of outcasts which probably contributed largely to the gypsies, but at a *later* period, the first immigrants having been Doms. These are the Nāts, whom all European residents in India call simply gypsies, from their similarity. The Nāts "are noted thieves, wander about, are addicted to conjuring, legerdemain, and theatrical pursuits." Probably there is not one theater or circus in Great Britain or the U. S. in which there is not at least one performer of more or less mixed gypsy blood. The Nāts tell fortunes by chiromancy, and live, like English gypsies, in tents of dark blanket-stuff. Many of the men are skillful blacksmiths. Their women sell love-potions and charms against the evil eye, just as in Europe. The personal appearance of these tribes is peculiar, and so similar to that of gypsies that any one who is familiar with the one can not fail to recognize the other. This is especially seen in a very singular and characteristic glitter of the eye, and an expression not to be seen in any other kind of Easterns, excepting perhaps Persians, who often resemble gypsies. Like North American Indians, the gypsies all walk with the feet straight; so that, as a gypsy once informed the writer, he could tell the track of one of his own people among a hundred *gorgios* (or non-gypsies). There are in India two or three other roaming castes which have strongly marked gypsy traits. The use of a secret language among most of these wanderers, and especially by the Nāts, also identifies them with gypsies. Nothing is as yet known which explains the fact why at one period there was apparently a vast and sudden migration of them from India. The pariahs or outcasts of that country have in their ranks many men of genius, and it is to the writings of members of the Purrachchameiyan and Valluran sects of pariahs and similar heretics that India owes its best literature in a literal sense. It is probable that the first leaders of the gypsies into Europe, who are described as men of rank and knowledge, were of this class, and that owing to the free thought which sprang from Būddhism the ranks of the intellectual pariahs were at one time largely augmented, the result being an effort to deliver themselves by emigration from the extreme tyranny to which they were subjected. The only history of their early migration is contained in their language.

Language.—This is called the Rommany or gypsy language. Though the first conjecture ever made by a scholar in Europe as to the origin of the gypsy tongue declared it to be Indian, and though specimens of it were printed by Andrew Boorde (1547) and Vulcanius (1589), the world at large, and even Ben Jonson, Sir Walter Scott, Lord Lytton, etc., believed that this language was only a jargon or cant, and under this impression more than one work has been published as a gypsy vocabulary which contained no gypsy words whatever. It is, however, a curious fact that in every country the gypsies have carefully excluded the current slang words from their own tongue, and when they find that a Rommany word has become known beyond themselves they discontinue its use. Thus the writer has heard gypsies say that a certain word has gone out of use or is going out, because the tramps have got hold of it or because it has become "canting." Yet, as their object is to have a secret language, they have not scrupled when migrating from one country to another to use many of the words which belonged to the language of their last home, since these answered every purpose and replaced those which had been eliminated because they were becoming known. These facts should be borne in mind as necessary to the understanding of the gradual formation of this curious tongue in its dialects, for it is by these additions to the original "new Indian" language, whatever it was, which the first gypsies spoke when they came to Europe, that their wanderings have been accurately traced by Miklosich. Great interest has been taken in the Rommany language, as gypsies themselves call their tongue, owing (1) to the extraordinary number of curious words, both ancient and modern, from different languages, which abound in it; (2) because it is possible that even if it be in the main a new Indian tongue formed with Urdu, its germ may still have existed originally as an obscure but very ancient Aryan language; (3) because, while the origin of every word in Rommany is known, and with it the grammar of the languages from which it comes, that of the Rommany grammar itself is as yet a mystery, nor is it ascertained whether it was formed in India previous to the great migration between the tenth and thirteenth centuries, or during the early travels of the race. And though there is one Indian element common to Rommany wherever spoken, and many words the same in all its dialects—e. g. *churi*, "a knife"—yet much may be found in one country that is not known to gypsies in others. The universal dissemination of Rommany, the great unwillingness of all who speak it to have it made known, and finally the number of words which it has contributed to English slang, are also causes which invest it with interest. Little was known regarding it until J. C. C. Rüdiger (*Neuester Zuwachs der Sprachkunde*, Halle, 1782) announced that the gypsy language, apart from its Slavonic and German additions, consisted of Hindu words. In 1783 H. M. G. Grellmann cleverly availed himself of his predecessor's labors, and published a work from which the public for many years inferred that he was the first to discover the Indian origin of Rommany. It has not yet, however, been pointed out by any writer through what media of more recent Indian tongues the Sanskrit words have passed, nor have any philologists shown to what degree the Slavonic and Greek words in Rommany are really Indian, but simply Slavonized or Græcized. This process is continually going on in Rommany.

There are fourteen principal dialects of the European tribes—Turkish, Roumanian, Hungarian, Moravo-Bohemian, German, Polo-Lithuanian, Russian, Finnish, Scandinavian, Anglo-Scottish, Welsh, Italian, Basque, and Spanish. But several of these are so corrupt that those speaking them would not comprehend the others, although a great number of isolated words are common to them. With little effort or practice Turkish, Hungarian, and Welsh gypsies could talk together, and the few Rommanies in England who have still preserved the grammar of their tongue could join them in mutual intelligence. But the majority of English gypsies, with all the Spanish and their Scandinavian and Egyptian brothers, would find themselves no nearer than a Spaniard and an Italian. It is impossible to assume with certainty any dialect as the type, but the Turkish, as set forth by Dr. Paspati, may be taken for a basis, since its grammar is the most perfect known. Its main features are as follows: The articles are *o* (masculine) and *i* (feminine), as *o raklò*, "the boy," *i rakli*, "the girl." *Nouns.*—These are masculine or feminine. Abstract nouns are formed in Hindu by the termination *pan*, like the English "-ship" or "-hood." In English Rommany this termination is still *pen* or *ben*; in Turkey it is *pé* or *be*. Thus *kushto*, "good," becomes *kushtopen* or *kushtopé*. In English Rommany, and to a certain extent in other dialects, an active agent or person doing anything is ingeniously expressed by the termination *engro*. Thus from *giv*, "wheat," we have *givengro*, "a farmer"; *saster*, "iron," *sastengro*, "a smith," corresponding to the generally applied *walla* of India. The origin of *engro* is to be found in the *koro*, genitive termination of all nouns, which is itself derived from the verb *ker-ava* (Sansk. *kāra*, m. rad. *kri*, *faciens*, factor). This is so general that it may be said that almost every adjective and active verb yields an agent. English gypsies make nouns by changing *engro* to *engrī* (a thing), thus *mui*, "a face," becomes *muiengrī*, "a pillow" (lit., a face-thing, also a portrait); *wast*, "a hand," *wast-engrī*, "a hand-cuff."

The regular declension is

Rakló = "a boy."

	Singular.		*Plural.*
Nom.	*o rakló,*	the boy,	*o raklé.*
Gen.	*e rakléskoro,*	of the boy,	*e raklengoro.*
Acc.	*e rakles,*	the boy,	*e raklen.*
1st Dative,	*e rakleste,*	to the boy,	*e raklende.*
2d Dative,	*e rakléske,*	in the boy,	*e raklenghe.*
Instr.	*e rakléso,*	with the boy,	*e raklendja.*
Ablat.	*e rakléstar,*	from a boy,	*e raklendar.*
Voc.	*rakleya,*	O boy!	*raklale!*

Nouns ending in *i* take *a* after it and before the inflection, as *rakli*, "a girl," *rakliákoro, rakliu, rakliáte, rakliáke, rakliása, rakliatar*, and *raklie*. Feminine nouns ending in consonants are declined similarly: *len*, "a river," gen. *leniákoro*. *Eskoro* is commonly used to form adjectives; in England it is used like *engro*; e. g. *wardo*, "a wheel," *wardomescro*, a "wheelwright" or "cooper." These cases are not all *pure* inflections; several are formed with *post-positions* (as occurs in the Ural-Altaic groups and in Dakota). Thus the Rommany instrumental is formed by adding the Sanskrit *saha*, "with" or "together." The ablative sing. term. *ato* (*tar*) is the Sanskrit particle *tas*. "The gypsy noun has properly only four cases." (*Paspati.*) In English Rommany the plural and sing. *ia* has been corrupted into *yor*, sometimes into *yas*, as *lav*, a "word," which should be *lavya*, becomes *lavyor* or *lavyas*. Nouns ending in *o* are generally masculine—those in *i*, feminine. Adjectives are formed in *o* (masc.) or *i* (fem.). *O* is kept in the nom.; it becomes *e* in the other cases, as *kálo manush* (Eng. Rom. *kālo mūsh*) "a black man"; gen. *kalé manusheskoro*, "of a black man"; plural adj. termination for all cases, *e*. Many adjectives applicable to living beings end in *no* or *ni*, more in *lo*; e. g. *bākht*, "luck," *bakhtalo*, "lucky." From many verbal adjectives in Rommany lost verbs have been recovered. Whether these indicate an ancient Rommany language, or some early tongue merged in it, no one can say, but it is very certain that there is no language so very simple, and yet so rich—so capable of expressing thought, and yet so easy to learn. The comparative degree is formed in Turkey by adding *po* ("more"), as *lachó*, "good," *polachó*, "better." Also by *der*, as *baro*, "great," *baroder*, "greater." In England it is formed by *dir* or *diro*; e. g. *bāro*, "great," *bordir* or *borodiro*, "greater." No true superlative exists. Pronouns are formed in the singular like nouns plural; e. g. *me*, "I," *mangoro, man, mánde, mánghe, mándja, mandar*; plural, *amén*, ("we"), *améngoro, amén, améndе, aménghe, améndja, améndar*. *Tu* ("thou") is formed thus: *Tu* (gen. wanting), *tut, túte, túke, túsa, tutar*; plural, *tumen, tumengoro, tumen, tumende, tumenghe, tumendja, tumendar*. In England *tu* and *tute* are generally used for "you" in all cases, as "you" is used in English; *tukey*, "to you," rarely. *Ov* ("he," Eng., and Germ. *yov* or *yuv*) becomes *leskoro, les, leste, leske, lesa, lestar*; fem. *oi, ai* (Eng. *yoi*), *lakoro, la, láte, láke, lása, latar*. *Ol* ("they," Eng. Rom. *yúl*), *lengoro, len, lende, lenghe, lendja, lendar*. All of these inflections are commonly known in England, but are greatly confused and corrupted. *Mo*, "my," simply becomes *me* in all other cases, and *me* in the plural; also *minro* ("mine"), *tinro* ("thine"). *Amaro*, "our," is in Eng. *moro*. *Tumaro*, "your," is unchanged. Hindu *pes* is the reflective pronoun "self," taking in Germany the form *peskro*, also very rarely in England, where the common form is *kokero* (i. e. "alone"). *Lester kokero*, "his self." In Turkey, *po* and *pi*, plural *po*, are the common possessive pronouns; e. g. *po drom*, "his road," evidently from the Hindu. *Aka* and *avaka* ("this" and "that") exist in English Rommany as *akovo, 'covo*, and *kavakoi*; e. g. *'covo*, "that man," (slang, *cove, covey*). The Turkish *odova*, "this" or "that," is in English *odova* or *dovo*, "that." *Verbs.*—All simple verbs are of Indian origin; their conjugation is as follows:

Indicative.		*Imperfect.*	*1st Aorist.*
Me avava,	I come,	*Me avávas,*	*Avádom.*
Tu avesa,	Thou comest,	*Tu avésas,*	*Avádan.*
Ov avella,	He comes,	*Ov avélas,*	*Avádas.*
Amen avasa,	We come,	*Amen avasas,*	*Avádomas.*
Tumen avéna,	Ye come,	*Tumen avenas,*	*Avádonas.*
Ol avena,	They come,	*Ol avenas,*	*Avádas.*

All participles in Turkish Rommany end in *to* or *do, lo, no*. We can trace in Rommany verbs a class formed with an Indian root and the auxiliaries *isam*, "to be," or *uvava*, "to become," the former of which is conjugated:

Me isam,	I am.	*Me isamas,*	I was.
Tu isan,	thou art.	*Tu isanas,*	thou wert.
Ov isi,	he is.	*Ov isas,*	he was.
Amen isám,	we are.	*Amen isámas,*	we were.
Tumen isan,	ye are.	*Tumen isánas,*	ye were.
Ol isi,	they are.	*Ol isas,*	they were.

In Sanskrit *asmi, asi, asti*, plural *sma, stka, santi*. It is remarkable that in England gypsies use commonly several Oriental forms of the verb not known in Germany. Thus the English Rommany verb runs *me shom*, "I am," *tu shan*, "thou art," *yuv se*, "he is," *men shom, tute shan, yul see*. In fact, the verb is nearly the same with the Turkish, while in Germany it is *hom, hal, hi, ham, ham, shi*.

There is as yet wanting a grammar which shall reduce Rommany to its original simple elements. Pott, Ascoli, and Miklosich have collected the material and cleared it, but no one has distinctly set forth in paradigms this curious tongue, which with the simplest elements is capable of as much expression as English. Even in its present popular and corrupt form, English Rommany is only unmusical where the English grammar intrudes, as may be seen in the following verses by Miss Janet Tuckey, who was the first to write *poetry* in this dialect:

I tāni mūllos 'pré ó dóeyav
Shán sār i sāni chūmor fon o báv;
O lūllopen apré i pābor cháu
Li se i tátti chūmor ó the kám;
Te dóvo rinkeni hév pré tíri mūi,
Shán mīri chūmor, o mi kāmeli.

The little bubbles floating on the wave
Are all soft kisses which the west wind gave;
The luscious glow upon the peach's face
Bears blushing witness to the sun's embrace;
And those two dimples, sweet, that come and go,
Tell tales of true-love kisses: is it so?

No writers have as yet sufficiently indicated the influence of Persian dialects on the Rommany. A few words, with their origin, drawn from English gypsy and taken down by the writer in gypsy tents, are as follows: *Sakkū*, "a swan," Persian and Arabic, *sakka*; *purser*, "to ask," P. *pursidan*; *pusht*, "the back" (also *dūmo*), P. *pusht*; *pish*, "before," P. *pish*; *shock*, "a bough," P. *shakht*; *rushni*, "bright," P. *rūshán*; *bunner*, "to build," "shape," etc., the foundation of a house, P. *bunyad*; *sikar*, "a clothes-line," Hind. *sikhar*; *sig-tud*, "milk-weed," H. *sij*; *sim*, also *rupp*, "silver," both the same in Hindu; "*Yeck simmery covva se yeck ruppeny covva*," i. e. "a silver thing *is* a silver thing"; *bero*, "a ship," H. *buhr*; *sīrni*, "sacred," "magical," H. *sīhr*. The transposition of Oriental words through a Slavonic medium may be seen in *sivety*, "people" (as in French *le monde*), which the gypsies are supposed to have picked up in Slavonic, as *sweti*, "the world," but which they probably had originally as *saraswati* in Hindu. All Rommany dialects are extremely corrupt, and even in Turkey it has been almost impossible to determine their grammar, simple as it is. The English gypsy generally uses *tute* for *you* in all cases, and will say *mandy avella* for *me avava* ("I come"), and *yoi wellas* for *yoi avilas*. In Germany the language is spoken with very little admixture of non-Rommany words, and with a great exercise of ingenuity English gypsies often achieve the same feat. To do this one word must do duty for many. Thus *chiv* means to "put," "place," "throw," "lay," and in fact almost any positive *action*; while *hatch* expresses "stand," "rest," "encamp," and *kér* "make," "do," "cook," "cause." Most words for the different kinds of trees, animals, minerals, fish, and insects are wanting in Rommany, showing that they have recently come from a land where nature is different; and in many cases they have applied the name of a similar animal, etc.; e. g. *sakku*, "a swan" (E. R.), is the P. Arabic *sakká*, "a pelican." No language in the world is so easy to acquire as Rommany; most persons can learn it in three months, and when learned it is of incredible assistance in acquiring Hindustani and Persian. In fact, a proficient in Rommany can within a month make himself readily intelligible in Hindustani. In pronunciation Rommany resembles the soft Latin tongues; e. g. *kūshto* or *cōōshto*, "good"; *más* or *mawhs*, "meat"; *tūte* or *tooty*, "thy"; *me kamāva*, "I love." The English Rommany pronounce *sig*, with *i* as *ee*, and the *g* very soft (between the German *ch* and *g*, inclining to the latter strongly accented). It is not impossible that the thousands of Rommanies of every kind reuniting in the U. S. may in time originate an American Rommany dialect, which, of course, would be very much like the English Rommany, though with local shades.

English and Scottish Gypsies.—Their dialect contains Greek, Slavonian, Magyar, and German words. To these Miklosich adds French, but the ten "French" words given by five different writers are not all French, and the rest are either not gypsy or are doubtful. The fact that an immense number of Indian and Persian words not as yet found on the Continent are used by English gypsies goes far

to prove that the English branch are of a separate migration; which seems the more likely from the fact that many of these so-called Greek, etc., words are also of Indian origin. The first gypsies slipped over into Britain very quietly, reaching England by 1514 and Scotland by 1505 (or possibly fifty-six years earlier). In 1522 they were described as an outlandish people calling themselves Egyptians, exercising no craft but palmistry and robbery, etc. In 1549 they were included in a search made through Sussex for all "vagabonds, gypsies, conspirators, prophesiers, players, and such like." From some cause it would appear that gypsies during the reign of Henry VIII. were imported into England. A fine of £40—a large sum for those days—was imposed in consequence on every gypsy entering England; and at one time a great number were reshipped to the Continent. Yet in 1562 there were fully 10,000 of them in England. At this time they taught their language freely to recruits. Acts for their suppression being useless, it was made felony without benefit of clergy for any person above fourteen years of age to keep company with them; and Judge Hale remarks that at one assize a few years before the Restoration thirteen gypsies were executed—i. e. simply for being gypsies. It should be remembered that the outrages and evils committed by them were incredible. The *Rommany* is still the life of the entire vagabond population of the roads in England, it being almost impossible to find a tinker or petty hawker who is not part gypsy. There are but a few hundred full-blooded *tent*-gypsy persons in England, but of *kairengroes*, or house-dwellers, who keep their gypsy blood a secret, and of half-breeds (*churedi* or *posh an posh*), or of those affiliated by blood—all of whom possess the great secret of the Rommany language to a greater or less degree—there are perhaps 20,000. As the tinkers in England are all gypsies, and as they were probably the same in the time of Shakspeare, since he speaks of "their own language," it is thought by some that John Bunyan was of gypsy origin, for his father was a tinker, he himself speaks of being of the most despised *race* in the land, and James Bownian was in 1586 the name borne by "an Egiptian rogue" in Cornwall. The old class of gypsies in England occasionally speak Rommany very purely, and mourn for the dead, as in Germany, by abstaining from some peculiar food for years, or from some pursuit or pleasure. They also refrain from mentioning the name of the dead, and otherwise manifest great respect for them. Gypsydom in England received its first blow at the period of the American Revolution, when great numbers were forced into the fleets and armies serving in North America. Most of these deserted, finding America a congenial home. Another great blow to English gypsyism was the railways, and later the Inclosure Act, which by inclosing all commons and wastelands deprived them of places to camp. In an outskirt of London called the Potteries about 1,000 live in small houses, especially during the winter. The gypsies are by no means so dishonest as is generally supposed, though, like all childish, ignorant, and very poor people, they yield to temptation. When implicitly trusted they are very honorable, and are grateful for kindness. They are all strong of body, are good rough riders, and box well. They are very quarrelsome, continually fighting, and even murdering, among themselves, but very seldom trouble *gorgios*. When one is arrested for crime, his friends make incredible efforts to obtain his release. They burn the clothes of their dead, and sometimes other valuables. Their favorite food is the hedgehog, stewed or roasted. It should be known that gypsies among themselves ridicule fortune-telling as being mere *hockerben* or lying, as the writer has learned from frequent conversations with them on the subject.

In Scotland the gypsies multiplied prodigiously, and married well among the natives, their thieving habits, as Simson (himself a Scotchman) asserts, proving no bar to such connections, "as the Scottish people were accustomed to thieving of all kinds." Severe laws were, however, passed against them in 1541 and subsequent years; and nearly a hundred gypsies, men and women, were hanged or drowned in Scotland between 1577 and 1701 "for being Egyptians." They remained, however, in great numbers; and it was only after the persecution ceased that they rapidly diminished. Until a very recent period the Scottish gypsies were generally robbers and villains of the worst kind, availing themselves of the popular weakness for romance and boldness to outrage law, as they appear, according to Simson, to have always been popular. The border village of Kirk-Yetholm, near Kelso, was once peopled by them, in consequence of a gypsy, by his bravery at the siege of Namur, having obtained a grant authorizing his descendants to dwell there. Very few remain in it, great numbers of the Scotch gypsies having gone to the U. S., where they generally became at once house-dwellers, and are lost to view. At one time English gypsies buried their dead in remote places, but at present they are careful to secure Christian burial. Their ordinary weddings generally consist of nothing but an announcement and a feast, but the better class obtain the aid of a clergyman. They have several Hindu superstitions not known to the English, such as the evil eye and a belief that the blind worm sees for half the year out of his right eye, and half with his left. Like the Hindus, they send cooked food for three days to the family of a deceased person, and call it by nearly the same words (*kair hābben*; Hindu, *karwá khana*). Their children are very beautiful, and the old people are distinguished by a peculiarity which is also observed among their ancestors, the Doms of India. Their hair seldom turns gray, even in advanced age, unless there be "white" blood in their veins. During the summer the gypsies frequent races, where they set up cocoanuts or toys to be thrown at at a halfpenny a throw, while their women beg and tell fortunes. They also frequent fairs, where they sell horses and haunt picnics with their games or music. In the autumn, during a period of three days, hundreds of them may be seen in London crowding one or two favorite shops, and buying baskets, brooms, clothes-lines, etc.; after which they wander all over England selling them. As winter advances the men begin to manufacture clothes-pins and butchers' skewers, by which they earn two shillings a day. Chair-mending with split rattan is in England exclusively followed by quarter-blood gypsies or those more remotely allied to them. This class speak very little Rommany. In England gypsies are industrious; the women, however, earn more than the men. On the whole, they earn twice as much as farm-laborers, and lead much happier lives. They are very fond of tea and beer, and always live well. The men greatly prize a coat or other garment from a gentlemen, particularly from a patron, far above its value. There are nearly 100 English gypsy family-names, most of which are represented in the U. S.

It has been asserted that there are no gypsies in the U. S., but in fact they are found in great numbers. Simson met with French, Hungarian, German, and English gypsies in the U. S., and speaks of a village in Pennsylvania and of one in New England originally established by gypsies, in which Rommany is still secretly spoken. Many peddlers in the U. S. are gypsies, and many of the smaller tin, crockery, and basket stores in New York are kept by half or quarter blood gypsies. The tinware they sell is of a plain, coarse kind, so that a gypsy tin-store is easily known. A very large proportion of the itinerant cutlers and tinkers in cities of the U. S. are German, Hungarian, or French gypsies. Hungarian gypsies are sometimes to be found in negro-minstrel and other bands. There are a number of gypsy musicians in Baltimore. Many of the fortune-telling women in cities are half-blood gypsies. Many tent-gypsies roam from Canada to Texas. They are, like all gypsies, very reticent as to their language. Yet very few among the wanderers possess a large vocabulary or speak Rommany well.

Bibliography.—Of more than 300 works upon the gypsies may be mentioned those in German by Grellmann (1783; Eng. trans. 1787); Pott (2 vols., 1844–45); Liebich (1863); Ascoli (1865); and Miklosich (12 parts, 1872–80); in French by Paspati (on the Turkish gypsies, 1870); and Bataillard, whose numerous writings, published between 1844 and 1890, are mainly historical, and ascribe to the gypsies a prehistoric origin; and in Italian by Colocci (1889)—this last with a full bibliography. In English, besides five well-known works by George Borrow (1840–74), and four by the present writer (1873–91), there are works by Richard Bright (1818); Simson (1865); Smart and Crofton (1875); Groome (1880); and MacRitchie (1886); to which should be added the invaluable *Journal of the Gypsy Lore Society* (3 vols., Edinburgh, 1888–92), whose work was taken up in 1893 by Prof. Hermann's *Ethnologische Mittheilungen* (Budapest).

Revised by F. H. Groome.

Gyp'sum [= Lat. *gyp'sum*, from Gr. *γύψος*, chalk, gypsum]: a mineral, the natural bihydrated calcium sulphate, $CaSO_4 + 2H_2O$, crystallizing in the monoclinic system. The translucent crystalline varieties are known as selenite (from selene, the "moon," in allusion to the characteristic soft luster); the ordinary massive forms and opaque crystals as

gypsum: the finer granular sub-translucent massive kinds, as alabaster, and fibrous varieties, as satin-spar. In hardness gypsum varies from 1·5 to 2·0, and the specific gravity of pure crystals is from 2·314 to 2·328. Heated, this mineral gives off its contained water, and becoming opaque falls to a powder, which has the power, if moistened, of rapidly "setting" or assuming again the solid form. Upon this property depends the most extensive application of this mineral in the arts, as plaster-of-Paris is made from it by heating and subsequently grinding it to a fine powder. It is also used as a fertilizer and in the manufacture of glass and porcelain. Alabaster, being of great beauty and easily carved on account of its softness, is extensively used for ornamental purposes. Extensive deposits of gypsum are worked in England, France, and other countries of Europe, and also in the U. S. and Nova Scotia. The latter occur in the Palæozoic series of rocks, but this mineral occurs most abundantly in the Mesozoic or Secondary formations, especially in association with deposits of rock-salt. Gypsum is also found generally in volcanic regions. In the U. S. gypsum is obtained from a great number of localities, more or less extensive beds having been met with in Virginia, Tennessee, Michigan, etc., and in imitative forms of scrolls, vines, flowers, shrubbery, etc., it constitutes one of the wonders of the Mammoth Cave, Kentucky. Perhaps the most celebrated gypsum-beds in the world are those of Montmartre, near Paris, which have given rise to the name "plaster-of-Paris," and which are rich in the remains of Tertiary mammals.

Gyrenceph'ala [Mod. Lat. *gy'rus*, gyre, convolution (from Gr. *γῦρος*, ring, circle) + Gr. *ἐγκέφαλος*, brain]: those mammals in which the superficies of the cerebrum is folded into gyri or convolutions (as implied by the name), and the cerebrum itself extends over more or less of the cerebellum, and generally over the olfactory lobes; they were considered by Owen as a "sub-class," and in the group were included the quadrumanous Primates, Carnivores, Ungulates, Proboscidians, Toxodonts, Sirenians, and Cetaceans. Man was excluded, through a peculiar interpretation of certain characters, as the sole representative of a corresponding group called *Archencephala*. This sub-class has not received the approbation of original investigators, although it has found considerable currency in popular and semi-popular works. The *Gyrencephala* and *Archencephala* had been combined long previously in a group named (by Bonaparte) Educabilia, for more valid reasons.

Gyrfalcon: See GERFALCON.

Gyro-pigeon: See PIGEON, GYRO.

Gy'roscope [= Fr.; Gr. *γῦρος*, circle + *σκοπεῖν*, to view]: an instrument designed by Bohnenberger, and made famous by Foucault's use of it to show ocularly the rotation of the earth. The Bohnenberger machine (Fig. 1) was first described in the *Tübingen Blätter für Naturwissenschaft*, etc., 1817, and also in Gilbert's *Annalen*, vol. lx., p. 60, and is the prototype of gyroscopic instruments. Designed, probably, to illustrate the precession of the equinoxes, and consisting merely of a spherical or spheroidal body so balanced in gimbals that its axis is free to take any direction, it is well fitted to illustrate —first, the *stability of direction* of the axis of rotation of a solid of revolution possessing high rotary velocity, which may be done by placing the instrument on the revolving disk of a centrifugal machine, when the axis of the rotating sphere will continue nearly invariable in direction; second, *precessional motion*. This is accomplished by attaching the small weight G to the inner ring J near one of the extremities of the axis of the rotating spheroid, which causes a slow horizontal gyration.

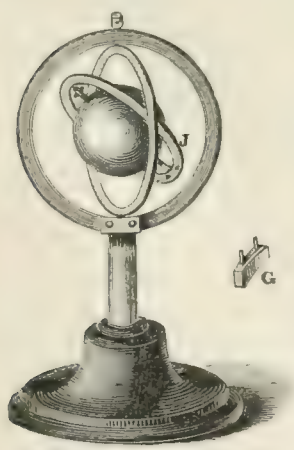


FIG. 1. Bohnenberger machine.

The gyroscope in its common form is shown in Fig. 2. The circular disk A of the instrument having been put in motion with very great velocity, the bearing-point C of the ring in which the disk and axis are mounted is placed on the point of an upright support, B. Not only does the rotating disk (with its ring) *not* fall, as would happen were there no rotation, but, preserving the angular elevation of

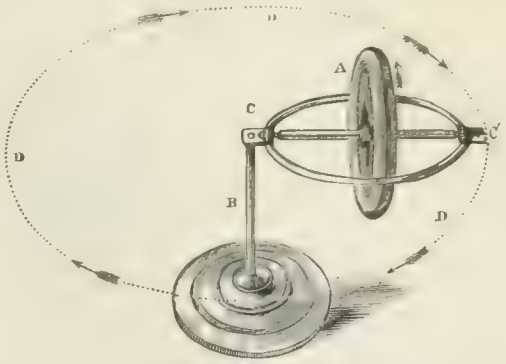


FIG. 2.—Gyroscope.

its axis, it takes up a slow horizontal motion (gyration) in the reverse direction to that in which, by rotating, the upper periphery of the disk is moving—e. g. the disk in the figure revolves as marked by the arrow near its top; its *gyration* is as the arrows along the indicated horizontal circle D. If the direction of disk-rotation be reversed, so will be that of the gyration. It will be found also that the *rate of gyration* is the same for all elevations of the axle, and that the greater the rotating velocity of A the *slower* will be the gyration—that as rotatory velocity is lost, the *gyratory* velocity increases simultaneously, with a gradual drooping of the outer extremity of the axis, which, with continually accelerated gyratory velocity, falls in a descending spiral (or helix). When the wheel, rotating with great velocity, is placed on the point of support with axis considerably elevated, the axis, instead of falling (as it gyrates), will *rise*.

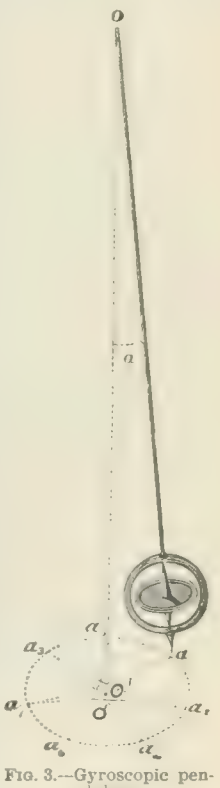


FIG. 3.—Gyroscopic pendulum.

The GYROSCOPIC PENDULUM (Fig. 3) consists of a freely suspended rotating gyroscope. If the pendulum starts from a position of rest at *a*, and O O' is a vertical dropped from the point of suspension, the foot of the pendulum will not swing through O', but, passing near it, be deviated in a curve, *a* a_1, convex toward O', till it attains a departure at *a* equal to the initial angle *a*, where, coming to rest, it begins (making a *cusp* at a_1) another swing at a_2; and so on. If propelled from a state of rest *in* O', the curves of vibration will all pass *through* the center O', and the extremities a_1, a_2, a_3, etc., will be loops instead of cusps. The special analysis of the motion is identically the same as that of the "freely suspended pendulum," which reveals by the progressive azimuthal displacement of its plane of vibration the rotation of the earth, though in the case in hand this azimuthal motion is far more rapid. See *Smithsonian Contributions*, vol. xix., *Problems of Rotary Motion*.

The TOP (which is called by Sir John Herschel in his *Treatise on Astronomy* a "philosophical instrument") is but a gyroscope of which a point of its rotary axis rests not on a fixed point, but on a horizontal plane. The theory is analogous. As in the gyroscope, a *deflecting force* is generated by any angular motion of the axis of the rotating top; and it is this force which supports it. Did the axles of the top terminate in a mathematical point, and were the horizontal surface on which it spins a true plane, and *perfectly* hard and smooth, the center of gravity of the top would be ever in the same vertical line, and its point would *gyrate*, describ-

ing on the surface an epicycloid. It will be found that the more perfectly pointed the top is, and the harder and smoother the surface, the less will be the tendency to *rise*. This rising is due to the (more or less) *rounded* point rolling on the surface, and thus increasing the angular motion of the axle, by which the upward *deflecting force* is made greater than the downward force of gravity, and the top gradually rises to a motionless spinning in a vertical position.

Another form of the gyroscope (Fig. 4) is the apparatus introduced by Fessel (*Pogg. Ann.*, vol. xc., pp. 175 and 351).

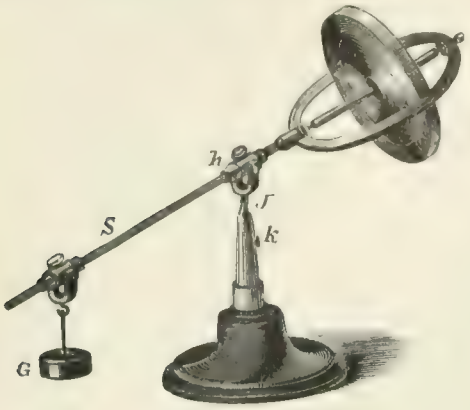


Fig. 4.

The prolonged stem S and the movable counterweight G serve only to vary the experiments. If the counterweight is placed so near the fulcrum that the weight of the disk and ring preponderates, gyration will ensue, as in the case of Fig. 2, but slower, since the weight of the latter is partly counterbalanced. If the weight is so far removed as to preponderate, gyration in the reverse direction will ensue, since, through the preponderating counterweight, gravity tends to *lift* (instead of to pull down) the rotating disk. If the weight be placed so as exactly to balance the disk and ring, no gyration will be observed. The weight and a portion of the prolonged stem S can be removed, and then we have *essentially* the gyroscope of Fig. 2; with this difference, however, that instead of a mere pointed end to the standard B, there is introduced the fork J (Fig. 4), the vertical stem of which turns freely in the standard, while the prongs hold the trunnions of the band or socket *h* through which the stem S is introduced and clamped. By this arrangement free angular motion is permitted, while at the same time the disk and ring are always firmly connected with the standard, and can not fly off, as they often do from the common gyroscope. The machine illustrates another property, which has been announced as a discovery of experiment, but which theoretical investigation without experiment affirmed—viz., that by simply *preventing gyration* (by means of the clamp-screw *k* which fixes the axle J) the disk and ring *fall* "as if no rotary motion existed."

Foucault's modification of the gyroscope is shown in Fig. 5.

"The tall figure shows the gyroscope in supposed action, the frame *e e* being suspended at the top by a simple thread passing through the upright cylinder, and resting at its bottom on a very fine point placed in an agate cup. Within the frame *e* the detached frame *c c* may be laid at any time so that the knife-edges *d d* rest on hard plates; the rotation-disk *a a* may be put into rapid rotation by a separate machine, and placed in that state of rapid motion within *e e*, where, by the suspension, and by the knife-edge bearings, it will have perfect freedom of motion.

"Suppose, now, that a graduated slip on the edge of the apparatus is examined through the telescope *m*; it is clear that if the earth be at rest, the same graduated line will continue under the spectator's eye at the telescope. But if the earth is rotating, and carrying the gyroscope along with it, the revolving ring can not remain in its original relation

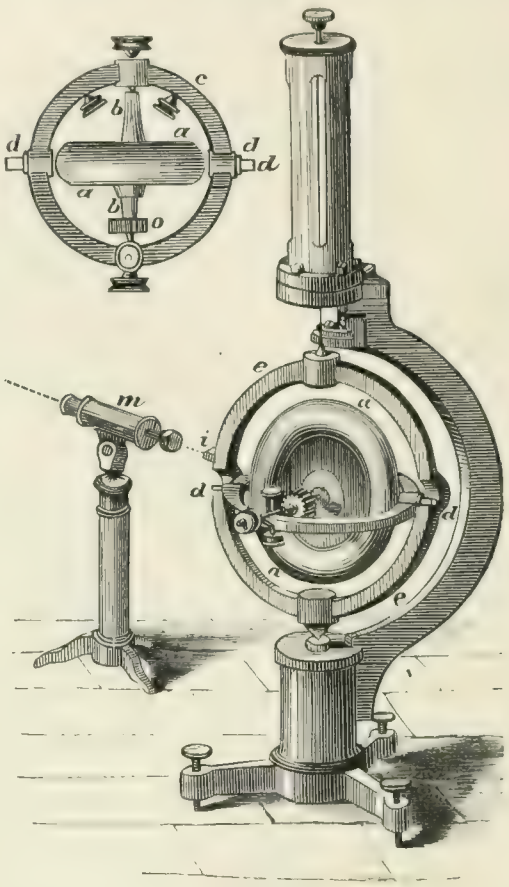


Fig. 5.

to the telescope, just because its displacement by the earth would, if it did so, *change the direction of the plane in space in which the ring revolves.* The graduated slip will therefore move in the telescope, and the observer will discern the different lines of graduation passing regularly under his eye, exactly as a star moves across the field of view of a transit instrument."

The same ingenious inventor had previously applied the pendulum to the same effect—i. e. the ocular exhibition of the earth's rotation.

H

: the eighth letter of the English alphabet.

Form.—Its form is derived through the Latin H from the Chalcidian Greek H or B, the latter being the primitive Phœnician form.

Name.—The Phœnician name *Cheth* (fence) was adopted as *hēta* (ἦτα) by the Greeks, and the letter used to denote *h*, but among the Asiatic Ionians the name was *ēta* (ἦτα), and the letter denoted the initial sound of its name, viz., *ē*. With the predominance of the Ionic alphabet in Greece this name and value became standard. The English name "aitch" (pron. *ētš*) strangely enough does not contain the sound denoted by the letter. It comes through the old French *ache*, cognate with Italian *acca*. These coupled with Portug. *agá* point to a Vulgar Latin *ac'ca* or *aca'*, which probably combines the old Lat. name of *h* (*ha*) with that of the rare letter *k* (*ka*), which followed it in the list of the mutes as recited in the schools (i. e. *b*, *c*, *d*, *g*, *h*, *k*, *p*, *q*, *t*), hence (*h*)*aka*. Cf. E. S. Sheldon, *Studies and Notes in Philol. and Liter.* (i., 83 ff.).

Sound.—When standing alone in English it indicates the whispered beginning or close of a voiced sound. Thus *ha* differs from *a* in that the vowel opens as an impulsive whispered form of *a*, the organs of the mouth being somewhat slacker than in the position for the voiced vowel, while in *a* the vowel opens as voiced. Comparison of the *h* in *ha* with that, e. g., in *hoo* (*hu*) will show that the position of the organs is determined by the following vowels, or, strictly speaking, by the voiced portion of the vowel. When accompanying *w* in *wh* it is a sign for a whispered beginning of *w*, or in some pronunciations of an entirely whispered (often called voiceless) *w*; similarly in Greek ῥ and in the *hy* of Eng. *hue*, etc.

Sources.—The commonest sources of English *h* are: (1) Teutonic *h* < Indo-Eur. *k*, as in *horn* : Lat. *cornu*; *heart* : καρδία : Lat. *cor*; *hundred* : Lat. *centum*; *h* < Indo-Eur. *kh*, as in *have* : Lat. *habe're* (*khabh-*). (2) Teutonic *hw* (ʍ) < Indo-Eur. *q*, as in *what* : Lat. *quod*. (3) The digraph *gh* represents generally a spirant which was preserved in English down to the beginning of the seventeenth century; *ght* < Indo-Eur. *kt*, e. g. *eight* : Lat. *octo*; *night* : Lat. *noct-em*; *light* : Germ. *licht*; *brought* : Germ. *brachte*; *might* : Germ. *macht*, etc.; *-gh* < O. E., *-h* < Teuton. *k*, χ < Indo-Eur. *k*, *gh*, e. g. *bough* < O. E. *bōh* < Indo-Eur. *bhāghu'-*, cf. Gr. πῆχυς; *dough* < O. E. *dāh* : Gr. τοῖχος; *high* < O. E. *hēah* : Germ. *hoch*; *nigh* < O. E. *nēah* : Germ. *nach*. Under the influence of a preceding guttural vowel the *gh* has been labialized and preserved as *f*; as in *rough*, *tough*, *trough*, *enough*, *slough*. (4) French *h* representing Latin *h* is often silent, as in *heir* (Lat. *heres*), *honest* (*honestus*), *honor*, *humble*, but cf. *habit* (M. Eng. *abit*), *humor* and (*h*)*umor*, *hotel* and *ostler*, etc. In *ch*, *sh*, *th*, *ph*, the letter does not stand for an independent sound, but serves merely to indicate a spirant pronunciation, while in initial *gh* it indicates that *g* is an explosive; e. g. *gherkin*, *ghost*, *ghastly*.

Symbolism.—H stands in chemistry for hydrogen. In Latin H = hic, H. S. = *hic situs est*, H. H. = *heredes*, H. E. T. = *heres ex testamento*. In Gr. η = 8, ῃ = 8,000.

Benj. Ide Wheeler.

H (pronounced haa): the German name for B natural, B flat being called B.

Haar, Bernard, ter: poet; b. in Amsterdam, Holland, June 13, 1806; d. at Velp, near Utrecht, Nov. 19, 1880. Through a long life he maintained side by side the interests of a poet and of a preacher and scholar. He obtained his doctor's degree in theology in Leyden in 1829, and the next year became pastor at Eemnes-Binnen, passing thence to Vlaardingen (1833), to Arnhem (1835), to Leyden (1839), to Amsterdam (1843). In 1854 he was appointed Professor of Ecclesiastical History in Utrecht, and fulfilled the duties of his office until 1874, when he retired. The remainder of his life was spent quietly in his villa at Velp. The strongest poetical influence upon ter Haar in his youth seems to have been that of Lamartine, and he became himself perhaps the best representative of romantic sentimentalism in Holland. The same feeling pervaded his religious studies, as is shown by his strong aversion from Strauss, Renan, and the whole body of their followers. His poetical work is accordingly vivid, highly colored, and noble in manner, but seriously defective in inwardness and imaginative comprehension of life. The dates of his most notable poems are: *Johannes en Theagenes* (1838); *Huibert en Klaartje* (1844); *De Sint-Paulus-Rots* (1846); *Gedichten* (ed. in fol., Arnhem, 1871); *Gedichten* (3 vols., The Hague, 1878); *Laatste Gedichten* (The Hague, 1879). Of works in prose, the following may be mentioned: *Welken invloed heeft het Christendom gehad op de Poëzy ?* (2 vols., 1843); *De Kerkhervorming in tafereelen geschetst* (5th ed., The Hague, 1854); *Hollands bloei in Schoone Kunsten en Wetenschappen, enz.* (Leyden, 1848); *De historiographie der kerkgeschiedenis geschetst* (2 vols., Utrecht, 1870–73). A. R. Marsh.

Haar'lem: city of the Netherlands; in the province of North Holland, on the Spaarne; 10 miles W. of Amsterdam (see map of Holland and Belgium, ref. 5–E). It is a well-built and extremely neat city, with several interesting buildings, as, for instance, St. Bavon's Kerk, with its world-famous organ. It has many collections of consequence to science and art, good educational institutions, and considerable manufactures of velvet, silk, linen, carpets, and lace. It is the center of the trade in flowers, especially hyacinths, bulbs, and flower-seeds, which is a specialty of Dutch enterprise, and which here has assumed astonishing dimensions. Close by is the beautiful Haarlem Forest, with the royal palace, Welgeleque, which is a much frequented summer resort for people from Haarlem and Amsterdam. It has a Roman Catholic church and a Jansenist bishop. The city has played an important part in the history of the Netherlands, and particularly during the revolt against Spain, when its inhabitants sustained a seven months' siege (1572–73) against the Spanish commanded by Don Frederick, Alva's son. After a heroic defense it was forced to capitulate, and the conquerors, despite their promise of mercy, took a barbarous vengeance upon the inhabitants. It was not till 1577 that it was regained by the Dutch under the Prince of Orange. Pop. (1891) 53,692.

Haarlem Lake: a body of water which was contiguous to the city of Haarlem in Holland. A map of the date of 1531 shows within the area afterward covered by it, which was traversed by two highways, four small lakes and three flourishing villages; the combined area of the lakes was about 15,000 acres. In 1591 one of these villages had disappeared, and so in 1647 had the other two, and the four lakes had united into one. In the early part of the nineteenth century it had acquired an area of 45,000 acres. With such an area, and a perimeter of more than 30 miles, every tempest caused new encroachments, and the danger to some of the adjacent regions became very great. Long before, projects of drainage had been proposed and discussed. The need grew more and more urgent, and in 1839 the Dutch Government inaugurated the great work. The entire lake was surrounded by a dike and an encircling canal, 37 miles in length, whose construction occupied nine years. Pumping began in May, 1848, three enormous engines having been especially built for the work, and in July, 1852, the lake was dry. The total cost of the drainage was $3,940,000, and $3,500,000 was received from the sale of land, so that the net cost of the work was less than $10 per acre for the land reclaimed.

Revised by Mansfield Merriman.

Haase, haa'ze, Heinrich Gottlob Friedrich: classical scholar; b. in Magdeburg, Germany, Jan. 4, 1808; studied in Halle, Greifswald, and Berlin. After extensive researches in the libraries of Paris, Heidelberg, Strassburg, Bern, Vienna, made with a view to an elaborate edition of the Greek and Roman military writers, he was appointed professor at Breslau in 1840, where he remained till his death, Aug. 16, 1867. The most important of his numerous works are editions of Xenophon, *de republ. Lacedæm* (1833); *Thucydides* (1840); Vell. Paterculus, *Seneca* (3 vols., 1852), still

the best edition: *Tacitus*, with excellent prolegomena (2 vols., 1855). The most valuable of many contributions to *Ersch and Gruber's Encyclopädie* is his article on philology (sec. iii., vol. xxiii., pp. 374–422). He is also the author of the *Vorlesungen über lateinische Sprachwissenschaft*, edited after his death by F. A. Eckstein and H. Peter, a work which gave a decided impetus to research in this field of study. See Bursian, *Geschichte der classischen Philologie in Deutschland* pp. 805–812). ALFRED GUDEMAN.

Habak'kuk [Heb., loving embrace or embracer]: the eighth of the twelve minor prophets of the Old Testament. Apparently (iii. 19) he was a Levite, and he is thought to have prophesied during the reign of Josiah (638–608 B. C.). Delitzsch supposes about the year 630 or 629 B. C. As Nahum denounces the Assyrians, who had already crushed the kingdom of Israel, so Habakkuk denounces the Chaldeans, who are about to crush the kingdom of Judah. The third chapter, which has been called a Pindaric ode, is one of the sublimest compositions ever penned. *The History of Bel and the Dragon*, an apocryphal addition to the book of Daniel, is, in the Septuagint, ascribed to "Habakkuk, the son of Joshua, of the tribe of Levi," thought by some to be identical with the prophet.

Revised by WILLIS J. BEECHER.

Habana (in Cuba): See HAVANA.

Habberton, JOHN: author; b. in Brooklyn, N. Y., Feb. 24, 1842; learned type-setting in the establishment of Harper & Brothers, New York; enlisted as a private in the Union army 1862; returned to the Harper establishment in 1865; began business on his own account in 1872, but failed; became literary editor of *The Christian Union* in 1874 and editorial writer on *The New York Herald* in 1877, and published many novels, of which *Helen's Babies* is the best known.

Ha'beas Cor'pus [Lat., you may have the body]: in law, a writ issuing out of a court of justice, or awarded by a judge in vacation, with the view of bringing a person before the court or judge to be dealt with according to law. There are several writs passing by this name with words added, more specifically to denote their application, such as: (1) *Habeas corpus ad faciendum et recipiendum*; (2) *ad prosequendum*; (3) *ad respondendum*; (4) *ad satisfaciendum*; (5) *ad subjiciendum*; (6) *ad testificandum*. The office of the first of these is to remove, on the application of a defendant, a cause from an inferior to a superior court; of the second, to remove a prisoner to be tried within the jurisdiction where an alleged act was committed; of the third, on the part of a suitor, to remove a cause of action to a higher court; of the fourth, after judgment, to charge a person in a superior court, with process of execution; of the fifth, to bring up a person detained by another, with a view of inquiring into the cause of detention; and of the sixth, to bring a witness who is in custody at the time of a trial into court. Of these the last two are much the most important. The fifth, as above enumerated, is the great writ of *habeas corpus*, of so much importance to the liberty of the individual both in Great Britain and in the U. S.

The writ of *habeas corpus* is called in the English law a "writ of right." By this is meant that the party in confinement, on making a proper case, is entitled to it. It is, accordingly, only issued on a proper foundation of proof. It is necessary that there should be an affidavit and motion for an allowance of the writ. When these steps are taken, the right of the prisoner is fixed. The writ is said by some jurists to be based on the well-known clause in Magna Charta that "no freeman is to be deprived of his life, liberty, and property except by the judgment of his peers and the law of the land." The subject will be treated under the following principal divisions: I. History of the writ and of the statutes affecting it; II. Its general effect; III. Procedure; IV. Relation of the States to the U. S. courts; V. Power of U. S. courts to issue the writ.

I. At the common law the writ issued from the court of king's (or queen's) bench, not only while the court was in session (or in "term-time"), but also in the vacation, by an order from one of the justices. In the latter case it was made returnable either before the judge who issued it or before the full court. The other great common-law courts (viz., the common pleas and exchequer) did not originally have general power to issue the writ, but only in special cases. It was supposed at one time that the lord chancellor had no power to grant the writ in vacation, though the law is now settled to the contrary. A serious controversy arose in England in the reign of Charles I. upon the point whether a return to a writ of *habeas corpus* by the warden of the Fleet Prison was legally sufficient, which set forth that the prisoners were detained by a warrant from the privy council, setting forth no particular cause of imprisonment, but that they were committed by the special command of the king. The counsel for the prisoners insisted that the council was bound as much as any petty magistrate to assign a sufficient cause for commitment. The decision of the judges was in favor of the legality of the warrant. The effect of this decision was that every statute from the time of Magna Charta designed to protect personal liberty was practically nullified, since it was only necessary, in order to avoid their effect, to insert in the warrant the words "by the special mandate of the king." This servile action of the bench so aroused the nation that an act affecting the subject was passed in the same reign, the famous petition of right, 16 Charles I., ch. 10, sec. 8. This statute, among other things, provided that where a person was committed by the king or his privy council, he should have a writ of *habeas corpus* upon demand or motion made to the *court* of king's bench or common pleas. A close construction was put upon this statute by the judges, who declined to award the writ (*ad subjiciendum*) in vacation. At a later day, for the purpose of furnishing a more complete remedy, the famous *habeas corpus* act was passed (31 Charles II., c. 2). This act is frequently termed "Lord Shaftesbury's act," its enactment having been due largely to the exertions of that distinguished statesman. It is said to have been carried through the House of Lords by a mere artifice. Bishop Burnet gives the following account of it in his *History of his Own Time*: "Lords Gray and Norreys were named to be the tellers. Lord Norreys, being a man subject to vapors, was not at all times attentive to what he was doing, so, a very fat lord coming in, Lord Gray counted him for ten, as a jest at first; but seeing Lord Norreys had not observed it, he went on with this misreckoning of ten, so it was reported to the house, and declared that they who were for the bill were the majority, though it indeed went on the other side." (Vol. ii., p. 256, Oxford ed., 1833.) This story is corroborated by a note by Speaker Onslow and adopted by Lord Mahon in his *History of England* (ed. 1858; Murray, London, vol. iv., p. 125. See also Cooke's *Life of Shaftesbury*, 220, ed. 1836). The last-named work adds that when the numbers were reported from the wool-sack, the ministry, who knew their strength, were surprised; and while they were whispering to one another, Lord Shaftesbury, who found there was a mistake and guessed their intentions, immediately started up and spoke upon the first thing that occurred to him almost an hour. While he was speaking several lords went out and others came in, so that it was impracticable to retell the house, and by this means the bill was carried. This great act was an important contribution to English constitutional law, as it tended to render more effectual rights whose existence had long been recognized, but which had hitherto been imperfectly vindicated. This statute has had much influence upon legislation in the U. S. It is applicable to persons committed and charged with *crime*, and therefore does not embrace all the cases in which there may be an unlawful detention. The act provides that, with certain exceptions, when any person is charged with crime, a judge, in vacation, on viewing a copy of the warrant, shall award the writ, returnable either before himself or any other of the judges, and if the case is bailable shall discharge the prisoner on proper security being given. The prisoner is required to be brought up within a limited time, not exceeding twenty days. Heavy fines are imposed upon the judge for refusing to award the writ upon a proper case being made, as well as upon the officer or keeper of the prisoner neglecting to make return or evading the mandate of the judge; similar provisions are made for punishment of one causing, after discharge, a recommitment of the prisoner for the same offense. The writ was made to run into all counties palatine and privileged places. There are also clauses providing for the prisoner's discharge unless he is speedily indicted and tried after indictment. There is also a heavy penalty imposed upon any one sending a person as a prisoner out of England, unless in cases of transportation for crime, etc. The *habeas corpus* act of Charles II. was seriously defective in one respect: it only applied to persons arrested on *criminal* charge. In the year 1757 an instance occurred of a gentleman being by some mistake pressed as a foot-soldier, whereupon his friends, on applying for the writ, found that the case did not come within the

act. This led to the introduction of a bill into Parliament extending the act to other cases of confinement besides those resulting from a charge of crime. Though the bill passed the House of Commons, it was defeated in the House of Lords under the lead of the great Lord Hardwicke, and it was not until the year 1816 (56 Geo. III., c. 108) that this obvious defect in the law was supplied and the writ in other respects made more effective.

Legislation in general in the U. S., while following the spirit of the British act, is not confined to commitments on criminal charges, but is more comprehensive in its character, and extends beneficial provisions to all arrests and detentions on any grounds or pretexts whatsoever. There is a clause in the U. S. Constitution and in State constitutions to the effect that "the privilege of the writ of *habeas corpus* shall not be suspended unless when, in cases of rebellion or invasion, the public safety may require it." The effect of this clause was much discussed in the civil war, the President of the U. S. having on Apr. 27, 1861, addressed to Lieut.-Gen. Scott an order authorizing him, under certain contingencies, to suspend the writ. Other orders of a similar nature were issued. One Merryman having been arrested on May 25, 1867, charged with various acts of treason, the general having him in charge refused to comply with the writ, as well as to yield to an attachment issued for its enforcement, on the ground of its suspension by the President. Chief Justice Taney, who had issued the writ, filed an opinion denying the President's authority, and insisting that the power of suspension was vested solely in Congress. (9 Am. Law Register, N. S., 527.) This view is supported by the opinion of Deady in the case of *McCall* v. *McDowell*, 1 Abb. U. S. 112, and of Smalley in *Ex parte Field*, 5 Blatchford 63. These views of the judges referred to have been distinctly controverted by able jurists in pamphlets and professional opinions. Congress passed an act upon this subject, Mar. 3, 1863, authorizing the President to suspend the writ. (12 U. S. Statutes at Large, 282. See also ch. 22, Laws of 1871, sec. 4; 17 U. S. Stat. 15.) A proclamation by the President, issued Oct. 17, 1871, under the last-named act, will be found in 17 U. S. Stat. Appendix No. 4, and another in Appendix No. 7, issued Nov. 10, 1871. The current of judicial and professional opinion appears to be in favor of the view that the power of suspension under this constitutional provision is vested in Congress rather than in the President.

II. The general scope and office of the writ is to bring before a court or judge the question whether the person in whose behalf it is issued is lawfully detained. The cases coming before the court, etc., will be divisible into two principal classes, one where the person is simply detained without any legal process, and the other where he is in custody under such process. The first class of cases is illustrated by that of a contest between a father and a mother as to the custody of a child. There being no legal process in such a case, there must be an inquiry embracing the merits of the whole controversy for the sake of determining to whom the custody of the child shall be awarded. Wholly different considerations occur when the detention is upon legal process. The point then may be whether the legal proceedings were not wholly void because the court instituting them had no jurisdiction, or whether, assuming that the tribunal had jurisdiction, it was proceeding irregularly, or if all the proceedings were regular whether the merits of the controversy can be considered. There will thus be three principal points to be examined: (1) The right upon a writ of *habeas corpus* to relieve from detention where the process is issued by a court or magistrate having no jurisdiction; (2) where jurisdiction exists, but the proceedings are irregular; and (3) cases where there is an entire regularity of proceeding and the claim is made that the merits of the case shall be considered.

(1) Where the court or magistrate has no jurisdiction over the subject-matter or the person, the prisoner may be relieved by this writ even though there may have been a final judgment, and though the court may have been one of high jurisdiction. So if it had no power to dispose of the particular question in the mode that it pursued, its judgment is a mere nullity. In the eye of reason there has been no decision and no judgment, no matter though legal forms may have been pursued. Thus if a court had only power to sentence to imprisonment, and it rendered judgment of death, a writ of *habeas corpus* might be resorted to. It may be said that this is a dangerous document. While this is readily conceded, its soundness can not be denied. Judicial as well as administrative power has its limits. If these are exceeded by a court, its pretended decision is no judgment; it is but waste paper, and may be disregarded. Great caution should be observed in reaching a conclusion that the judgment is a nullity. If, however, it be clear that jurisdiction is exceeded, there is no more reason why a prisoner held under such a void judgment should be detained than that property seized under a similar void proceeding should be sacrificed. The writ of *habeas corpus* is a legitimate mode of showing the nullity of the judgment and of relieving from the false imprisonment.

(2) In the second class of cases (where the court has jurisdiction over the subject in the way that it is presented for its action, but it is proceeding in an irregular manner), it will not necessarily follow that a prisoner will be discharged by the writ. If the proceedings be of a summary nature, and it appears upon the face of them that some essential step or form has been omitted, they will be void and the prisoner will be discharged. Thus if a fugitive from justice were demanded by way of extradition, the regularity of the proceedings might be tested by means of a writ of *habeas corpus*. It has, however, been maintained by some jurists that if the warrant or other process is sufficient to protect the officer who executes it from an action of false imprisonment a discharge will not be made. In many cases where a court has jurisdiction over the subject-matter and of the person, the only mode of taking advantage of an irregularity in the proceedings is by a motion addressed to the court itself in the very proceeding complained of. In other words, the writ of *habeas corpus*, an independent method of review, is not to be resorted to, but the mode of correcting the irregularity is to be found in addressing the very tribunal before which it takes place, and asking it so to mold and correct its own procedure as to make it conform to the rules of law; and if such correction is refused, resort may perhaps be had to an appellate court.

(3) Where the case is regularly before a court, the writ under consideration can not be used to determine the merits of the controversy. This point will only be considered in detail in connection with the administration of criminal law. When a prisoner is charged with crime the common practice is to bring him before a magistrate, e. g. a justice of the peace, and to make an inquiry into the circumstances which are supposed to establish his guilt. This is not a trial, but a preliminary proceeding devised for the purpose of securing his attendance at the trial. The testimony of witnesses is taken down in writing by the magistrate; on this he proceeds in making his commitment. The writ of *habeas corpus* may be resorted to with the view of testing its validity, and the court may, in connection with a *certiorari*, consider whether the testimony, as shown in the depositions, supplied a sufficient basis for the action of the magistrate, as well as whether the commitment itself is sufficient in point of legal form. No inquiry can be had even at this stage as to the guilt or innocence of the prisoner. To do that would be to examine the case on its merits. Let it now be assumed that an indictment has been found. The writ of *habeas corpus* can not be used to inquire into the depositions before the committing magistrate. These are shut out of view by the indictment; the prisoner is now held upon that. The only question that can be examined is whether the indictment itself is sufficient in point of form. If that be regular, the court or judge will not go beyond the indictment to inquire into the merits; if it would, trial by jury might be practically abolished. The writ of *habeas corpus* accomplishes its beneficent purposes by securing the prisoner so far that he is not to be held without *apparent* cause. Whether he is in fact guilty or innocent can only be determined by a regular course of trial. The prisoner may be allowed, in certain cases, to go at large on bail, notwithstanding that the proceedings are valid. The statute of the respective States must be consulted upon this point.

III. *Procedure.*—Application for the writ must be made by petition signed by the party or some one in his behalf. In the well-known case of *Ashby* v. *White*, in Parliament, it was resolved "that every Englishman who is imprisoned by any authority whatsoever has an undoubted right, by his agents or *friends*, to apply for and obtain a writ of *habeas corpus* in order to procure his liberty by due course of law." A father claiming the custody of an infant child may himself apply for the writ. Statutory provisions in some of the U. S. lead to the view that if the petition is properly drawn the writ must be granted, even though there is good reason to believe that it would be without practical effect; in other

words, it must be granted where there is but slight apparent ground for asking for it. The form of petition is also in some States prescribed by statute. It may be directed to any one who has the prisoner in custody or who has participated in the illegal detention. The writ is made returnable at a specified time and place, either before the officer who issues it, at chambers (see CHAMBERS), or to the court as such. The person to whom the writ is directed is expected at the appointed time to make a "return," or a statement of the grounds on which the detention is made. This must be distinct and unequivocal. It would not be enough, for example, to state that the prisoner is not in the defendant's *custody*, but it must be made to appear that he is not under his control, so that he could respond to the requirements of the writ. If the return be evasive or otherwise imperfect, an amendment of it may be allowed. Formerly, the prisoner could make no denial of the truth of the matters alleged in the return. If that furnished a sufficient excuse for the imprisonment, though it were wholly unfounded in point of fact, the prisoner must be remanded. The only remedy of the prisoner was to bring an action for damages for any injury sustained by him for the false return. In some cases criminal proceedings might be instituted. This serious defect in the administration of justice has been remedied by modern statutes, and the prisoner has been allowed to deny the statements of his custodian, or, in legal phrase, to "traverse the return," and also to set up any facts arising subsequently which may make in his favor. The judge or court disposing of the writ may thus have to consider both questions of fact and of law, the matters of fact being presented by way of affidavit or affirmation. If the return is not made or is evasive, the party to whom it is addressed may be regarded as having committed a contempt of court, and will be liable to be placed in close custody until he obeys the writ. On the hearing of the case the prisoner, if the circumstances require it, may be discharged, or may be remanded to the original custody. The decision does not, as it would seem, necessarily prevent the hearing of the matter again upon a new writ, particularly where the circumstances of the case have changed. Thus if the custody of a child were awarded to one of its parents at a given time, the facts might be so changed as to make it proper that, on a new application, it should be awarded to the other. Severe penalties are imposed by law upon a ministerial officer who knowingly recommits a prisoner for the same cause as that on account of which he was discharged. There is another writ existing at common law in favor of personal liberty, *de homine replegiando* (replevying a man). This raises a question to be tried by a jury; while the proceedings in a *habeas corpus* take place before a judge or court. The former writ has become practically obsolete.

IV. Conflicts of jurisdiction have arisen frequently in executing writs of *habeas corpus* between the State and the Federal courts. The principles that should apply to the subject as expounded by the final interpreter of the U. S. Constitution, the Supreme Court, may be found in *Tarble's Case*, 13 Wallace Reports, 397. It is there said that no State judge has a right to issue a writ of *habeas corpus* for the discharge of a person held under the authority of the Federal Government. If it do not appear, upon application for such a writ, that the person is so held, the State judge may inquire into the circumstances of the case as to how the prisoner is held, and the marshal in whose custody the party is should give the requisite information. These principles were applied to a case in which the commissioner of a State court issued a warrant to a recruiting officer of the U. S. to discharge a minor who had enlisted in the service of the U. S. It was decided that the commissioner had no jurisdiction, the prisoner being detained under the authority of the Federal Government. The proper course in such a case is that the U. S. officer upon whom the writ is served shall produce the body of the prisoner before the State court, and set forth in what manner he holds him under the authority of the U. S. The State court or judge should go no further. By this decision the relations of the two governments as to this writ must be regarded as authoritatively settled.

V. The power of the U. S. courts to issue the writ is more limited than that of the State courts, being confined to the exercise of such authority as is either expressly or by implication conferred by the U. S. Constitution and the laws made under its provisions. The courts and judges of the U. S. are authorized to issue the writ in cases coming within Federal jurisdiction. The *circuit* court may inquire into the cause of a commitment, and except when the privilege of the writ is suspended may determine the question whether the prisoner is entitled to be discharged. Thus this court may by this means, where the circumstances of the case require it, discharge a prisoner held under a warrant of extradition issued by the Governor of a State. The writ, however, can not be issued to bring up any person *confined in jail* unless held under or by color of the authority of the U. S., or unless such person is required to testify in a cause depending in a court of the U. S. Neither a court of the U. S., nor any judge thereof, under these rules can issue the writ to bring up a prisoner in custody under a sentence or execution of a State court for any other purpose than to be used as a witness. When a prisoner is taken by an order of a U. S. court from a State court to be used as a witness, its authority continues so as to send him back, after his testimony is taken, to the place from which he was brought. In cases coming within the purview of the U. S. Constitution and the laws of Congress, it has been said that relief may be granted not only to those held under legal process, but also to such as are confined without any formal appearance of authority; as, for example, where the prisoner and the defendant are citizens of different States, or where a master, before the abolition of slavery, demanded the return of slaves taken from him by force. The *Supreme* Court of the U. S. has not the same power to issue the writ in question as the circuit court. It can only exercise the power in an appellate form, as its original jurisdiction is limited to specific cases. It may accordingly issue the writ, where the circumstances of the case require it, when a person is imprisoned under the order or warrant of a court of the U. S. It does not by this means review decisions made at chambers (see CHAMBERS) by a justice of the court.

Further information upon the general subject of the writ will be found in Hurd's treatise on *Habeas Corpus*, and in an elaborate note written by the late Nicholas Hill, of Albany, and published in vol. iii. of his *Reports*, pp. 647–676; also in Blackstone's Kent's *Commentaries*, Story, Rawle, Paschal, and Pomeroy on the *United States Constitution*, and in the digests and decisions of the Federal and State courts. See also Hallam's *Constitutional History* for historical information.

The writ *ad testificandum* is resorted to for the purpose of bringing up a person who is in custody to testify in some cause or other matter pending judicially. When his testimony is given in he is returned to the custody from which he is taken. The writ is obtained upon motion based upon an affidavit setting forth the facts upon which the application is founded. A legislative body, e. g. the House of Representatives, desiring the attendance of a witness at the time in custody, simply executes its will by the warrant of its Speaker, giving authority to its sergeant-at-arms to produce the prisoner. The writ of *habeas corpus ad testificandum* can not in such a case be resorted to.

Revised by HENRY WADE ROGERS.

Haber'geon [M. Eng. *haubergeoun*, from O. Fr. *haubergeon*, dimin. of *hauberc*, from O. H. Germ. *halsberg*; *hals*, neck + *bergan*, protect]: in the Middle Ages, a coat of chain-mail, a HAUBERK (*q. v.*); in later times, a piece of plate armor, the exact nature of which is uncertain.

Habington, WILLIAM: author; b. at Hindlip, Worcestershire, England, Nov. 5, 1605, of an old Roman Catholic family; educated at St. Omer, in France; married Lucy Herbert (Castara), the daughter of Lord Powis, and lived chiefly on his ancestral estate at Hindlip, where he died Nov. 30, 1645. He is chiefly remembered for his *Castara* (1634), a collection of poems addressed mostly to his wife, and remarkable for their pure and elevated sentiment and for their occasional quaint and farfetched conceits. The *History of Edward IV.* (1640) is believed to have been his father's work. He also wrote the *Queene of Aragon, a Tragi-comedie* (1640).

Habit [M. Eng. *habit*, from O. Fr. *habit*: Ital. *abito* < Lat. *ha'bitus*, condition, attire, nature, disposition, habit, deriv. of *habe're*, have]: a constitution or state of mind or body which disposes one to certain acts or conditions, mental or physical. A habit is of more fixed character than a *disposition*, but is generically the same. There are habits intellectual and moral, acquired and inherited, active and passive. Habits are originally the results of voluntary acts, but the control of them may become impossible to the will. A wise and skillful formation of habits may be of the greatest moral and intellectual advantage, while habits injudiciously formed may be destructive of mind, character, body, and

estate. The question of habit is intimately connected with that of the Association of Ideas (*q. v.*).

The *law of habit* in psychology and physiology is the principle by which habits are expressed in terms of functions. A habit represents, according to the degree of fixity which it has attained, the amount of readiness of an organism or an organ for the performance of its peculiar function, this readiness being due to the previous exercise of this same function. Further, on the physiological side, habit always represents modification of structure to an extent which gives the organism a bent or tendency toward a repetition of the function again. Each performance of the function also further strengthens the habit by deepening the organic tendencies which lie at the basis of the habit. The acquisition of complex movements of skill illustrates the manner in which simple organic habit may bring the influence of the organism to the support of the efforts of the mind.

On the mental side, the law is capable of a corresponding statement. A mental function grows easy and then habitual in proportion to the frequency of its performance. Probably the *locus* of the mental disposition involved is the attention, and the strength of mental habit depends upon the relative ease or freedom in the concentration of the attention. No adequate statement of mental habit, however, is possible which does not recognize the alliance spoken of between organic and mental dispositions, as is done in what is called the psycho-physical theory of mental functions in Physiological Psychology (*q. v.*). The principle which takes account of the breaking up or modification of habit by new adjustments of an organism or new efforts of the mind is the law of *accommodation*. "Psychologically, habit involves loss of mental oversight, diffusion of attention, subsiding consciousness" (Baldwin's *Handbook of Psychology*, ii., p. 49); and accommodation means the opposite, i. e. "reviving consciousness, concentration of attention, voluntary control—the mental state which has its most general expression in what we call Interest" (*q. v.*). See Imitation and James's *Principles of Psychology*, vol. ii., chap. iv.

J. Mark Baldwin.

Habsburg, House of: See Hapsburg, House of.

Hack'berry, Sugarberry, or **Nettle-tree** [hackberry is from an earlier *hagberry*, from Dan. *haeggebaer*, liter., hedgeberry]: the *Celtis occidentalis*, a North American tree of considerable height and much beauty, but singularly variable in its mode of growth and botanical characters. Its wood is quite tough, but is not much used in the arts. It makes good charcoal, and when young is used for barrel hoops, and sometimes called hoop-ash. The genus (*Celtis*, family *Urticaceæ*) contains several foreign trees of considerable importance. Revised by L. H. Bailey.

Hackel, Eduard: German botanist; Professor of Botany in the Gymnasium of St. Poelten, Austria, and the foremost living student of the grasses. Among his published works are *Monographia Festucarum Europæarum* (1882); *Gramineæ* (in Engler and Prantl's *Pflanzenfamilien*, 1887), of which an English translation appeared in 1890 under the name of *The True Grasses*; *Andropogoneæ* (in de Candolle's *Monographiæ Phanerogamarum*, 1889).

Charles E. Bessey.

Häckel, Ernst H.: See Haeckel, Ernst H.

Hackensack: town; capital of Bergen co., N. J. (for location of county, see map of New Jersey, ref. 2–E); on the Hackensack river, and the N. J. and N. Y., the N. Y., Ont. and W., the N. Y., Susq. and W., and the W. Shore Railways; 8 miles S. E. of Paterson, 13 miles N. of New York. It has gas, water, and electric-light plants, several brickyards, silk-mill, jewelry-factory; 12 churches, 3 public, 1 parochial, and 2 private schools; and 1 tri-weekly and 2 weekly newspapers. There is considerable trade by railway and river. Pop. (1880) 4,248; (1890) 6,004; (1895) 7,282.

Editor of "Index."

Hack'ett, Horatio Balch, D. D., LL. D.: educator; b. at Salisbury, Mass., Dec. 27, 1808; graduated at Amherst College in 1830; was tutor there 1831–32; studied theology at the Andover Seminary until 1834; was Adjunct Professor of Latin and Greek in Brown University three years, and Professor of Hebrew one year; was elected to the chair of Biblical Literature in the Newton Theological Institution (Baptist) in 1839; studied at Halle and Berlin from Sept., 1841–42; Professor of New Testament Greek in Rochester Theological Seminary 1870. He published Plutarch's *De Sera Numinis Vindicta*, with notes (1844); translated and enlarged Winer's Chaldee grammar (1845); published a Hebrew grammar and reader (1847); *Commentary on Acts* (1851); *Illustrations of Scripture*, suggested by a tour through the Holy Land (1855; new edition 1882); *Philemon*, newly translated, with notes (1860); *Christian Memorials of the War* (1864); translated (for Lange's *Commentary*) Von Oosterzee on Philemon (1868), and Braune on Philippians (1870); was one of the editors of the enlarged American edition of Smith's *Dictionary of the Bible*; edited also Rawlinson's *Historical Illustrations of the Old Testament* (American reprint, 1873); and was a member of the New Testament company of the American Bible Revision Committee. D. at Rochester, N. Y., Nov. 2, 1875. See *Memorials of Horatio Balch Hackett*, edited by G. H. Whittemore (1876).

Hackettstown: town; Warren co., N. J. (for location of county, see map of New Jersey, ref. 2–C); on the Musconetcong river, the Morris Canal, and the D., L. and W. Railroad; 52 miles W. of Newark. It is at the head of the beautiful Musconetcong valley, with mountains surrounding it on three sides, and within half a mile of the highest point in the State. The public water-supply is from mineral springs on Schooley's Mountain, 2½ miles distant. The town is the seat of the seminary of the Methodist Episcopal Conference of Newark, and has manufactures of agricultural implements, silk goods, and carriages, and two weekly newspapers. Pop. (1880) 2,502; (1890) 2,417; (1895) 2,594.

Editor of "Gazette."

Hackländer, hăk'len-der, Friedrich Wilhelm, von: novelist and comedy-writer; b. at Bertscheid, near Aix-la-Chapelle, Nov. 1, 1816. He learned the dry-goods business in Elberfeld; entered the Prussian artillery; returned again to his commercial occupations, and succeeded at last in 1841 in making for himself a literary name by the publication of his *Bilder aus dem Soldatenleben* in a Stuttgart paper, and shortly after of his *Wachtstubenabenteuer*. He published in 1842 *Daguerreotypen aufgenommen auf einer Reise in den Orient*, which recommended him to the Crown Prince of Würtemberg, whom he accompanied on a journey through Italy, France, and Russia. New sketches and humorous tales followed, and the King of Würtemberg gave the author an office and a pension. In 1850 he published a large novel or romance, *Handel und Wandel* (2 vols., Berlin), and in 1854 another, *Europäisches Sklavenleben* (4 vols., Stuttgart). Of his dramas, *Der geheime Agent*, a comedy in five acts (1850), and two or three one-act pieces, *Schuldig*, *Unten im Hause*, etc., have been played with success in all the German theaters. In 1857 he founded, in connection with Zoller, *Ueber Land und Meer*, an illustrated paper. D. at Leoni, near Munich, July 6, 1877. Revised by Julius Goebel.

Hackle, Hatchel, or **Hetchel** [dialectal forms of *heckle* < M. Eng. *hekele*; cf. Dutch *hekel* (: Germ. *hechel*), deriv. of Dutch *haak*, hook : Germ. *hake* : Eng. *hook*]: a comb with long steel teeth by means of which the tow is removed from flax, hemp, or jute, and the fibers fitted for spinning or other uses by straightening and laying them parallel to each other. The long, tapering, polished teeth are affixed to a wooden or metallic block, and are arranged in two, or more frequently in many, rows. Their adjustment for effective use requires considerable skill. See Flax.

Hack'matack [Amer. Ind.], **Tam'arack** [Amer. Ind.], or **American Larch** (*Larix americana*): a forest-tree of the U. S., growing frequently in wet places, and attaining a large size, except in the far north. It is one of the few native coniferous trees whose leaves fall off in winter. Its wood is of excellent quality. It is used for poles and rafters; in ship-building it is used for ship's knees, top-timbers, and spars; and if fastened with square iron is far better than oak for such uses. It is very durable in contact with the soil, and is prized for posts, pump-logs, etc. It is also a good ornamental tree, especially when young. The European species (*L. europæa*) is planted in the U. S. for ornamental and forestry purposes. Revised by L. H. Bailey.

Ha-Dani: See Eldad Ben Malchi.

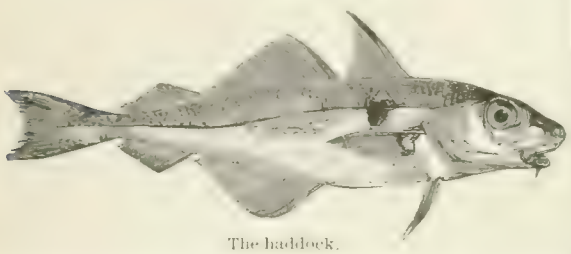
Hadassah: See Esther.

Haddam: town; one of the capitals of Middlesex co., Conn. (for location of county, see map of Connecticut, ref. 10–I); on the Connecticut river, 20 miles from its mouth, and the N. Y., N. H. and Hart. Railroad; 26 miles S. S. E. of Hartford. Haddam township contains the villages of Ponsett, Walkley Hill, Arnolds, Higganum, Little City, and

Tylerville. The principal industry of the town is granite-quarrying. Pop. (1880) 2,419; (1890) 2,095.

Had'dingtonshire, or **East Lo'thian**: county of Scotland; bounded N. by the Firth of Forth, E. by the North Sea, S. by Berwickshire, and W. by Midlothian. Area, 271 sq. miles. In the southern part rise the Lammermoor Hills; the northern and eastern part is a plain sloping gently toward the Firth of Forth, and mostly consisting of clayey loam. Haddingtonshire is famous for its agriculture, in which respect it is said to occupy the foremost rank in Scotland. Coal and limestone abound. Pop. (1891) 37,491. The capital is Haddington, a small town on the Tyne.

Haddock [M. Eng. *hadok*; cf. Irish *codog*; Gael. *odag*]: *Melanogrammus æglefinus*, a fish of the cod family, captured in large quantities on both sides of the Atlantic for food. It



The haddock.

is generally eaten fresh, but is sometimes smoked or salted and dried. It resembles the cod, but is easily distinguished by the black line along its side, that of the cod being white. It sometimes weighs 15 lb., and is often caught in great quantities. It is, however, somewhat fickle in its habits, often leaving the places where it once congregated, and not returning for a long time. See FISHERIES.

Haddonfield: borough; Camden co., N. J. (for location of county, see map of New Jersey, ref. 6–C); on the Camden and Atlantic Railroad; 6 miles S. E. of Philadelphia. It is in the township of Haddon, which includes the boroughs of Collingswood and Haddonfield, and is the center of a fertile agricultural region. Pop. (1880) 1,480; (1890) 2,502; (1895) 2,580.

Hade: See FAULTS and GEOLOGY.

Haden, FRANCIS SEYMOUR: etcher; b. in London, Sept. 16, 1818; a physician of repute and a member of the Royal College of Surgeons. He had been a collector and a passionate lover of landscape art and of fine prints, and began to make etchings as a rest from professional practice; so that he is one of the very few amateurs whose artistic work is of value. His *Études à l'Eau-forte*, with text by Ph. Burty, were published in Paris and London simultaneously in 1865. Since that time his prints have been continually in demand at high prices. The largest of them is a study after J. M. W. Turner's picture, *Calais Pier*. R. S.

Hadersleben, haa'ders-lā-ben [Germ., from Dan. name *Hadersley*]: town; in the duchy of Schleswig, Prussia, with a harbor for small vessels on the Hadersley Fjord, an inlet of the Little Belt (see map of German Empire, ref. 1–E). The town has some tanneries, iron-foundries, etc., and a beautiful church built in the thirteenth century. It suffered considerably in the wars between Schleswig and Holstein in the fifteenth century, and in 1864 was ceded, with Schleswig, to Prussia. Pop. (1890) 8,399.

Ha'des [from Gr. Ἅιδης, Hades or Pluto, god of the lower world, the lower world itself. Derived from ἀ-, -un- + ἰδεῖν, to see: the invisible one, or he who makes invisible]: in Greek mythology, a son of Cronus and Rhea. Uranus, who had been mutilated by Cronus, prophesied that the latter would be dethroned eventually by one of his own sons, wherefore Cronus swallowed his children as soon as they were born. Along with the rest Hades shared this fate, and was freed by the machinations of Zeus and Gæa. In the war waged by Zeus against the Titans, Hades fought by the side of Zeus, wearing a cap that made him invisible. After the conquest of the Titans, Zeus shared the empire of the universe with his two brothers, Poseidon and Hades. Poseidon received the empire of the sea and Hades that of the lower world, along with the sovereignty of the dead. Hades figures but rarely in myths, and he left the lower world only on two occasions—once when he ascended to earth to carry off Persephone (Proserpina) to be his wife, and again when, wounded by Hercules, he went to Olympus to be healed by Paeon. His epithets usually have reference to what is powerful, dark, and terrible in his nature, though euphemistic epithets also were applied to him. In Eleusis he was worshiped along with Demeter and Persephone under the title of the Well-wisher (Eubouleus). The name Pluto (in Gr. Πλούτων) was given to Hades by the poets as early as the fifth century B. C.; it applies to him as the giver of wealth, whether in the shape of grain or of precious metals, both of which come out of the bowels of the earth, his realm. So far as is known Hades had but one single temple in his own name (i. e. in Elis), though he was worshiped in many places along with Demeter and Cora, and then in a modified character; men were not fond of worshiping a god whose very name they dreaded to pronounce. Only black animals were offered in sacrifice to him; the dog, the wolf, the snake, the cypress-tree, and the narcissus flower were sacred to him. The Greeks were not fond of representing Hades in art, and no statues of the best period of art have come down to us, though in his modified character of Eubouleus he is often figured on vase-paintings, where he carries a cornucopia in addition to his scepter. In 1885 a bust of Eubouleus, thought to be a work of Praxiteles, was discovered at Eleusis. The sitting statue of Hades in the Villa Borghese belongs to the fourth century B. C.

The lower world was spoken of from the earliest times as "the house of Hades," and a dead man was said to have gone "to the house of Hades," our phrase "he has gone to *Jones's*" being precisely analogous. The house of Hades was vast, and had wide gates that stood open day and night, for Hades was hospitable, in so far as that all might enter freely, but none depart. The door of the house of Hades was watched by Cerberus, a many-headed dog, who caressed and fawned upon all who wished to enter, but allowed none to go out. The house of Hades was dark and gloomy and full of ghost-like horrors; its very vastness was terrible. Quite in keeping with the house were its gloomy surroundings—the Grove of Persephone, with its weeping-willows and barren aspen-trees, and the Asphodel Meadow, upon which the shades of the dead disported themselves, with its rocky or sandy ground that was covered with hateful trees and prickly shrubs. See Preller, *Griechische Mythologie* (Berlin, 1872; i., 655 ff; new ed. by Robert, Berlin, 1888); H. D. Müller, *Mythologie der griechischen Stämme* (p. 151 ff); the articles *Hades* in Roscher's *Lexicon* and Baumeister's *Denkmäler*.

The word in Hebrew corresponding to Hades is *Sheol*, which in the English version of the Bible is sometimes rendered "grave," sometimes "pit," and sometimes "hell." *Hades* is almost always employed by LXX. in translating *Sheol*. In the text used by King James's translators it occurs eleven times, and was rendered "hell" in every place except 1 Cor. xv. 55. In the text adopted by the revisers (1881) it occurs ten times (1 Cor. xv. 55 dropping out), and is uniformly rendered simply "Hades." See HELL.

J. R. S. STERRETT.

Hading, JANE: actress; b. at Marseilles, France, Nov. 25, 1859; appeared on the stage when a child; studied at the Marseilles Conservatory, and while still very young played at Algiers and Cairo, usually in comic opera. Returning to Marseilles in 1876, she played in a variety of *rôles*, and in 1879 appeared in *La Chaste Suzanna* at the Palais Royal in Paris. Her Parisian success was assured in 1883 when she appeared at the Gymnase in *Autour du mariage* and *Le Maître de Forges*. Since 1885 she has played with success in Great Britain and the U. S.

Hadj [Arab., setting out, pilgrimage]: the pilgrimage to Mecca—one of the five ritual observances incumbent on Mussulmans, ablution, almsgiving, fast, and prayer being the other four. The Hadj may, however, be performed by deputy, or be dispensed with altogether in case of disease, poverty, or any sufficient cause. The strictest discipline is maintained among the Hadjis (pilgrims) who visit the various objects of sacred interest in prescribed order, according to a scrupulous ceremonial. Formerly, if possible, all pilgrimages were made by land, generally in caravans, along one of the four main routes from Cairo, Damascus, Babylon, and Zibith. Steam-navigation has greatly modified this system. The annual departure of the pilgrims of the sacred caravan from Constantinople, with the sacred camel bearing the presents of the sultan, is an occasion of great solemnity and magnificence. EDWIN A. GROSVENOR.

Hadji Khalifah: See HAJJI KHALIFAH.

Hadley, Arthur Twining: political economist; b. at New Haven, Conn., Apr. 23, 1856; son of Prof. James Hadley; graduated at Yale 1876; pursued graduate studies in political science at Yale University and Berlin for three years; tutor in Yale College 1879–83; engaged in literary and journalistic work treating of railways mainly; commissioner of labor statistics for Connecticut 1885–87; appointed Professor of Political Science at Yale University 1886; has continued his journalistic work, chiefly for *The Railroad Gazette* and *The Financial Chronicle*. Author of *Railroad Transportation, its History and its Laws* (1885; translated into Russian 1886, and into French 1887); *Report on the Labor Question* (1885); *Economics* (New York, 1896); associate editor *Johnson's Universal Cyclopædia*, in charge of the department of political economy, finance, and transportation. C. H. Thurber.

Hadley, James: linguist and professor in Greek; b. at Fairfield, Herkimer co., N. Y., Mar. 30, 1821, where his father was Professor of Chemistry in a medical institution. Entering the junior class in Yale College, James Hadley graduated in 1842. From 1843 to 1845 he was a theological student in New Haven, serving as tutor in Middlebury College meanwhile (from Sept., 1844, to Apr., 1845); was tutor at Yale from 1845 to 1848, when he was appointed Associate Professor of Greek; succeeded Dr. Woolsey as full professor in 1851. As a student he gave great promise of distinction in mathematics, but circumstances turned his genius and industry in a different direction. In addition to his mastery of the Greek language, he was well versed in Hebrew, Arabic, Armenian, Sanskrit, Welsh, Gaelic, Irish, and the principal modern languages. His *Greek Grammar*, based on that of Curtius, was published in 1860. In 1873 a posthumous volume of twelve lectures on *Roman Law* was edited by ex-President Woolsey, and in the same year another volume of twenty *Philological and Critical Essays* was edited by Prof. Whitney. D. in New Haven, Nov. 14, 1872. See President Porter's article in *The New Englander* (Jan., 1873). Revised by A. T. Hadley.

Hadley, John: an English astronomer, the date and place of whose birth are unknown; became a fellow of the Royal Society in London in 1717, and published in the *Transactions* of the society for 1731 an account of an invention he had made with respect to the quadrant. (See Sextant.) Shortly after, however, Thomas Godfrey, of Philadelphia, laid before the society a similar invention. The case was investigated, both parties were declared entitled to the honor of invention, and each of them received a prize of £200. Hadley died Feb. 15, 1744.

Hadramaut' (the *Adramitæ* of Strabo): the southwestern portion of Arabia Felix, but in a larger sense it includes nearly all that part of Arabia S. and S. E. of the central desert of the peninsula. The coast land is low, the interior dry, and broken with ranges of mountains and hills. In the valleys there are some torrents, which are often dry. Its people are of many tribes, subject to various local sultans. As a rule, they are not nomadic. The country affords fine horses, camels, wool, dates, gums, and grain. Copper, coal, and bitumen exist. Chief seaport, Makallah.

Ha'drian, or **Hadrianus**, Publius Ælius: the fourteenth Roman emperor; b. at Rome in 76 A. D.; the son of a senator, a kinsman of Trajan, who became his guardian in youth. Young Hadrian was a zealous student of Greek letters; entered the army in Spain when fifteen years old, and passed rapidly from the rank of a military tribune (95 A. D.) through the successive steps of military and civil life to the consulship, an office which he held in 109. His promotion was facilitated by the influence of the wife of Trajan, who also brought about his marriage to Julia Sabina, a granddaughter of the emperor's sister. On the death of Trajan he was proclaimed emperor, 117 A. D. His policy with regard to foreign conquest differed radically from that of his predecessor, and, realizing that the time for an extension of territory was past, he gave up the country east of the Euphrates to the Parthians, and made Armenia independent. He appeased the discontent of the people consequent upon the bloody suppression of a formidable conspiracy by the remission of all arrears in taxes and debts due the state, and by large gifts of money to the people. A large part of his reign was spent in travels throughout the empire, redressing wrongs, confirming disputed privileges, inspecting the troops and the fortifications. During one of these trips the wall of Hadrian from the Tyne to the Solway was constructed (119 A. D.) In 132 the bloody revolt of the Jews broke out, which lasted for several years, and was not ended till Palestine was almost depopulated. Athens was a favorite residence of the emperor. He rebuilt Jerusalem (134); returned finally to Rome in 135, spending a great part of his declining years in his splendid villa near Tibur. He died at Baiæ, July 10, 138 A. D. Hadrian's name is one of the most illustrious in the imperial annals. He was the first emperor, almost the first Roman, who cared for any part of the empire except Italy. He fostered peace and promoted the welfare of his people. But his private character was not free from stains, and late in his reign he was guilty of many acts of tyranny. He affected to be a poet, architect, painter, philosopher, orator, and musician. Six Greek epigrams, and some quotations from a history of his own life, are all that remain to us of his written works. The poems of the Latin anthology attributed to him are of doubtful authenticity. Revised by G. L. Hendrickson.

Hadrian's Wall: an ancient line of defenses extending from the Solway to the Tyne in the north of England. It consisted originally of a stone wall, three parallel earthen walls, two ditches or fossæ, and numerous castles and turrets connected by a military road. It bears evident marks of Roman workmanship and is commonly assigned to the time of the Emperor Publius Ælius Hadrianus. B. B. H.

Hadrosau'rus [Mod. Lat.; Gr. ἁδρός, thick, stout + σαῦρος, lizard]: a genus of fossil reptiles from the North American Cretaceous, belonging to the order *Dinosauria*, which included animals now extinct. These animals were mostly of large size, some of them being the largest of land animals, and, although true reptiles, they possessed also some characters of birds and mammals. Their affinities with the birds, as Huxley has shown, are especially seen in the large medullary cavities of the long bones, and in the structure of the pelvic arch and hind limbs. Thus the sacrum consists of several vertebræ; the ilium extends far in advance of the acetabulum, the ischium is greatly elongated, and often presents the obturator process characteristic of birds; and the *os pubis*, in some genera at least, is elongated, and its posterior branch directed downward and backward. The femur has, usually, a strong inner trochanter, and its distal end is particularly bird-like in the presence of a strong ridge between the tibia and fibula. The tibia closely resembles that of a bird, and in some genera the astragalus is ankylosed with its distal end. The latter bone is very similar to that of a bird. The metatarsals are as a rule elongate and closely fitted together; the inner and outer digits are short or even wanting; and the third digit is the longest, as in the birds. The hind legs were usually much larger than the fore legs, and ordinarily supported the body in walking. Probably the so-called bird-tracks in the Connecticut river sandstone were all made by Dinosaurs. The cervical vertebræ, in some genera, were convex in front and concave behind—a character possessed also by the dorsals, but in a less degree posteriorly. The teeth in some herbivorous forms present broad grinding surfaces, and the articulation of the jaw admitted of lateral motion, as in herbivorous mammals. Other genera were, however, carnivorous, and furnished with sharp, recurved, serrated teeth. The latter are implanted in various ways, but never ankylosed with the jaws. In their manner of life Dinosaurs seem to have resembled ordinary terrestrial mammals. Their remains are found throughout the Mesozoic or Reptilian age, at the close of which they appear to have become entirely extinct. The genus *Hadrosaurus* is one of the principal American representatives of the herbivorous group of this order. Its existence was first made known in 1858 by Dr. Leidy, who described portions of a skeleton found at Haddonfield, N. J., under the name of *Hadrosaurus foulkii*. It is related to the *Iguanodon* from the Wealden and Cretaceous of Europe. The teeth of *Hadrosaurus* are small, set in alveolar grooves separated by narrow intervening ridges. They were crowded together, both those in actual use and the successional teeth, in a quincuncial arrangement. In the upper teeth the layer of enamel was on the outer side, so that the series of teeth at the border of the jaw, as worn down by use, formed a continuous pavement sloping outward and downward, and presenting triturating points and facets of various sizes and patterns, according to the portion of the tooth that had reached the grinding surface. In the lower teeth the inner side of the crown only is covered with enamel, and forms a lozenge-shaped surface, divided by a prominent median keel. This structure and disposition of teeth indicate a vegetable feeder that masticated its food like the herbivorous mammals.

The humerus resembles that of *Iguanodon*. The bones of the forearm are similar to those of the living iguana. The bones of the hind limbs are very large in comparison with those of the fore limbs—larger than in *Iguanodon*. The entire length of this animal is estimated at over 25 feet. It moved usually upon its hind legs, and used its large tail as an additional support while it browsed upon the vegetation growing near the water where it lived. Several smaller species of *Hadrosaurus* have been found, also in the Cretaceous. O. C. Marsh.

Haeckel, or **Häckel**, hek'el, Ernst, Ph. D., M. D., LL. D.: naturalist and writer; b. at Potsdam, Germany, Feb. 16, 1834; educated at several German universities, and at Naples and Messina in Italy; Professor of Zoölogy in Jena 1862; chief representative of radical naturalistic evolution in Germany; a bold theorist. Author of *Natural History of Creation*, translated into twelve languages (8th ed. 1889); *The Origin of the Human Race*; *Life in the Deep Seas*; *The History of Man's Development* (1874); *Popular Lectures on Evolution* (1878); *Letters of Travel through India* (2d ed. 1884); and numerous important scientific monographs. C. H. T.

Hæmatem'esis [liter., vomiting of blood; Gr. *αἷμα, αἵματος*, blood + *ἔμεσις*, a vomiting, deriv. of *ἐμεῖν*, vomit]: vomiting of blood or hæmorrhage from the stomach; the result chiefly of ulcer of the stomach, cancer of the stomach, or extreme inflammation or congestion of the stomach, as when caused by corrosive irritants, excess of alcoholic drinks, or serious diseases of the liver. Hæmatemesis is treated by perfect rest on the back, cold packs over the stomach, and bits of ice swallowed. It must be carefully distinguished from Hæmoptysis (*q. v.*).

Hæm'atite, or **Specular Iron Ore** [*hæmatite* is from Lat. *hematī'tes* = Gr. *αἱματίτης* (sc. *λίθος*, stone), hematite, liter., blood-like, deriv. of *αἷμα, αἵματος*, blood]: one of the most common ores of iron, distinguished by its color into red and brown hæmatite. It does not attract the magnet. These ores are composed chiefly of peroxide of iron, and are very important sources of metallic iron. They occur largely in metamorphic strata, and are found sometimes crystallized in various forms. See Iron, Ores of.

Hæmatoglobin: See Hæmoglobin.

Hæmatocrystallin: See Hæmoglobin.

Hæmatop'tysis: same as Hæmoptysis (*q. v.*).

Hæmatox'ylin [deriv. of *hæmatoxylon*, liter., blood-wood; Gr. *αἷμα, αἵματος*, blood + *ξύλον*, wood]: a crystalline yellow principle obtained by digesting the aqueous extract of logwood (*Hæmatoxylon campeachianum*) in ether or alcohol, and carefully evaporating it; then adding a little water and allowing the hæmatoxylin to form crystals. When pure, it is sweet to the taste. Its formula is $C_{16}H_{14}O_6 + 3Aq$. It does not have the power of dyeing cloths, but with alkaline bases fine reds, blues, and purples are produced. It exists already formed in the logwood.

Hæmatozo'a [Mod. Lat., liter., blood animals; Gr. *αἷμα αἵματος*, blood + *ζῷα*, plur. of *ζῷον*, animal]: parasitic animals which live in blood. This habit is not confined to one natural group, but is manifested by representatives of widely different types, some belonging to the nematode and trematode families of the Vermes, others to the *Gregarinidæ* and *Protozoa*. They have been found in the blood of the lower animals, such as turtles, frogs, fishes, and birds, as well as in that of the higher mammals and man. Their size is necessarily small, and often microscopic. Much remains to be learned of the whole cycle of life of all of them. In man Hæmatozoa bear close relations to several diseases. Of the lower forms, the organism now commonly recognized as the cause of malarial fever may be cited. This small animal organism, generally smaller than the red blood-corpuscles, and often inclosed within them, bears some resemblance to monads, but some also to the *Sporozoa*, so that its exact position can not as yet be determined. Species very similar to the malarial "plasmodium," as it has been termed, occur in certain birds, frogs, and other animals. An interesting form is the nematode, *Filaria sanguinis hominis*, or *Filaria bancroftii*. It is found in the circulating blood in certain diseases as a slender, thread-like body, about a ninetieth of an inch in length, and the diameter of a red blood-corpuscle in thickness. This is the embryo form, and each is incased in a shell which is hardly visible and does not impede the motions, which are very active. The adult male and female are found together somewhere in the lymphatic system. The latter is much larger than the former, and gives birth to living young or embryos, that is, is viviparous. Curiously the embryos are found in the blood only during the night, but if the patient sleep during the day and wake at night a reversal of this fact is observed. This organism causes chyluria, a condition in which the urine is milky or chylous, and elephantiasis. Another hæmatozoön, the trematode, *Distoma hæmatobium*, *Bilharzia hæmatobia*, or blood-fluke, is of importance. It occurs especially in Egypt and other parts of Africa. The embryo probably enters through impure drinking-water, and the adult is found in various parts of the venous system, especially the portal, splenic, venal, and mesenteric veins, and those of the bladder. It causes continuous hæmaturia—that is, bloody urine. Bilharz affirms that fully 50 per cent. of the lower classes in Egypt are infected with this worm. In the lower animals there are numerous Hæmatozoa, many of which do not produce recognizable diseases. See Flukeworms, Miasma, and Intermittent Fever. William Pepper.

Hæmoglo'bin, **Hæm'atoglob'ulin**, or **Hæm'atocrys'tallin** [liter., the substance of blood-globules; deriv. of Gr. *αἷμα*, blood + Lat. *glo'bus*, ball, globe, or + Gr. *κρύσταλλος*, ice, crystal]: a substance found in venous blood, probably in combination. It is formed by abstracting oxygen from Oxyhæmoglobin (*q. v.*), either by pumping or by treating with reducing agents. By decomposition in sealed tubes oxyhæmoglobin is converted into hæmoglobin, and in this way the latter substance has been obtained in crystallized form. The water solution of hæmoglobin absorbs oxygen and oxyhæmoglobin is thus formed. In the arterial blood which has been aërated in the lungs, the hæmoglobin is in combination with oxygen, as oxyhæmoglobin, which gives the crimson color. In venous blood the "reduced hæmoglobin" causes the dark color.

Hæmophilia, or **Hæmatophilia** [Mod. Lat., from Gr. *αἷμα, αἵματος*, blood + *φιλεῖν*, love]: a tendency manifested in certain persons to bleed excessively after slight injury. The common name applied to such persons is *bleeders*. Hæmophilia is to a certain extent inherited, passing through the females of affected families to their male offspring, the females being rarely affected, though they transmit the disease. It manifests itself as a rule soon after birth and many children die early in life, though sometimes the tendency seems to be outgrown. The fundamental cause is unknown, but among the theories which have been offered two probably contain some part of the truth. First it is held that certain chemical defects are present in the blood, which render it less coagulable and more watery. The second theory is that there is present some disease of the blood-vessel walls, rendering them more pervious.
William Pepper.

Hæmop'tysis [Gr. *αἷμα, αἵματος*, blood + *πτύσις*, spitting; deriv. of *πτύειν*, to spit]: the expectoration of blood from the vessels of the lungs, or from the mucous membrane of the thoracic air-passages. Hæmoptysis occurs in pulmonary consumption, in heart disease, etc. It is sometimes vicarious in cases of suppressed menses. The significance of hæmoptysis in any case can only be estimated by the trained diagnostician. A distinction is to be observed between hæmoptysis from the congested mucous membrane of the air-passages (the blood issuing from many points in the congested surface, which is not lacerated), and the far more formidable *pneumorrhagia*, when the flow is from the vessel opened in the course of pulmonary disease. It is believed by some good observers that cases of consumption which are characterized by a decided tendency to hæmoptysis are as a rule slower in progress and less rapidly fatal than other cases are. Patients rarely die from the hæmorrhage, though sudden death may occur in this way. Hæmorrhages are popularly thought to bring on consumption, but this is not the case. The hæmorrhage in these cases results from slight changes which are easily overlooked. Perfect rest, secured if necessary by morphia, such hæmostatics as ergot, gallic acid, and turpentine, with ice-bags to the chest and swallowing of lumps of ice, are recommended for the relief of hæmoptysis. Revised by William Pepper.

Hæmorrhage [Gr. *αἱμορραγία*, violent bleeding; *αἷμα*, blood + *ῥαγῆναι* (*ῥηγνῦναι*), burst]: See Bleeding, Hæmoptysis, and Hæmatemesis.

Hæmorrhoids [Gr. *αἱμορροΐδες* (sc. *φλέβες*), veins liable to discharge blood, piles; *αἷμα*, blood + *-ροος*, flowing; deriv. of *ῥεῖν*, flow]: See Piles.

Hæ'res, or **Heir** [= Lat. *he'res*, *here'dis*, heir, whence viâ Fr. Eng. *heir*]: in the Roman and the civil law, one who is the universal successor to all the property and all the rights and liabilities of a person deceased, except such as are so purely personal as to be untransferable. The *hæres* succeeded immediately to all the property of the deceased, and not merely to some specific portion, as the real estate, there being a complete fusion between the estates of the deceased and the hæres, who had to discharge all the inherited obligation or incur the infamy of bankruptcy. When legacies or devises were made to a third person he was charged with their payment out of the funds inherited. The hæres might be such either by virtue of an appointment by a testament or by operation of law on account of his connection by blood with the deceased; but the hæres could not be partly testamentary and partly intestate. The *hæres* therefore corresponded partly with the heir or devisee, and partly with the executor or trustee under the common-law system. All persons might act in this capacity except persons not Roman citizens, slaves of such persons, persons not in being at the death of the testator, corporations unless specially privileged, and a few less important classes. If a person appointed *hæres* was a slave of the testator, or was under the testator's authority (*patria potestas*) at his death, he was obliged to accept the position, but in other cases acceptance was discretionary. The severity of this necessary inheritance, however, was mitigated in the case of all but the slave by the interference of the prætor, who under certain conditions would not allow the hæres to be sued for claims against the inheritance. Revised by F. Sturges Allen.

Hāfiz, haa'fiz [Pers., one who knows the Kor'ān by heart]: *takhallus* or *nom de plume* of Shams ud-dīn Mohammad; Persian lyrical poet; b. at Shīrāz in the beginning of the fourteenth century.

The historical notices of his life are scanty, and the known facts of his biography are confined chiefly to a few unimportant incidents. One of the best authenticated of these is that Mahmūd Shāh Bahmani, one of the kings of the Deccan, admiring the genius of Hāfiz, endeavored by splendid presents to attract the poet to his court. Hāfiz set out from Shīrāz and reached Ormuzd in safety, but no sooner had he embarked on shipboard than a storm arose which forced the ship to put back to port. The poet proved so bad a sailor that he refused to trust himself again on the ocean, sent an ode to his royal friend as an apology for not coming in person, and returned to his home in Shīrāz. Another incident related by the Persian historians is the following: When Timur-lang (Tamerlane) had subjugated the province of Fars, in which Hāfiz's home was, he sent for the poet and took him to task for having so freely given away the conqueror's dominions in one of his well-known verses, "For the black mole on thy cheek I would give Samarcand and Bokhara." Hāfiz promptly replied, "Yes, sire, and it is such reckless extravagance that has made me poor as I am." Tamerlane was so pleased with the ready wit of the answer that he bestowed on the offending author some magnificent gift of royal favor. Unfortunately for the truth of the story, Tamerlane did not capture Shīrāz till at least four years after the poet's death.

From an allusion in Hāfiz's writings it is inferred that he was happily married, as one of his odes contains a lament for the death of a beloved wife. He died in the year A. D. 1388 (A. H. 791), and was buried in a garden near Shīrāz; a white marble monument was erected over the tomb, which is still an object of veneration to numerous pilgrims who visit the spot. Owing to the anacreontic and freethinking expressions which abound in his writings, Hāfiz seems to have come into disfavor with the clerical party, and they hesitated to accord him Moslem burial. A *fāl*, or omen, was taken from his own poems after the fashion of the *Sortes Virgilianæ*; the verse in the poet's works opened at random chanced to be the following:

> Shun not Hāfiz's bier, for though sunk in sin, he will yet go straight to heaven.

The coincidence was considered sufficiently remarkable to overcome the scruples of the Mollahs, and Hāfiz was honorably interred. The works of Hāfiz are still used in similar superstitious practices.

The poems of Hāfiz consist for the most part of *ghazals*—that is to say, of short odes or sonnets, consisting of from five to fifteen verses each, with the same rhyme throughout, and having the poet's *nom de plume* woven into the last couplet as a signature. A collection of such short poems, arranged in alphabetical order of the rhymes, is called in Persian literature a *dīvān*, and the *Dīvān i Hafiz* is perhaps the most famous and is the name under which the writings of Hāfiz are generally known.

Hāfiz is justly esteemed to be the greatest lyrical poet Persia has produced. His language is singularly idiomatic and beautiful; his verse is exquisitely smooth and flowing, and his thoughts and allusions are eminently national. European writers for the most part disputed whether the odes of Hāfiz are to be considered anacreontic and erotic, as they at first sight appear, or whether they are mystical and religious, as native readers and critics deem them. The fact is that both views are correct. Hāfiz, in common with nearly all his compatriot poets, belonged to the religious order of dervishes called Sūfis. This sect professes doctrines which may be fairly called the esoteric creed of Islam; steering a middle course between the pantheism of India on the one hand, and the monotheism of the Koran on the other, the Sūfis's cult is a religion of beauty, where heavenly perfection is considered under the imperfect type of earthly loveliness. He aims at elevating mankind by the contemplation of spiritual things through the medium of the most impressionable feelings. The charms of visible objects are enthusiastically described by him, but as he refers all love and beauty to the Deity, it is easy to extract an allegorical meaning from the most passionate of his utterances. This is the real secret of understanding Hāfiz's poetry; his utterances are fresh and natural, and, as he was no ascetic, it is probable that many of the passages in which he describes the pleasures of love and wine are actual records of his own experience. But the sorrows and yearnings to which he gives expression may also have been real; but, for all that, they may be read—nay more, may have been written—in an allegorical sense. As a true poet Hāfiz poured his soul into his verse; as a true mystic, he saw God reflected in the human soul.

To a person who desires to study the thoughts, manners, or language of Persia, Hāfiz is the best guide. The native editions of his *Dīvān* are so numerous that it would be difficult to make a selection, but for general use an edition lithographed at Lucknow by Munshī Nowel Kishore, proprietor of the *Audh Akhbār* newspaper, may be recommended. It is furnished with a concise and useful commentary in Persian. Of European editions, etc., there are H. Brockhaus, *Die Lieder des Hafiz, Persisch mit dem Commentar des Sudi* (Leipzig, 1855–60); Vincenz Ritter von Rosenszweig-Schwanau, *Der Diwan des grossen Lyrischen Dichters Hafiz, in Persischen Original herausgegeben ins Deutsch metrisch übersetzt, und mit Anmerkungen versehen* (Vienna, 1858); J. v. Hammer, *Der Diwan v. Mohammed Schems eddin Hafis aus dem Persischen zum erstenmal ganz übersetzt* (Stuttgart and Tübingen, 1813); J. Richardson, *A Specimen of Persian Poetry*, or *Odes of Hafiz*, with an English translation and notes (London, 1774; also a second ed., by Rousseau, London, 1802); J. Haddon Hindley, *Persian Lyrics, or Scattered Poems from the Diwan Hafiz*, with paraphrases in verse and prose (London, 1800); J. Nott, *Select Odes from the Persian Poet Hafiz*, translated into English verse, with notes critical and explanatory (London, 1787); Prof. Cowell, *The Persian Poet Hafiz*, in *Macmillan's Magazine* for Aug., 1874, No. 177, p. 251; *Selections from the Poems of Hafiz*, translated by A. H. Bicknell (London, 1875); also H. W. Clarke, *Divan of Hafiz, translated, with Comments and with Notes on the Author's Life* (London, 1891). The works of Hāfiz have never been completely translated into English. Revised by A. V. Williams Jackson.

Hag [presumably the same word as *hag*, witch: Germ. *hexe*]: popular name of a very low form of cyclostome fishes, including the *Myxine glutinosa* of Atlantic waters, found on

Hag.

both coasts of the U. S. northward. They live largely in the bodies of other fishes. They have a remarkable power of se-

erecting slime. There are no eyes, and the ears are but little superior to the molluscan type. The six pairs of gill-sacs receive water from the gullet, and discharge it from an opening upon the ventral aspect of the fish. There are no bones, and the dorsal chord is of embryonic type. There is a portal heart. The mouth is a sucking organ, and is surrounded with barbules. A species, *Petromyzon dombeyi*, is common on the coast of California, and is very destructive to other fishes, boring into their bodies, devouring the muscle, leaving only the skin, skeleton, and viscera untouched.

Revised by D. S. Jordan.

Hagberg, Jakob Teodor, Ph. D.: poet and linguist; b. in Stockholm, Sweden, 1825; studied at the University of Upsala; graduated 1848; in 1851 he was made a lecturer in French Literature. 1860 Associate Professor of Italian and French, and 1868 Professor of Modern European Languages and Modern Literature at the same university. He has been active as a linguistic author, translator, and poet; published an Italian grammar (*Italiensk språklära*, 1863; 2d edition 1882); translated *Tvenne dramer af Don Pedro Calderon de la Barca* (Three Dramas by Don Pedro Calderon de la Barca, 1870, and *Petrarcas sonetter till Laura* (Petrarch's Sonnets to Laura, 1874). Hagberg is the author of the historical dramas *Karl den tolfte* (Charles the Twelfth, 1864) and *Karl den elfte* (Charles the Eleventh, 1866). Besides, he has published *Omarton af Molières Lustspel* (The Manner of Molière's Comedies, 1851); *Hvarför är vår tid icke poetisk?* (Why is not our Time Poetical? 1852); *Om Rabelais* (1862); *Det historiska skådespelet* (The Historical Drama, 1866); *Den provençalska vitterhetens återuppståndelse, i. 19 : de århundradet* (The Resurrection of Provençal Literature in the Nineteenth Century, 1873); and other literary essays.

P. Groth.

Hagdon, or **Hagden**: the common name among the New England fishermen for the greater shearwater (*Puffinus major*), a bird abundant in the North Atlantic off the shores of Europe and America. F. A. L.

Hagedorn, Friedrich, von: poet; b. in Hamburg, Apr. 23, 1708; studied jurisprudence at Jena; was secretary to the Danish minister in London 1729–31, afterward to the "English Court," a trade association in Hamburg. He wrote poems of various descriptions. He is called the father of the German *Lieder*, and his songs, which distinguished themselves by great elegance and easiness of language and rhythm, were set to music by the leading composers of his time. He represents a French and especially an English (Prior) influence in German literature, and exercised a great and beneficial influence upon the development of lyrical art in Germany. D. in Hamburg, Oct. 28, 1755. A collected edition of his works appeared at Hamburg (1800, 5 vols.). See also H. Schuster, *Friedrich von Hagedorn und seine Bedeutung für die d. Lit.* (1882); Witkowski, *Die Vorläufer der anakreontischen Dichtung und Friedrich von Hagedorn* (1889). Revised by Julius Goebel.

Ha'gen: town and railway junction of Westphalia, Prussia; on the river Volme; 12 miles N. E. of Elberfeld (see map of German Empire, ref. 4–C); it has extensive manufactures of metallic wares, steel, cloth, paper, leather, and tobacco. Pop. (1890) 35,428.

Ha'genau [Germ., hedge-meadow]: town of Germany; in the province of Lower Alsace; on the Moder (see map of German Empire, ref. 7–C). It was founded by Frederick Barbarossa in 1164, and was formerly a fortress which played a conspicuous part in the wars between France and Austria. It has manufactures of porcelain, stoves, and cotton and woolen fabrics. Pop. (1890) 14,752.

Hagenbach, haa'gen-baăkh', Karl Rudolph, D. D.: theologian and author; b. at Basel, Mar. 4, 1801; studied at Basel, Bonn, and Berlin; in 1823 became privat docent in Theology at Basel 1823, professor extraordinary 1824, full Professor of Theology 1829. He was a firm Protestant, but a man of catholic temper. Of the long list of his publications, the most important are *Encyklopädie und Methodologie der theologischen Wissenschaften* (Leipzig, 1833; 12th ed., by Reischle, 1889; Eng. trans. by Crooks and Hurst, New York, 1884; 2d ed. 1894); *Lehrbuch der Dogmengeschichte* (1840; 6th ed., by Benrath, 1888; Eng. trans. from 5th ed., Edinburgh, 1880, 3 vols.); and *Vorlesungen über die Kirchengeschichte von der ältesten Zeit bis zum 19. Jahrhundert* (1868–72, 7 vols.; n. e. by F. Nippold, 1885–87; partially trans.; *History of the Reformation* [2 vols., Edinburgh, 1878]; *History of the Church in the Eighteenth and Nineteenth Centuries* [New York, 1869, 2 vols.]). His sermons were published in Basel, 1858–75; his poems 1846 (2 vols., 2d ed. 1863). D. in Basel, June 7, 1874. See his *Life* by C. F. Eppler (Güterslop, 1875).—His father and his two brothers, Johann Jakob and Eduard, were distinguished naturalists.

Samuel Macauley Jackson.

Hagerstown: city; capital of Washington co., Md. (for location of county, see map of Maryland, ref. 1–C); on Antietam creek and the B. and O., the Cumberland Val., the Norfolk and W., and the W. Md. Railways; 20 miles N. W. of Harper's Ferry, 85 miles W. N. W. of Baltimore. It has manufactures of flour, machinery, agricultural implements, furniture, cigars, and fertilizers. Its railway connections make it the distributing point for a large section of country. Pop. (1880) 6,627; (1890) 10,118; (1893) estimated, 11,600. Editor of "News."

Hagersville: a town of Haldimand County, Ontario, Canada; on the Michigan Central and the Port Dover Branch of the Grand Trunk Railways; 15 miles N. E. of Port Dover (see map of Ontario, Canada, ref. 5–D). Pop. 1,500. M. W. H.

Hagga'da [Heb., narration, plur. *haggadoth*; from *higgīdh*, relate]: the part of Jewish tradition consisting of stories, legends, etc., giving a homiletical exposition of the entire Bible, as complementary to the Halacha, which gives the legal exposition and is limited chiefly to the Pentateuch. The two make up the Midrash. See the German translation of the Midrashim by A. Wünsche (n. e. Leipzig, 1890, *sqq.*). The Haggadoth are not regarded as authoritative in their teachings. S. M. J.

Haggai, hag'ā-ī [Heb. *Chaggāi*, festal; derivative of *hāg*, festival, feast], in the Apocrypha and Vulgate Aggeus: the tenth of the twelve minor prophets of the Old Testament, and the first after the Babylonian captivity. Chronologically, he follows Jeremiah, Ezekiel, and Daniel. The rebuilding of the temple, which began under Zerubbabel in 535 B. C., had been arrested by the hostility of the Samaritans. In 520 B. C., the second year of Darius Hystaspis (521–486 B. C.), Haggai roused his disheartened and sluggish countrymen to a resumption of the work. His three messages were delivered in the sixth, seventh, and ninth months (September, October, and December) of that year. His third message contains a striking Messianic prediction, which is referred to in Heb. xii. 26. Haggai is supposed by some critics to have written also a part of the book of Ezra. In the Roman martyrology Hosea and Haggai are reckoned among the saints, and commemorated on July 4. See *Acta Sanctorum*.

Haggard, Henry Rider: novelist; b. in England, June 22, 1856; entered the colonial service in 1875, serving in Natal and the Transvaal till 1879, when he retired and returned to England; published (1882) *Cetewayo and his White Neighbors*, a work of a political character that made no great impression. This was followed by two novels, *Dawn* (1884) and *The Witch's Head* (1885), which, though favorably received, were not especially popular, but in 1886 *King Solomon's Mines* took the popular fancy, and gave its author a prominent place among the narrators of the marvelous. His subsequent works have had a ready and extensive sale. Among them are *She*; *Jess*; *Allan Quatermain*; *Colonel Quaritch, V. C.*; *Maiwa's Revenge*; *Mr. Meeson's Will*; *Cleopatra*; *Allan's Wife*; *Beatrice*; and *Nada the Lily*.

Haggart, John Graham: member of Canadian cabinet; b. at Perth, Ontario, Nov. 14, 1836. He became engaged in business as a mill-owner, and was for several years mayor of Perth; entered the Dominion Parliament in 1872; re-elected in 1874, 1878, 1882, 1887, and 1891. He was appointed Postmaster-General Aug. 6, 1888, and upon the reconstruction of the cabinet under Premier Abbott was assigned the portfolio of Minister of Railways and Canals, which he now (1894) holds.

Hagiog'rapha: See Bible.

Hague, hāg, or **The Hague** (Dutch, *s' Gravenshaag*, or the count's meadow, or hedge): city of the Netherlands; the capital of the province of South Holland, and the residence of the king and seat of the States-General; in lat. 52° 4′ N. and lon. 4° 81′ E. (see map of Holland and Belgium, ref. 6–D). It is a very handsome city, with beautiful parks and broad streets, many of which are intersected by canals, with rows of linden-trees planted on both sides, and spanned by fine bridges. Among its most notable buildings are the Church of St. James, built in 1308, and famous for its hexagonal tower, with a chime of thirty-eight bells; the picture gallery,

containing large collections of the most excellent works of the Dutch school of painting; the Gevangenpoort, the Binnenhof, and the Buitenhof, old places of striking architecture, and interesting on account of their connection with the history of the country. In 1668 the triple alliance between England, Sweden, and the Netherlands was concluded here, and in 1717 the peace between Austria, Spain, and Savoy. A mile and a half N. from the city lies the Huis in 't Bosch, a royal summer palace, containing some of the finest frescoes and paintings by Rubens, and to the S. is the Castle of Ryswick, where the treaty was signed in 1697. The Hague, although chiefly important as the capital of the country, is also known for its metal-working, printing, and manufactures of furniture, carriages, and lace. Scheveningen, a favorite resort on the North Sea, is 2½ miles from the city. Pop. (1890) 160,531.

Hague, Arnold: geologist; b. in Boston, Mass., Dec. 3, 1840; educated at Sheffield Scientific School (Yale University), Heidelberg University, and Freiberg Mining Academy; assistant geologist on the Fortieth Parallel Survey (1867–77); Government geologist to Guatemala (1877); Government geologist to China (1878); geologist on U. S. Geological Survey from 1879; member of the National Academy of Sciences from 1885. His official works and writings have a wide range, but the volcanic rocks are his favorite theme. His principal writings are contained in *Descriptive Geology*, vol. ii., *Geological Exploration of the Fortieth Parallel* (1878), and in *Geology of the Eureka District, Nevada*, Monograph XX., *U. S. Geological Survey* (1892). Among his minor papers are *Volcanoes of Northern California, Oregon, and Washington Territory* (1883); *Volcanic Rocks of the Great Basin* (1884); *Development of Crystallization in the Igneous Rocks of Washoe, Nevada* (1886); and *Geological History of the Yellowstone National Park* (*Proc.* Amer. Inst. Mining Engineers, 1888). Grove K. Gilbert.

Ha-Ha Bay: See Grand Bay.

Hahnemann, haa'ne-măn, Samuel: founder of the system of homœopathy; b. at Meissen, Saxony, Apr. 11, 1755. When twenty years of age he entered the University of Leipzig with only twenty ducats in his possession, and took the course in medicine. He managed to eke out his scanty resources by translating medical works from foreign languages, chiefly from the English. After spending two years at Leipzig he went to Vienna, but was obliged to leave from lack of means and spent two years at Hermanstadt, where he was employed as physician and librarian to the governor of Transylvania. After this he entered the University of Erlangen, where he graduated in 1779. Subsequently he settled in Hettstadt, then in Dessau, where he pursued the studies of chemistry and mineralogy. His special work was in the toxicology of arsenic and the various chemical preparations of mercury. In 1790 he translated from the English Cullen's *Materia Medica*, and while at work upon this, it is said, he became impressed with the similarity of the effects of various substances, especially of quinine, to the diseases which it was known they would produce in healthy people. Certainly at this time he became intensely interested in the investigation of the law of "similars" in therapeutics, and made extensive researches in medical literature for corroborations of the truth which had dawned upon him. His first great paper upon this subject was published in Hufeland's journal in 1796, and was entitled *An Attempt to find a New Principle for the Discovery of the Healing Power of Medicines, with Observations on Existing Methods*. In it he propounds the "law of similars," and gives a list of drugs known to produce effects similar to the diseases they seem to cure. At this time he began to make experiments upon himself and his friends in order to obtain further knowledge of the pathogenetic power of drugs. He was then practicing medicine as district physician at Gommern, near Magdeburg, where he became utterly discouraged and disgusted with the prevailing methods of therapeutics. Although extremely poor, with scarcely means enough to support his family in the most frugal manner, he pursued his investigations with the greatest eagerness.

In 1805 he published in Leipzig, in Latin, a collection of all that was then known concerning the positive action of drugs, entitled *Fragmenta de viribus medicamentorum*, the first part of which (269 pages) consisted of the arrangement of the effects of drugs under each drug; the second part (470 pages) was an index to the first part. In 1810 he published, in Dresden, the first edition of his celebrated *Organon of Rational Healing*, a moderate work of 222 pages (the fifth edition of which was published in 1833). In 1811 he published in Dresden the first volume of the *Reine Arzneimittellehre*. This was followed in quick succession by five other volumes, the sixth being published in 1821. This was immediately followed by a second edition, the first volume of which was published in 1822 and the sixth in 1827. A third edition was subsequently published. These volumes comprise his collected observations of the effects of drugs upon healthy human beings.

In 1820 Hahnemann's revolutionary methods had aroused such an interest, the results of their application had proved to be so remarkable, and his success so great that an obsolete law was revived and he was forbidden to dispense his own remedies. He was thus driven from his home, but found an asylum with Ferdinand, the reigning Duke of Anhalt-Coethen, where he resided fifteen years. In 1828 he published a work of five volumes, known as *Chronic Diseases*. The first part is occupied with observations concerning the character and symptomatology of chronic diseases, and the subsequent volumes give the properties of various medicines which seemed to Hahnemann to be particularly adapted for their cure. In this work he discusses the famous and much-abused psoric theory. In 1835 a second edition of the same work was issued. During these years Hahnemann had been publishing various articles in Hufeland's journal. Homœopathy had been very much favored by the fact that about the year 1800 a violent epidemic of scarlatina ravaged Germany, during the progress of which Hahnemann discovered and announced the prophylactic virtues of belladonna.

When eighty years of age he remarried, this time a French lady, and moved to Paris, where he acquired an enormous reputation and practice, and on the occasion of the sixtieth jubilee of his doctorate received deputations from all parts of Europe, from hospitals, and from princely houses, congratulating him on the unprecedented and rapid spread of his methods. He died in Paris, July 2, 1843, leaving a large fortune and a mass of unpublished manuscript.

Samuel Hahnemann was essentially a reformer in medicine. It is difficult to realize the condition of therapeutics in his day and the enormous departure from old medicine, both in methods and results of the homœopathic system. It was a revolution in medicine such as the world had never seen. It spread with the greatest rapidity, and was adopted with avidity by many of the most cultivated physicians of Europe. While it is not true that Hahnemann was the first to announce the homœopathic method, since Hippocrates, long before the Christian era, distinctly stated that some diseases may be cured by the "law of similars," while others were cured by the "law of contraries," yet Hahnemann is as much entitled to be termed the discoverer of homœopathy as though Hippocrates never had promulgated this law. Hahnemann evidently apprehended the truth of the "law of similars" independently of Hippocrates, and, what is of vastly more importance, he immediately proceeded to fortify himself by investigation into the records of the past, and, when thoroughly convinced, at once began to investigate the properties of drugs in order to make the application of the law possible and universal. Baron von Stoerck, in Austria, before Hahnemann's time had made experiments with aconite and other drugs upon healthy people, but had done this without any conception of a law in therapeutics, and no practical results followed. Hahnemann, moreover, promulgated an entirely new theory concerning the preparation of drugs as affecting their action, namely, that of dynamization. Finding it necessary, in order to avoid intensely aggravating the sufferings of his patients by the application of large doses of a similar drug, Hahnemann, instead of mixing the curative drug with other drugs to counteract injurious effects, simply reduced the doses of drugs homœopathically applied, and finding the amount of the homœopathic remedy sufficient to remove morbid symptoms from his patients minute beyond all previous conceptions of the nature of drug action, adopted the working hypothesis of potentization or dynamization. By this he accounted for the wonderful action of such minute and apparently infinitesimal quantities of the homœopathic remedy, and also explained the development of drug power in substances apparently inert in their crude condition by means of subdivision and trituration of dry substances and of dilution and succussion of liquid substances. Hahnemann conceived the idea that each substance, particularly each drug, possesses a "spirit-like force," which could be developed by dynamization. This theory of Hahnemann's does not sound

so strange to those who know that substances owe their material form, physical and probably medicinal properties, to the peculiar groupings of their molecules and atoms; that substances absolutely identical as to atomic constitution possess quite different physical as well as medicinal properties when the molecules or atoms are differently grouped. This molecular force, determining the properties of substances, may reasonably be supposed to constitute the "spirit-like force" of a substance, as conceived by Hahnemann a century before the era of molecular physics and atomic chemistry. There is nothing in Hahnemann's theory of dynamization which conflicts with our present knowledge of chemistry or physics, and it may yet be proved to be true, experimentally, in the laboratory, as it seems to many of Hahnemann's followers to have been proved clinically.

TIMOTHY F. ALLEN.

Haidarabad', or **Hyderabad** : a native state in the Deccan, Southern India, otherwise called the Nizam's Dominions. With the Haidarabad assigned districts, known as Berar and lying to the N., the state lies between lats. 15° 10′ and 21° 41′ N. and lons. 74° 40′ and 81° 31′ E. The area of Haidarabad is 82,697 sq. miles, and that of Berar 17,714 sq. miles, making a total of 100,411 sq. miles. The state is bounded on the N. E. by the Central Provinces, on the S. E. by the Madras Presidency, and on the W. by the Bombay Presidency. It presents great variety in surface and features. It is in general well watered, though irrigation is necessary in some places. The principal rivers are the Godavari, which with its tributaries forms the northeast boundary, and the Krishna, which in the same way forms the southeast boundary. The climate is healthful, the mean temperature about 81°, and the rainfall about 30 inches. Rice, wheat, maize, several native cereals, cotton, sugar-cane, and tobacco are grown. The silk of a wild species of worm is largely utilized. Lac, suitable for use as a resin or dye, is found in great quantities. The Deccan-bred horses are well adapted to military and general uses. Among the manufactures are ornamental wares, gold-embroidered cloths, and excellent paper. The railway line from Bombay to Madras runs through the southwestern part of the state, and a branch from this runs eastward nearly across the state to Warangal. The latter is the Nizam's State Railway, and from it a short spur extends to the capital.

Nizam is a title derived from the founder, Asaf Jah, a distinguished soldier of Aurangzeb, who in 1713 was appointed Nizam-ul-Mulk, regulator of the state. Since 1765 the British Government has cultivated friendly relations with the Nizam. He has repaid them abundantly by remaining faithful in critical times. He is the principal Mohammedan ruler in India. The population in 1891 was 2,892,670 for Berar and 11,489,210 for the Nizam's Dominions proper, making in all 14,385,880. The Mahrattas are most numerous in the west. They are usually in the employ of the Government. There are also many Sikhs, Parsees, and Arabs. The chief languages are Marathi, Kanarese, and Telugu.

The capital is Haidarabad, near the center of the state; lat. 17° 22′ N., lon. 78° 30′ E.; at an elevation of 1,827 feet above sea-level, and in the midst of an immense plain; the terminus of a branch of the Nizam's State Railway (see map of South India, ref. 4–E). It was founded in 1589, is surrounded by a wall, and is celebrated for its mosques and for the fanaticism of its Mohammedan inhabitants. The palace of the Nizam is here; it is a vast waste of edifices without character. Outside the city is the residence of the British political agency; it is one of the finest European constructions in India. Five miles N. are the British cantonments of Sekanderabad and 7 miles W. is the celebrated fortress of Golconda. Pop. of the city of Haidarabad with suburbs (1881) 231,287; (1891) 312,390.

MARK W. HARRINGTON.

Haidarabad : a district and city of Sindh, Bombay Presidency, British India. The district lies on the left bank of the Indus from lat. 23° 13′ to lat. 27° 15′ N.; 216 miles long by 48 broad; area, 9,053 sq. miles. It is a vast, monotonous alluvial plain, fertile near the Indus but gradually passing eastward into the desert. The district is healthful, but the climate is severe, growing worse toward the north. Agriculture is entirely dependent on inundations and irrigation. Pop. about 750,000, more than two-thirds of whom are Mohammedans. The chief town is Haidarabad, 3 miles from the left bank of the Indus, near the apex of the delta, lat. 25° 23′ N. (see map of North India, ref. 6–A). It is on the opposite side of the river from the railway, the station being Kotri. It is believed to occupy the site of the ancient Patala, founded by Alexander the Great 325 B. C. It is the commercial center of the district, and is celebrated for its manufactures of ornamental silks, silver and gold work, and lacquered ware. Pop. (1891) 57,790.

MARK W. HARRINGTON.

Hai'duk, Hajduk, or **Hayduk** : the Magyar inhabitants of the district of Hajdu Kerület in Eastern Hungary. They are Calvinists, and descendants of Bockskay's soldiers. From 1605 to about 1700 they were free from taxation and had the privileges of nobles. They are chiefly agriculturists, and are estimated to number 70,000. The name signifies "shepherds"; sometimes designates the militia of the country; and frequently is incorrectly applied to menial attendants at German courts.

Haight, BENJAMIN I., S. T. D., LL. D.: b. in the city of New York, Oct. 16, 1809; graduated at Columbia College 1828, and at the General Theological Seminary 1831; ordained same year, and became first rector of St. Peter's church in New York; from 1834 to 1837 was rector of St. Paul's church, Cincinnati; from 1837–46 was rector of All Saints' church, New York; from 1837 to 1855 acted as Professor of Pastoral Theology and Pulpit Eloquence in the General Theological Seminary. His connection with Trinity parish began in 1855, and in 1874 he was elected assistant rector. He received the honorary degree of LL. D. from Hobart College in 1870, and was appointed a delegate from the diocese of New York to the General Conventions of 1868, 1871, and 1874. In 1873 he was elected Bishop of Massachusetts, but was obliged, from failing health, to decline. He was secretary of the diocese of New York for twenty years, and for more than ten years a member of the standing committee of that diocese. He held the office of trustee of Columbia College from 1843. D. in New York city, Feb. 21, 1879.

Revised by W. S. PERRY.

Hail [M. Eng., *hayle* < O. Eng. *hægel* : O. H. Germ. *hagal* > Mod. Germ. *hagel* < Teuton. *hagl-* < Indo-Eur. *kaghlo-*; cf. Gr. κάχληξ, pebble]: small masses of ice which fall from the clouds. Frozen precipitation from the air may be snow, which is in crystals; sleet, in part liquid and and in part frozen; ball-snow, small opaque balls, like small shot; and hail. Snow belongs to the winter season, ball-snow to the spring and autumn, and hail to the summer, while the occurrence of sleet is more a question of climate than season. Hailstones vary much in size, form, and constitution. In size they are generally from that of peas to hazelnuts, but they sometimes reach the size of walnuts or even of hen's eggs, and there are a few fairly authentic records of storms in which hailstones of much greater size have fallen. The forms are extremely varied. The commonest is that of a lens or flattened sphere, but they are often angular, or knobby, or irregular, and are sometimes massed together like a bunch of grapes. They are generally symmetrical about one axis, which is probably the vertical one during the fall, and the upper surface is often different from the other, being rougher, more irregular, streaked, sometimes spirally. Perfect spheres are rare in hail. The surface is usually opaque, and sometimes has a rough, floury look. The nucleus is sometimes an opaque ball; the rest of the stone is usually transparent ice, and may be in layers like an onion, or with an obscure radiating crystalline structure, or without apparent structure, or with these arrangements in separate layers. Microscopic analysis shows the existence in the stones of numerous minute air-bubbles and of a small number of minute foreign bodies, and analysis by melting shows the ultimate structure to consist often of minute globules of ice. The stones are elastic, and rebound when they strike rock or pavement. They clash together in the air, so that the sound of an approaching or retreating hail-storm is very characteristic. Their size, which is larger than that of ordinary raindrops, permits them to have a great velocity in falling through the air, and this, with their solidity, makes hail-storms destructive. Not only do they break windows, but the larger stones beat down crops, tear the foliage from trees, and kill delicate animals. The stones generally fall obliquely, and sometimes they are driven nearly horizontally with such speed as to make round holes through panes of glass without shattering. The explanation of the formation of hail presents many difficulties. The prevailing theory is that powerful ascending currents carry raindrops or ball-snow upward, where they are frozen and chilled, forming bodies on which

rapid condensation takes place when they fall to a warm and moist stratum below. This process may be often repeated before the stone escapes from the turmoil and reaches the ground. This would explain the successive layering of structure so often found, but would not explain the angularity of many stones. See HAIL-STORM.

MARK W. HARRINGTON.

Hailes, Sir DAVID DALRYMPLE, Lord: judge, historian, and critic; b. in Edinburgh, Oct. 28, 1726; grandson of Viscount Stair; was educated at Eton and Utrecht; became a Scottish advocate Feb. 23, 1748; made a judge of the court of session in 1766, with the title of Lord Hailes, but was never a peer; became a lord of justiciary 1776. D. of apoplexy, Nov. 29, 1792. His works relate mostly to the history of Christianity or to the antiquities and history of Scotland, and his most important work is *Annals of Scotland* (1776–79); among his other numerous works are *Canons of the Scottish Church*; *Remains of Christian Antiquity* (1776–80); *An Inquiry into the Secondary Causes which Mr. Gibbon has Assigned to the Rapid Growth of Christianity* (1786), etc. See memoirs prefixed to later editions of the *Inquiry*; Boswell's *Life of Johnson*; Brunton and Haig's *College of Justice*, p. 529.

F. STURGES ALLEN.

Hailes of Eton, JOHN: See HALES, JOHN.

Hail-storm: a storm in which hail falls. Hail-storms are secondaries (to cyclones or general storms) or local storms, of which the thunder-storm, tornado, and cloud-burst are other types. They are usually found to the S. or S. E. of a "low" or general storm, and several hundred miles from the center of the latter. They belong to the summer months and to sultry or humid weather. Hail-storms usually occur in the afternoon or early evening, and are followed by cooler weather. The barometer rises rapidly a few hundredths of an inch as the storm passes over. These storms are more common in temperate regions than in the tropics. Hail generally falls over only a narrow strip of land, which usually extends from S. W. to N. E., but the storms show themselves to be sensitive to local conditions. Hills form obstacles to their free motion, and they even avoid forests. Usually they are accompanied by marked electric phenomena, and indeed appear to be only intense thunder-storms. The theory of their mechanism is that they are small aspiration storms, like tornadoes, but this does not satisfactorily explain all their phenomena. See HAIL.

MARK W. HARRINGTON.

Hainan, hī'năăn' (literally, south of the sea, i. e. of the sea or strait which separates it from the mainland): a large island belonging to China and separated from it by a shallow channel, 12 miles wide, which connects the Gulf of Tonquin with the China Sea. The name dates from the beginning of the Yuen dynasty (1280–1368), when the island formed the southern portion of a *tao* or circuit, which included the peninsula of Lei-chow, which lies to the N. of that channel and was called *Hai-peh*. Since 878 it has been known to the Chinese chiefly as K'iung-chow, from k'iung, a variety of jade found in its hills. It extends from 17° 52′ to 20° 8′ N. lat., and from 108° 36′ to 111° 15′ E. lon. Its greatest length (from N. E. to S. W.) is about 160 miles, and its breadth is 90; area, 13,600 sq. miles.

Physical Features.—The island is mountainous. The central mass, called Wu-chih-shan, or Five-Finger Mountain, takes its name from the five important spurs which it sends out. The highest peaks probably do not exceed 7,000 feet, but heights which reach above the snow-line are spoken of. The mountains are covered with dense forests, in which the tiger and other wild animals roam, but which have never been penetrated except by the Li or aboriginal inhabitants, who have for 2,000 years maintained their independence against the Chinese.

Soil, Productions, etc.—The country is well watered and the soil fertile. The chief river is the Ta-Kiang, which rises in the mountains of the interior, and flows N. E. into the Bay of Hoi-how. Sugar-cane, sesame, cotton, tobacco, and indigo flourish, as do mangoes, bananas, lichis, and other tropical fruits. The areca-palm grows everywhere, and the cocoanut-tree attains a height of 70 to 80 feet. The chief exports are sugar, sesame oil, fragrant woods, betel-nuts, cocoanuts, cocoanut-fiber, China-grass, and hides. Copper, lead, and silver are found, and gold is said to abound.

Divisions.—The island forms a department of the province of Kwang-tung, and is divided into 3 chow and 10 hien districts, each with its walled city either on the coast or within 20 miles of it. The capital is K'iung-chow-foo, situated near the northeast coast; lat. 20° 2′ 26″ N., lon. 110° 4′ 40″ E. In the treaties of 1858–60 it is designated as a treaty-port, but was not formally opened to foreign trade until 1876. The shipping lies off Hoi-how, 3 miles distant. See HOI-HOW.

Inhabitants.—The aborigines, a small, timid people of coppery color, occupy the mountains of the interior, from which they come down at stated times to the barter-stations to trade with the Chinese, giving deerskins, deerhorns and sinews, the skins of the scaly ant-eater and of other animals, buffalo-hides, rattans, timber, betel-nuts, etc., in exchange for manufactured articles and the productions of the plain. Money is unknown among them. They differ considerably from the aborigines of Formosa, and are more nearly allied to the Miao-tse of the mainland. The women wear a serang, or short skirt, part their hair in the middle, and tattoo their faces when engaged to be married. The young people make their own matches. The men wear a kind of apron before and behind. These are the sŭng-li, or "untamed" savages. The Chinese inhabit the coasts, while the Siao-li, who early submitted to the Chinese, but do not wear the queue, and the Miao-li, descendants of some aborigines from Kwangsi on the mainland, who settled on the island some centuries ago, inhabit the lower hills and engage in farming and pasturing cattle. The Miao-li dress somewhat like the Chinese, and wear the queue in token of their submission to Chinese rule. Many Hakkas are also found. Hainan was first settled by the Chinese in 110 B. C., and subsequent years by 23,000 military families. In 1370 the population was 291,030; in 1835 it was 1,350,000; and it is now estimated at 2,500,000.

Sû-t'ung-po, the famous poet and statesman, was banished to Hainan in 1097 and spent three years on the island, which is further noted as the birthplace of Hwang-tao-p'o, the woman who, about the close of the fourteenth century, taught the women of China to spin and weave the cotton which had just been introduced into China by the Mongols.

R. LILLEY.

Hainaut (formerly **Hainault**), ā'nō': province of Belgium; bounded W. and S. by France, E. and N. by the provinces of Brabant and Flanders. Area, 1,437 sq. miles. Pop. (1891) 1,058,737. The southern and eastern parts are hilly, occupied by the Ardennes; the northern and western parts are flat, but exceedingly fertile. The region around Mons contains very extensive coal-fields, and coal, together with porcelain, flax, hemp, tobacco, and linen, forms the main export. The old province of Hainault comprised also a territory which in 1678 was ceded to France, and now forms the department of the North.

Hainburg, hīn'boorch (anc. *Carnuntum*): town of Austria; in the province of Lower Austria; on the Danube; 27 miles S. E. of Vienna (see map of Austria-Hungary, ref. 5–E). It contains many interesting remains of antiquity, among which are a Roman aqueduct which provides the town-market with water, and the so-called Roman tower with the statue of Attila; and has an imperial manufactory of tobacco, employing over 1,500 persons. Pop. (1890) 5,075.

Haiphong, hī'fŏng': the chief shipping-port for Tonquin, China; in lat. 20° 52′ N., lon. 106° 40′ E.; 14 miles from the sea in the delta of the Songka river, on a channel connecting the Cuakam and Cuatrai mouths, and in connection by steamer with Hanoi, the capital. It consists of houses and huts in swampy ground on both sides of the channel. A French official resident is stationed here, and coal mines are worked at Hongay, near by. Its prosperity has fallen off in consequence of French military operations near it. Pop. about 7,000, less than 1,000 Chinese, and about 150 French.

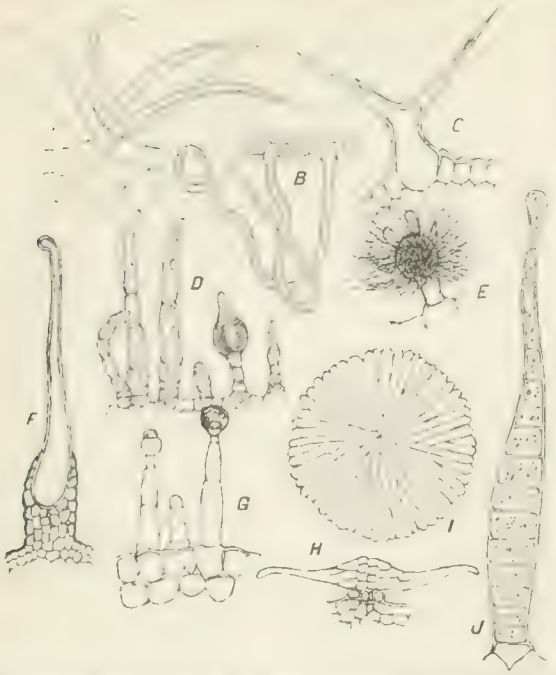
MARK W. HARRINGTON.

Hair: See KERATIN and HISTOLOGY.

Hair, Diseases of: See BALDNESS and BARBER'S ITCH.

Hairs (of plants): processes of many of the external cells of the larger plants, resembling hairs, and technically known as *trichomes*. Strictly speaking, these terms are restricted to such outgrowths from the outer layer of cells alone, and they are often confined to those which originate in a single cell, but between these simple forms and the massive outgrowths which involve several or many cells in area and depth no sharp line of demarkation can be drawn. Many hairs are single cells, which may be unbranched, or they may be branched. Root-hairs are of this kind, branching little if at all, and having very thin walls. More commonly

they are composed of a row of cells (D and J in the figure), and these again may be simple, as in the examples cited, or they may be more or less branched, a notable example being the much-branched hairs of the mullein (B). In glandular



A, clustered hairs of mallow; B, woolly hairs of hollyhock; C, stellate hair in section of *Cometiana*; D, jointed hairs (one glandular) of *Cucurbita*; E, dusty glandular hair of a fern (Gymnogramme); F, stinging hair of nettle; G, glandular hairs of primrose; H, sectional, and I, top view of shield-shaped hair of *Shepherdia*; J, a common form of hair, glandular above (from *Cistus*).

hairs (D and J) certain cells, usually the terminal one, or more, secrete a gummy, waxy, or oily matter, as in the primrose, petunia, tomato, etc. In stinging hairs the cell-sap contains an irritant poison which escapes by the breaking of the point of the cell, as in the nettle (E).

The uses of hairs are many. When young they are often aërating organs, exposing a large surface of living cells to the air. In many cases they protect the surface against the direct action of dry air, as in many white-woolly plants of the great plains of the U. S. Shield-shaped hairs (scales) doubtless have the same function. Glandular hairs are protective against insects and other animals, as are also the prickly and stinging hairs. Root-hairs are organs of absorption, and supply the plant with a large part of its watery solutions. The hairs on seeds, as in cotton, cottonwood, etc., are for the purpose of distributing the seeds by attaching them to moving objects, or by floating upon water or air currents. The hairs of the cotton-seed are long cells which soon lose their protoplasm, leaving them as flattish, collapsed tubes. For their economic importance, see FIBER.

CHARLES E. BESSEY.

Hair-spring: in a watch, the delicate spiral steel spring, the outer extremity of which is attached to the frame of the watch, the inner to the verge (or axle) of the balance-wheel, supplying the force for resisting the successive impulses given by the teeth of the escapement-wheel, and converting them into isochronous vibrations. The perfect manufacture (tempering included) of these springs, finer than hair (the combined weight of 4,000 being required to make an ounce), is one of the essentials to producing correct timepieces. See WATCHES.

Hair'tails: fishes of the family *Trichiuridæ*, genus *Trichiurus*. The silvery hairtail, *T. lepturus* (ribbon-fish, sword-fish), is from 2 to 4 feet long, of a shining, silvery color, and is caught along the Atlantic shores of the U. S.

Hairworm: See GORDIUS.

Haiti, or **Hayti** (Fr. *République de Haïti*): a republic occupying the western and smaller portion of the island of Santo Domingo, West Indies. For physical features, see SANTO DOMINGO.

Area, Population, etc.—There have been no careful surveys and no reliable census of Haiti, and the boundary with the Dominican republic is not well established. The best estimates give an area of 10,204 sq. miles, with a population (1891) of 572,000; but native writers have estimated the population as high as 960,000. Nine-tenths of the people are Negroes, or of nearly pure African blood, and nearly all the rest are mulattoes; the number of whites is very small, and they are prohibited by the constitution from holding real estate. The state religion is Roman Catholic. There are a few Protestant missionaries, who are tolerated. Forms of voudoo, or demon worship, are said to be practiced secretly in the interior, and there are stories of human sacrifices in connection with them; but such practices can only exist among the most debased class. Primary education is free, and there are over 400 national schools, but most of them are poor; the better classes send their children to private schools, of which there are many, and rich young men often finish their education in France or the U. S. The official language, and that of educated persons, is French; commonly a debased French patois is spoken. There is a constant rivalry between the Negro and mulatto inhabitants. The latter, though comparatively few in numbers, are socially and intellectually far in advance, and a large proportion of the property is held by them. While the mass of the people are ignorant, and easily led by political demagogues, Haiti has some statesmen, authors, lawyers, physicians, and merchants who would be an honor to any country, and who give bright hope for the future.

Government and Finances.—The government is republican. The constitution, founded on that of the U. S., has been several times changed and revised; the last revision was that of Oct. 9, 1889. The chief executive officer is a president, nominally elected by the people for seven years; practically he is generally chosen by congress—sometimes by the army—and his term is very liable to curtailment by revolution. He is assisted by a cabinet. Congress consists of a senate and a house of representatives, the latter elected for five years by the people; the thirty senators are chosen for six years by the house, from two lists presented by the executive and the electoral colleges. The only qualification for suffrage is a visible occupation. The republic is divided into five departments, and these again into *arrondissements* and *communes*. The capital, Port-au-Prince, is also the seat of the ecclesiastical chief, an archbishop. The highest judicial power is the tribunal of cassation at Port-au-Prince; there are civil and criminal courts in the principal towns. Owing to civil wars and the struggle with the Dominican republic the finances of Haiti have long been in very bad shape, and doubtless matters have often been made worse by bad management if not by irregularities. Under President Hippolyte affairs sensibly improved. In 1892, according to the official statement, the external debt was $4,536,504; internal debt, $4,390,547; both these bear interest at 5 per cent., with an amortization of 1 per cent. In addition there were floating debt and short loans, $2,294,000; paper currency, $4,040,504; total, $15,261,557. The revenue in 1891 was $7,322,076, nearly all from export and import duties. The Haitian dollar, or *gourde*, is equal to nearly 4*s.* sterling, or 96·5 cents U. S. currency. The national paper currency is depreciated, and subject to fluctuations; at the end of 1892 the paper dollar was quoted at 81½ cents. About $3,000,000 of national silver and copper coins are in circulation; American and French gold and silver are freely used, and the Bank of Haiti issues notes.

Industries and Commerce.—Agriculture is the chief industry, all the trade of the republic and the few unimportant manufactures depending on it. In general, the methods of cultivation in use are very primitive, and there are few improved plantations. Coffee is the most important product. Cacao, cotton, tobacco, a little sugar-cane, maize, and the ordinary tropical fruits and vegetables are cultivated. Mahogany, logwood, and other timbers are obtained in the forest. The principal exports are coffee, cocoa, cotton, and cabinet woods. The exports in 1891 were valued at $12,400,000; imports, $14,200,000. In 1890 the exports to the U. S. amounted to $2,421,221; imports from the U. S., $5,101,464. Haiti has no railways, few good roads, and a very inadequate telegraph system. European and American steamers touch regularly at Port-au-Prince, Gonaïves, and Jacmel.

Weights and Measures.—The French metric system is used for measures, and to some extent for weights, for which, however, the old French system is still generally in vogue.

History.—(For history up to the separation of the Dominican republic in 1844, see SANTO DOMINGO.) After the fall of Boyer in 1843 a period of confusion followed in the western part of the island. Hérard, Guerrier, and Pierrot successively held the presidency for brief periods; but in the constant struggle between the blacks and mulattoes there was little chance for peace. In 1846, under President Riche, a republican constitution was proclaimed, which has been the basis of succeeding ones; but in 1847 Riche was overturned by the Negro Soulouque, who, in 1849, proclaimed himself emperor as Faustin I. His tyranny and ridiculous vanity excited the hatred of the better classes, and especially of the mulattoes, who repeatedly revolted. He renewed the war with the Dominican republic, ruined the finances, provoked quarrels with foreign countries, and endeavored to establish a government monopoly of sugar and coffee. At length the mulatto Gen. Geffrard, whom he had condemned to death, revolted, and was proclaimed president at Gonaïves, Dec. 22, 1858. Shortly after Soulouque was routed, and Geffrard re-established the constitution of 1846, with some changes. He was overturned in 1867 by Salnave, who on June 14 of that year promulgated a new constitution. Salnave was deposed and shot Jan. 15, 1870. He was succeeded by Nissage Saget (May, 1870), Dominique, and Boisrond-Canal. Salomon became president Oct. 22, 1879, and was re-elected in 1886, but deposed in 1888. A civil war between rival aspirants for the presidency resulted in the ascendency of Télémaque until the election of Hippolyte Oct. 9, 1889. Hippolyte died Mar. 24, 1896, and was succeeded by Gen. Theresias Simon Sam.

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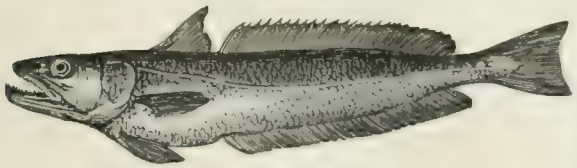
HERBERT H. SMITH.

Hajji, or **Hadji, Khalifah** [from Arab. *hajj*, pilgrimage, deriv. of *hajja*, set out, go on a pilgrimage; cf. *hājjī*, pilgrim; *Khalifa*, successor]: the surname, or rather the title, of the Turkish historian and scholar Mustafah-ben-Abdallah. He was born in Constantinople toward the close of the sixteenth century, and died there in 1658. He held a government position, and in that capacity he accompanied the Turkish army in several campaigns. In 1638 he made a pilgrimage to Mecca, and on his return took the cognomen Hadji. In 1642 he resigned his position in order to devote himself exclusively to science and literature. About 1648 he became assessor (Khalifah) to the principal of the Imperial College. His principal works are *Lexicon Bibliographicum et Encyclopædicum*, containing the most complete bibliographical representation of the Persian and Arabic literatures, originally written in Arab, but translated into Latin by Flügel (Leipzig, 1835–54, 6 vols. in quarto); a *History of the World from the Creation to 1655*, principally occupied with the deeds and exploits of Asiatic dynasties; a *History of the Ottoman Empire*; and a *History of the Maritime Wars of the Turks*, which has been twice translated into English, first from the Persian version, and afterward from the Turkish original, by James Mitchell (London, 1831).

Revised by C. H. TOY.

Hake [M. Eng. *hake*, name of a fish; cf. Norweg. *hake-fisk*, hook-fish, from shape of under jaw; Norweg. *hake*, hook; cf. Germ. *haken*. It is uncertain whether the word is of Scandinavian origin or English]: a name applied to the



Hake.

Merluccius merluccius, a fish of the cod family, caught along the coasts of North America and Europe. They are both coarse and poor. The name *hake* is also given in the U. S. to species of forked hake (*Phycis*) or FORKED BEARDS (*q. v.*).

Revised by D. S. JORDAN.

Hakim-Ben-Allah, haa'kim-ben-aal'laah' [Arab. (just), ruler, son of Allah], or **Ben-Ha'shem**: an Arabian impostor of the eighth century; also known under the name of MOKANNA (the veiled) and SEGENDE NAH (the moon-maker). The former of these surnames he received from his habit of wearing a veil before his face in order to hide his ugliness, or, as he said himself, in order to conceal the radiance of his eyes; the latter from a trick of legerdemain he once performed, causing a luminous body resembling a moon to issue from a deep well and remain visible for a whole week. He succeeded in gathering a number of adherents, with whom he seized several strong places near Nekshib and Kish. The Caliph Mahdi sent an army against him, and soon all his strongholds were taken. Shut up in the last of his fortresses, he poisoned his soldiers by wine at a banquet, and burned himself up in order to make people believe that he had ascended bodily to heaven. Moore has used the story of Hakim-Ben-Allah's life for the episode of the Veiled Prophet of Khorassan in *Lalla Rookh*.

Revised by J. R. JEWETT.

Hakkas (literally, stranger families): a class of hardy and industrious but despised and much-persecuted people found in Southern China, chiefly in the provinces of Kwangtung and Fuh-kien, whence they have spread to the neighboring islands of Formosa, Hongkong, and Hainan. Their origin is unknown. They are supposed, however, by those who have studied their family records to be the descendants of certain bodies of Chinese who were early compelled by "bloody persecutions," or by the oppressions incident to the political disturbances of their own times (the third century B. C. is mentioned), to abandon their homes in Shantung and other northern provinces, and to seek peace and safety in the south. From the first they seem to have been the objects of much hostility on the part of the punti, or native populations, among which they tried to settle as they moved southward, and hundreds of thousands of them have lost their lives in the persecutions to which they have been subjected for centuries. The reasons for this hostility are as little known as are the causes of their migration southward.

The language of the Hakkas differs widely from the other dialects of the southern provinces, and is more akin to the "Mandarin," or official dialect spoken in the north. Their customs and dress also differ. The sexes are not so strictly separated in domestic life as they are among the other Chinese, and the women do not bind their feet.

The total number of Hakkas is not known. In the province of Kwangtung they form one-third of the population, and the prefecture of Kia-ying-chow in that province is entirely peopled by them. In many other localities they form from one-third to one-half of the population. Several thousands are found in Hongkong, where they are employed as stonemasons, blacksmiths, porters, barbers, etc. In 1891 out of a Chinese population of 227,989 Chinese found in the Straits Settlements, 16,736 were Hakkas. Hung-siu-tsiuen, the originator and the head of the Taiping rebellion, and most of his generals were Hakkas, but the great body of the Hakkas found in Kwangtung remained loyal to the Government. The Hakkas of Kia-ying-chow are noted for their learning. See the Hongkong *Daily Press* for 1886; *Notes and Queries on China and Japan*, vol. i.; *The China Review* (vol. ii., Hongkong, 1873–74); *The Chinese Recorder* (vol. ix., Shanghai, 1878); and *Things Chinese* (London and New York, 1893). R. LILLEY.

Hakluyt, hak'loot, RICHARD: writer on geography; b. in London in 1553; studied at Oxford. He was master of arts and professor of divinity when in 1584 he accompanied the English ambassador to Paris, and there he published in 1587 an account of a voyage to Florida by Laudonnière, which he found in the library; also Peter Martyr's work, *De Novo Orbe*. But the greater part of his reputation he owes to his *Principal Navigations, Voyages, Traffiques, and Discoveries of the English Nation* (3 vols., 1598–1600), in which are accounts of 220 voyages, accompanied with many curious documents. He became prebendary (1602) and archdeacon (1603) of Westminster; subsequently was rector of a church at Wetheringset, Suffolk. In 1609 he published a translation of Fernando de Soto's discoveries in Florida, entitled *Virginia Richly Valued*. He died in London, Nov. 23, 1616, and was buried in Westminster Abbey. The Hakluyt Society was established in London in 1846 for the purpose of preserving and editing accounts of geographical or historical interest.

Hakodate, hä̆-kō-daa'tā: a seaport of Japan, and the principal city in the island of Yezo; finely situated on the northern slope of a lofty hill known as the Peak (1,106 feet), and partly on the isthmus which joins the hill to the mainland (see map of Japan, ref. 3 E). The harbor, which is landlocked and magnificent in its proportions, attracts the trade in fish, seaweed, and other marine products of the whole Yezo coast; it is also a favorite naval resort. Hakodate is one of the open ports; has a small foreign settlement, several consulates, a Roman Catholic cathedral, a Greek church, and Protestant churches and schools. The fort in the immediate neighborhood, where the adherents of the Tokugawas made a final stand in 1868, is still in existence. There is daily steam-communication with Awomori, across the Straits of Tsugaru. Amount of exports in 1890, $5,088,710; of imports, $5,080,220. Native pop. (1890) 45,477; foreigners (not Asiatics), 40. J. M. Dixon.

Hakone, hä̆-kō'nā: a village and lake in Japan; on the shore high road between Tokio and Kioto; about 60 miles S. W. of the former city, and 2,100 feet above sea-level. Here the emperor has a summer residence on an island in the lake, and it is a favorite summer resort of foreigners.
J. M. D.

Halacha [Heb., rule of procedure, deriv. of *halakh*, go]: the Hebrew oral and traditional law, handed down, as Jews believe, from Moses and the other eminent teachers of antiquity, and first reduced to writing in the early centuries of the Christian era. The general code is called Mishna (*q. v.*), but the Halacha is much more extensive.

Hal'berd [from O. Fr. *halebarde*: Ital. *alabarda*, of Teuton. origin; cf. M. H. Germ. *helmbarte*; *helm*, handle (: Eng. *helm*, tiller) + *barte* > Mod. Germ. *barte*, broadax]: a weapon combining a long cutting edge on one or on each side with the head of the lance, and mounted on a long handle. During the Middle Ages and the sixteenth century it assumed many different forms, some extremely irregular and fantastic. It was once borne by bodies of troops called halberdiers and by various non-commissioned officers. Its use is now limited to ceremonial occasions. In Great Britain the partisan, one form of the halberd, is borne by the Yeomen of the Guard. Revised by Russell Sturgis.

Hal'berstadt: town of Prussia; in the province of Saxony, on the Holzemme; 29 miles S. W. of Magdeburg (see map of German Empire, ref. 4–F). It is an old town; many of its houses are ornamented with curious wood-carvings. Its cathedral, rebuilt in the thirteenth century, and restored between 1850 and 1871, is in the finest Gothic style, and contains many interesting antiquities; the Church of Our Lady, built in the eleventh century, is in the Byzantine style. Halberstadt has considerable manufactures of soap, oil, leather, gloves, etc. The most important educational institutions of the town are the gymnasium, which has a library, a first-class Realschule, the normal school, the deaf and dumb institute, and the provincial trade school. Pop. (1890) 36,501.

Halbertsna, Fjalling: gynæcologist; b. at Sneek, in Holland, July 15, 1841; educated at Universities of Leyden, Tübingen, Vienna, and Paris; professor in the University of Groningen 1866–67; since professor in the University of Utrecht; author of *The Services of the English to Gynæcology* (1867); *On Ovariotomy* (1873); *On Craniotomy* (1874), all published in Dutch; and several important professional essays and monographs. C. H. T.

Halcyon: See Kingfisher.

Halcyone: See Alcyone.

Haldane, James Alexander: clergyman; brother of Robert Haldane; b. at Dundee, July 14, 1768; educated at Edinburgh; in the navy 1785–94; began lay-preaching 1797; was ordained Congregational pastor in Edinburgh 1799, and continued there till death, Feb. 8, 1851. In 1808 he became a Baptist. He published numerous controversial works.
S. M. J.

Haldane, Robert: philanthropist; b. of Scottish parents in London, Feb. 28, 1764; served 1780–83 in the royal navy; was converted to Christianity, of the divine origin of which he had entertained doubts, and devoted his life and large fortune thenceforth to missionary work. Forbidden in 1796 by the East India Company to work in India as a missionary, he became a lay-preacher, and his field-preaching roused great religious feeling in Scotland. In 1799 he left the National Church and joined the Congregationalists, and in 1808 the Baptists. He built many "tabernacles" or places of worship, did much for the African and French missions, and for the Bible and continental evangelical societies. Among his works are *Evidence and Authority of Revelation* (Edinburgh, 2 vols., 1816; 2d ed. 1834); *Exposition of Romans* (3 vols., 1835; new edition, New York, 1853); *Books of the Old and New Testament Proved to be Canonical and their Verbal Inspiration Maintained and Established* (1830; 5th ed. 1845), etc. D. in Edinburgh, Dec. 12, 1842. See *Memoirs of R. and J. A. Haldane*, by Alex. Haldane (1852; 4th ed. 1855). Revised by S. M. Jackson.

Hal'deman, Samuel Stehman, A. M., LL. D.: naturalist; b. near Columbia, Pa., Aug. 12, 1812; pursued his studies at Dickinson College until 1830; was chosen assistant in the New Jersey Geological Survey (1836), and held the same office the ensuing year in the Pennsylvania Geological Survey. While engaged in this capacity he discovered the oldest fossil known at that time—viz., *Scolithus linearis*. He occupied the chair of Natural History in the University of Pennsylvania (1851–55); took the corresponding professorship in Delaware College 1855, and in the same year became Professor of Geology and Chemistry at the Agricultural College of Pennsylvania; was Professor of Comparative Philology in the University of Pennsylvania. His work entitled *Analytic Orthography*, which consists of investigations into the philosophy of language, obtained for him in England the highest Trevellyan prize over eighteen competitors (1858). D. at Chickies, Pa., Sept. 10, 1880.

Hale, Benjamin, D. D.: educator; b. at Newbury, Mass., Nov. 23, 1797; graduated at Bowdoin College (1818) with high honors, and at once became principal of the Saco Academy; studied theology at Andover Seminary, and began preaching in 1822; was elected tutor at Bowdoin College 1823, and principal of the Gardiner Lyceum 1822–27; in 1827 became Professor of Chemistry and Mineralogy at Dartmouth College, Hanover, N. H., remaining until the office was abolished by the trustees in 1835; took orders in the Protestant Episcopal Church; was chosen president of Geneva (now Hobart) College in 1837. He was author of *Scriptural Illustrations of the Liturgy* (1835); *Liberty and Law* (1838); *Education in its Relations to a Free Government* (1838); *Historical Notices of Geneva College* (1849); and other works. His *Life*, with selections from his sermons, was published by the Rev. Malcolm Douglass, D. D., in 1883. D. at Newbury, Mass., July 15, 1863.
Revised by W. S. Perry.

Hale, Charles Reuben, S. T. D., LL. D. (Griswold College, 1889): Episcopalian bishop; b. at Lewistown, Mifflin co., Pa.; graduated from the University of Pennsylvania, Philadelphia, 1858; chaplain in the U. S. navy 1863; rector of churches in Pennsylvania, New York, and Maryland 1870; 1886–92 Dean of Davenport, Ia. He was secretary to the Italian Church reformation commission 1869; secretary to the Russo-Greek committee 1871; clerk to the commission of the House of Bishops on correspondence with the hierarchs of the Eastern Churches 1874; and with the Old Catholics 1874; secretary (for America) of the Anglo-Continental Society of England 1874; secretary to the commission of the General Convention on ecclesiastical relations 1877. In theology he is an Anglican. His published writings include *Reports* (of the Russo-Greek committee, New York, 1872 and 1875; of the committee on ecclesiastical relations, New York, 1881 and 1884); *Paper* (on the Russian Church, read before the Church Congress, Leicester, England, 1880; republished, Baltimore, 1881); *Sermons* (in St. Timothy's church, New York city, 1874, by appointment of the Most Rev. the Primus of Scotland, Oct. 5, 1884); *Report of the Committee appointed by the Philomathean Society of the University of Pennsylvania to Translate the Inscription on the Rosetta Stone* (privately printed, Philadelphia, 1858; 2d ed. 1859); *A List of all the Sees and Bishops of the Holy Orthodox Church of the East* (New York, 1872); *The Mozarabic Liturgy, and the Mexican Branch of the Catholic Church of our Lord Jesus Christ Militant upon Earth* (New York, 1876); *Russian Missions in China and Japan* (1878); *An Order for the Holy Communion, arranged from the Mozarabic Liturgy* (Baltimore, 1879; two supplements to the above 1879); *An Office for Holy Baptism, arranged from the Mozarabic and Cognate Sources* (1879); *The Universal Episcopate: a List of the Sees and Bishops in the Holy Catholic Church throughout the World* (Baltimore, 1882); *The Eucharistic Office of the Christian Catholic Church of Switzerland, Translated and Compared with that*

in the Missale Romanum (New York, 1882). Dean Hale was consecrated Assistant Bishop of Springfield (with the title of Bishop of Cairo), Ill., July 26, 1892. W. S. PERRY.

Hale, EDWARD EVERETT, D. D.: philanthropist and author; b. in Boston, Mass., Apr. 3, 1822; educated at the Boston Latin School and at Harvard College; studied divinity in private; entered the ministry of the Unitarian denomination; was settled at Worcester, Mass., in 1846; became minister of the South Congregational (Unitarian) church of Boston in 1856. In his profession Dr. Hale is eminent for his interest in social and philanthropic movements, for pastoral activity, denominational zeal, and power of organization. To the general public he is best known through his writings, which include *The Rosary* (1848); *Margaret Percival in America*; *Sketches of Christian History*; *Kansas and Nebraska* (1854); *Letters on Irish Emigration*; *Ninety Days' Worth of Europe*; *If, Yes, and Perhaps* (1868); *Ingham Papers*; *Sybaris and other Homes*; *How to Do It*; *Ten Times One is Ten* (1870); *Reformation*; *His Level Best and other Stories* (1870); *Ups and Downs*; *Christmas Eve and Christmas Day*; *In His Name* (1874); *Our New Crusade*; *Workingmen's Homes*; *A Family Flight through Egypt and Syria* (1882); *About Home* (1884); *Through Mexico* (1886); the last three and *The Story of Spain* (1886) in collaboration with Susan Hale, and *Franklin in France* (1887) in collaboration with his son, Edward E. Hale; *The Story of Massachusetts* (1891); *East and West* (a novel, 1892). He edited the Boston edition of Lingard's *History of England*, was editor of *The Christian Examiner*, the organ of the Unitarian body, and founded in 1869 *Old and New*, a monthly magazine semi-theological in its character, which he edited until it was merged into *Scribner's Monthly*. Two of his shorter stories, *A Man without a Country* and *My Double and how He Undid Me*, have given him a brilliant fame, the former making a deep impression during the civil war. Dr. Hale is a popular lecturer, a counselor of Chautauqua University, and now (1894) chairman of the council of the National Conference of Unitarian and other Christian Churches. Revised by J. W. CHADWICK.

Hale, EDWIN MOSES, M. D.: b. at Newport, N. H., Feb. 2, 1826; became a printer in Newark, O.; graduated from the Cleveland Homœopathic Medical College; practiced twelve years at Jonesville, Mich.; became in 1863 Professor of Materia Medica in the Hahnemann Medical College, Chicago; in 1870 Professor of Medical Botany and Pharmacology; and in 1871 became also special lecturer in the same institution on diseases of the heart. From 1880 till 1884 he was Professor of Materia Medica and Therapeutics in Chicago Homœopathic College; has long been editorially connected with professional journals. Author of many monographs; *New Remedies* (1862; 3d ed. 1867); *On Sterility* (1868); *Pocket Manual of Domestic Practice* (1870); *Lectures on Diseases of the Heart* (1871); *Treatise on Cerebro-spinal Meningitis* (1875), and other works.

Hale, HORATIO: ethnologist; b. in Newport, N. H., May 3, 1817. His father, David Hale, was a lawyer, and his mother, Sarah J. Hale (1788–1879), was a popular author. He graduated at Harvard in 1837, and the next year was appointed philologist to Capt. Wilkes's scientific expedition, which made a three-year exploration of the Antarctic and Southern Pacific seas. Here he studied native languages and customs, and so was led into the allied science of ethnology. After the return of Capt. Wilkes, Hale traveled widely and pursued investigations in literature and anthropology. Still later he was admitted to the Chicago bar, and practiced his profession at Clinton, Ontario, Canada, where he died Dec. 29, 1896. He was a member of many learned societies in America and Europe, and presided over the section of anthropology at one of the annual meetings of the American Association for the Advancement of Science. Some of his memoirs and monographs have provoked much discussion, notably that on *The Origin of Language and the Antiquity of Speaking Man*. Besides this he published *Ethnography and Philology* (Philadelphia, 1846), being the seventh volume of the Wilkes expedition reports; *The Iroquois Book of Rites* (Philadelphia, 1883); *Indian Migrations as Evidenced by Language* (Chicago, 1883); and a *Report on the Blackfoot Tribes*.

J. W. POWELL.

Hale, JOHN PARKER: U. S. Senator; b. at Rochester, N. H., Mar. 31, 1806; graduated from Bowdoin College, Maine, 1827; studied law, and was admitted to the bar in 1830; became a member of the New Hampshire Legislature 1832; member of Congress 1843–45; occupied the chair of U. S. Senator 1847–53 and 1855–65, and was U. S. minister to Spain 1865–69. He was the candidate of the Free-soil party for President in 1852, receiving 157,680 votes. D. at Dover, N. H., Nov. 19, 1873.

Hale, Sir MATTHEW: jurist; b. at Alderley, Gloucestershire, England, Nov. 1, 1609; orphaned at the age of five; studied at Oxford University (1626–29); entered Lincoln's Inn for the study of law 1628, and was there called to the bar; entered Parliament in 1654, and was made a judge of common pleas under Cromwell 1654–58; was in the convention Parliament 1660, and took an active part in the restoration of Charles II.; was made chief baron of the exchequer and knighted 1660; was chief justice of the king's bench 1671–76. He was the last English judge before whom persons were convicted and sentenced for witchcraft. He was, notwithstanding his belief in the existence of witches, a man of justice, moderation, wisdom, and wide learning, as well as of devout religious character. D. at Alderley, Dec. 25, 1676. He published a few works before his death, and left a great many manuscripts, concerning the publication of which he gave instructions in his will. He wrote on scientific, legal, and theological subjects, but left little of permanent value. Among his legal works are the *History of the Pleas of the Crown*; *History and Analysis of the Common Law*; *Analysis of the Law*. Among his religious works are *An Abstract of the Christian Religion*; *Contemplations, Moral and Divine*; *The Knowledge of Christ*, etc. See his *Works, Moral and Religious* (London, 1805, 2 vols.).

F. STURGES ALLEN.

Hale, NATHAN: soldier; b. at Coventry, Conn., June 6, 1755; in 1769 was sent to Yale College with a view to his entering the ministry; taught school at Moodus, East Haddam, and New London; on receipt of the news of the battle of Lexington joined an infantry company, and in July, 1775, was made a lieutenant in Col. Webb's regiment; took part in the siege of Boston, and on Sept. 1, 1775, was promoted to the rank of captain. On the reorganization of the forces in 1776 Hale received a commission in the regular army and joined the Nineteenth Continental Regiment of foot. On the evacuation of Boston by the British Mar. 17, 1776, he went to New York with his regiment, and on Aug. 27 took part in the battle of Long Island. Among his daring exploits was the capture at midnight of a British sloop loaded with provisions anchored under the protection of a man-of-war in the East river. About this time he was ordered to do scouting duty as captain of a company in the Connecticut Rangers, and hearing that Washington was anxious to obtain information of the situation, strength, and plans of the enemy on Long Island and in New York, Hale volunteered to act as a spy. Disguised as a Tory schoolmaster, he visited the British camps and obtained the desired information, but when about to return was recognized and seized. He was sentenced to death by Sir William Howe on Sept. 21, 1776, and on the following day was hanged near the present junction of Market Street and East Broadway. His last words were, "I only regret that I have but one life to lose for my country." The memorials of Hale include two statues at Hartford and one in City Hall park, New York city. See the *Life* by Stuart (Hartford, 1856), and *The Two Spies, Nathan Hale and John André*, by Lossing (New York, 1886).

Hale, NATHAN, LL. D.: journalist; b. at Westhampton, Mass., Aug. 16, 1784; graduated at Williams College 1804; began the study of law, but was two years instructor in the academy at Exeter, N. H., when he removed to Boston, and in 1810 was admitted to the bar; after practicing his profession four years and editing at the same time *The Weekly Messenger*, he purchased (Mar., 1814) the Boston *Daily Advertiser*, the pioneer daily in New England; Federal in politics at first, it subsequently became an advocate of the Whig and Republican parties, Mr. Hale remaining editor during his life. During the discussion of the Missouri (1820) and Nebraska (1854) bills the journal took a decided and influential stand in opposition, but was the first to advocate the free colonization of Kansas. He was the first president of the Boston and Worcester Railroad, and held the position nineteen years; was influential in promoting the introduction of water into the city of Boston, and at the head of the commission for that object; was one of the founders of *The North American Review*, also of *The Christian Examiner*; at various times elected to the Massachusetts Legislature. Mr. Hale was a nephew of NATHAN

Hale (*q. v.*), the Revolutionary patriot, and father of the Rev. Edward Everett Hale. D. in Brookline, Mass., Feb. 9, 1863.

Hales, John, M. A.: "the ever-memorable"; ecclesiastic and author; b. at Bath, England, Apr. 19, 1584; entered Corpus Christi College, Oxford, 1597; became a fellow of Merton 1605, of Eton 1613; Professor of Greek at Oxford 1612; went to the Synod of Dort 1618, and was there turned against Calvinism, and was thenceforth free from all sectarian prejudice; Canon of Windsor 1639; ejected 1642; dispossessed of his Eton fellowship 1649; was an irenic or latitudinarian, and one of the earliest of what is now called the Broad Church school, hence denounced in his own time as a trimmer; after his death was issued his *Golden Remains* (London, 1659; 4th ed. 1750), which shows that he had a quaint and vigorous style, but is hardly worthy of his great fame for learning and ability. D. at Eton, May 19, 1656. His complete works were published in three volumes at Glasgow in 1765. Revised by S. M. Jackson.

Hales, William, D. D.: author; b. in Cork, Apr. 8, 1747; became fellow of Trinity, Dublin, in 1768; Professor of Oriental languages 1782; rector of Killeshandra 1788. Among his scientific works are *Sanorum doctrina rationalis et experimentalis* (London, 1778); *Analysis æquationum* (Dublin, 1784); *Analysis harmonum* (1800); *New Analysis of Chronology* (London, 1809–12, 3 vols.) Among his other writings are *Prophecies regarding our Lord* (1808); *The Holy Trinity* (1818); *Primitive Church of the British Isles* (1819). D. in Cork, Jan. 30, 1831. Revised by S. M. Jackson.

Halévy, ȧ-lā'vē', Jacques François Élie Fromental: composer; b. in Paris, May 27, 1799. He was of Jewish parentage, and the family name was originally Lévi; studied successfully at the Conservatoire, and was a favorite pupil of Cherubini; was enabled to spend two years in Italy, having won a first prize for composition. There his opera *Pygmalion* was written; this was followed by others, *Phidias*, *The Artisan*, which had a local reputation. The opera *The Jewess* (1835) was the foundation of his fame. Other well-known works are *The Queen of Cyprus*, *Charles VI.*, *The Queen's Musketeers*, *The Wandering Jew*, *The Tempest*, *Valentine d'Aubigné*, and *The Sorceress*. He produced some thirty operas in all, tragic and comic. He was a talented and cultivated composer, painstaking and scholarly, but without the gift of genius. He was a writer on musical topics, and published also a volume entitled *Souvenirs and Portraits*. Louis Philippe and his family conferred distinction on him; he was made professeur de haute composition at the Conservatoire, member and perpetual secretary of the Academy of Fine Arts, and officer of the Legion of Honor. D. in Nice, Mar. 17, 1862.

Halévy, Léon: author; brother of Jacques Fromental Halévy; b. in Paris, Jan. 14, 1802; was Professor of French Literature at the École Polytechnique from 1831 to 1834, and afterward held a position in the administration from 1837 to 1853, when he retired in order to devote himself exclusively to literature. He produced many works on literature, philosophy, history, foreign languages, etc. One of these works appeared with the remarkable epigraph: "The golden age, which a blindfold tradition has placed behind us, is in front of us." His principal works are *Literary, Philosophical, and Industrial Opinions* (which appeared anonymously in 1825, and was written with the co-operation of Olinde Rodriques, Combe, and other adherents of Saint-Simon); *The Barcelona Plague*, *Summary of the History of the Hebrews* (1827–28); *Summary of the History of French Literature*. He wrote also many plays for Paris theaters: *The Spy*, *Czar Demetrius*, *Indiana*, *Beaumarchais at Madrid*, *The Golden Broomstick*, *Electra*, etc. Still greater attention was attracted by his translations from Horace (his literary *début*), the Greek tragedy, and Shakspeare (*Macbeth*), and his two collections of fables. D. at St.-Germain-en-Laye, Sept. 3, 1883.

Halévy, Ludovic: son of Léon Halévy; dramatic author and novelist; b. in Paris, July 1, 1834; held for nine years a position in the administration, which he resigned in 1861. He is one of the most popular authors of light plays or vaudevilles for the French stage. He wrote, chiefly in connection with Henri Meilhac, nearly all the librettos of the opéra-bouffe composer Offenbach. Among the works of these authors are the following: *La Belle Hélène* (1865); *Orphée aux Enfers* (1866); *Barbe-bleue*, *La Vie Parisienne* (1868); *La Grande Duchesse de Gérolstein* (1867); *Les Brigands* (1869); *Carmen* (1875). In connection with Meilhac he produced a large number of dramatic works, including *Le Menuet de Danaé* (1861); *Le Brésilien*, *Tout pour les Dames!* (1868); *Frautrou*; *Le Roi Candaule* (1873); *La Cigale* (1877); *La Roussotte* (1881). He has, in addition, published numerous romances, among which *L'Abbé Constantin* (1882) is notable. In 1886 he was admitted to the French Academy.

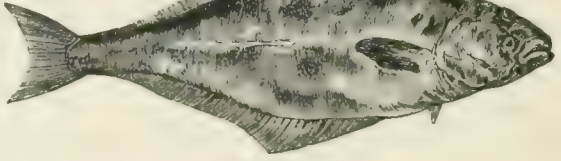
Half Cadence [from Lat. *cadentia*, a falling, deriv. of *cadere*, fall]: in music, the name sometimes applied to a cadence on the dominant, otherwise called the "imperfect" cadence, as contradistinguished from the perfect on the tonic. In the examples see the half (or imperfect) cadence at *a*, and the perfect at *b*:

Half-castes: See Eurasians.

Half Note: the designation of a minim, as having half the duration of a semibreve, the latter being regarded, in modern music, as the standard of measure, and hence called a *whole* note. See Note.

Hal'iburton, Thomas Chandler: author; b. at Windsor, Hants County, Nova Scotia, in 1797; was educated at King's College, Windsor; after studying law was called to the bar in 1820; practiced for a number of years in Nova Scotia, and subsequently became judge of the court of common pleas. He wrote *The Clockmaker, or Sayings and Doings of Samuel Slick of Slickville* (1837), which became very popular in the U. S. and Great Britain; *Traits of American Humor* (1852), and other books. In 1842 he removed to England and from 1859 till 1865 represented Launceston in Parliament. D. at Isleworth, England, Aug. 27, 1865.

Halibut [for older *holibut* < M. Eng. *halybutte*; *haly*, holy + *butte*, a flounder. Perhaps named from being eaten especially on holidays]: the *Hippoglossus hippoglossus*, a large fish of the family *Pleuronectidæ*, sometimes found to weigh more than 600 lb. It is caught on both sides of the Atlantic, and especially near Greenland and Iceland and



The halibut.

on the Banks of Newfoundland in the winter season. It is also abundant in the waters of Alaska, and is found on offshore banks as far southward as Monterey. Its flesh is justly prized. Its upper side is dark, its lower white, the eyes being both upon the upper side, as in the other flounders. See Fisheries.

Halicarnas'sus [viâ Lat. from Gr. Ἁλικαρνασσός. The modern name is *Budrun*]: a Greek city of Caria, the birthplace of Herodotus, situated in a crescent-shaped bay on the northern side of the Ceramian Gulf. The approach to the city was protected by the fortified island of Arconnesus (now Orak Adasi). It was colonized by Dorians from Trœzene, and once belonged to the Dorian Hexapolis, but was rejected in consequence of a quarrel at one of the conventions, and afterward became the great center of Persian influence. It fell under the power of a line of Carian princes, vassals of the Persians, of whom Mausolus (Satrap of Caria in 378 B. C.) was the most celebrated. Though Greek in language and culture, it was Persian in politics. Alexander was unable to take its citadel, Salmacis (so called from a spring that arose on the height), but destroyed the rest of the town, which never regained its greatness. The tomb of Mausolus (see Mausoleum), which was erected by his wife Artemisia (about 350 B. C.), was reckoned by the Greeks as

one of the seven wonders of the world. In 1857 C. J. Newton excavated Halicarnassus, and besides the site of the mausoleum discovered the statue of Mausolus, and many of the sculptures that adorned the tomb. These sculptures were executed by the first artists of the day: Scopas, Leochares, Bryaxis, and Timotheus. They are preserved in the British Museum.

LITERATURE. Mrs. Mitchell in her *History of Ancient Sculpture* (New York, 1888, pp. 463–474), describes the site of Halicarnassus, and gives an account of its history down to modern times; see also Newton, *A History of Discoveries at Halicarnassus* (London, 1862–63), and his *Travels and Discoveries* (ii., pp. 84–137); Droysen, *Geschichte des Hellenismus* (Gotha, 1877, i., pp. 208–218).

J. R. S. STERRETT.

Halicor'idæ [Mod. Lat., liter., tribe of the sea-maids; Gr. ἅλς, ἁλός, salt, sea + κόρη, girl, maiden + patronymic ending -ίδαι, descended from]: a family of mammals of the order SIRENIA (*q. v.*), having a fish-like form, with the tail emarginated or forked behind; the head moderate; intermaxillary bones with the anterior portion deflected, and with the branches prolonged backward; with two upper incisors, in the male at least; and with the molars successively increasing in size backward, with simple hollow roots, and with crowns capped by few tubercles. A single living genus (*Halicore*) represents this family; its species are found in the Red Sea and along the eastern coasts of Africa and the shores of the Indian Ocean, Australia, etc. The best-known species is the DUGONG (*q. v.*), *Halicore dugong*, of the Red Sea, the taschasch of the Bible, the skin of which was employed in the construction of the tabernacle, whence the name given by Rüppell, *Halicore tabernaculi*.

THEODORE GILL.

Halifax: town of England; in the county of York, on the Hebble; 194 miles N. N. W. of London (see map of England, ref. 7–H). It is a flourishing and rapidly growing town with very large manufacturing interests. Its carpet-works are the largest in the world, and its manufactures of woolen and worsted rank next to those of Leeds and Bradford. There are also manufactures of chemicals, iron, boots, and mill-machinery. It has several parks, a free library and museum, a grammar school, a bluecoat school, a flourishing co-operative society, a mechanics' institute, home and school for orphans, a handsome town-hall, a market-hall erected in 1779, and a number of handsome churches. The first recorded mention of Halifax was made in the twelfth century. Its manufacturing importance began in the fifteenth century. Pop. (1891) 82,864; including the registration district, 185,272. It sends two members to Parliament.

Halifax: capital and chief city of Nova Scotia; situated near the center of the southeast or Atlantic coast of the province; lat. 44° 39′ 42″ N., lon. 63° 35′ 30″ W. (see map of Quebec, etc., ref. 3–B). It is built on the eastern slope of a peninsula formed by Halifax harbor and an inlet called Northwest Arm. Halifax harbor, formerly called Chebucto Bay, extends 16 miles in from the ocean. It is one of the finest harbors in the world, is easy of access, and is admirably sheltered. The water is so deep that the largest ships can lie within a few feet of the shore, and the rise and fall of the tide are slight. The older portion of the city extends along the harbor for about 3 miles, the main streets are parallel to the water's edge and rise one above the other up to the citadel, a massive fortification on a hill. To the N. and S. of the citadel the city extends westward, and is rapidly nearing the water of the Northwest Arm. Dartmouth, on the other side of the harbor, a town of 6,249 inhabitants, is practically a suburb of Halifax. Halifax is the chief naval station of Great Britain in North America, and is the only town there garrisoned with British troops. It was founded by Lord Cornwallis in 1749, and was named after the Earl of Halifax, who, as president of the board of trade and plantations, took an active part in fitting out the expedition for the founding of the city. The entrance to the harbor is guarded by large forts and batteries of the most modern construction, mounted with the heaviest ordnance, rendering Halifax one of the strongest positions held by Great Britain.

During a large part of the year the war-ships of the North American station, comprising some of the finest frigates and ironclads of the royal navy, make Halifax their headquarters. The dockyard covers 14 acres. The dry dock, which serves the purposes of the royal and mercantile navy, is the largest in America. It was constructed at the cost of $1,000,000. The city limits cover an area of 4,363 acres. A park lying to the S. of the city covers a space of 200 acres, and is bounded on three sides by the Atlantic Ocean. The public gardens lie to the S. W. of the citadel, covering a space of 15 acres. Many houses are built of wood, but the center or business portion of the city contains a large number of handsome buildings of brick and stone. The provincial building, the city-hall, Government house, the university, the academy, the post-office, the hospitals, clubs, banks, and a number of the public schools would do credit to any city.

Halifax is the residence of a Roman Catholic archbishop and an Anglican bishop. It has 28 public schools with 127 departments, which afford accommodation for 7,550 pupils. It has a well-equipped academy and a university (Dalhousie), with faculties of art, science, law, and medicine; also a Presbyterian theological college, a ladies' college, a convent, a school for the blind, and a school for the deaf, besides many other benevolent and charitable institutions. The city is amply supplied with pure water brought from a chain of lakes about 5 miles distant, and has a regular system of sewerage. It is one of the most healthful cities in the world, and is becoming a favorite watering-place.

Halifax carries on a large business with the West Indies, exporting fish, lumber, and agricultural produce, receiving in return sugar and other tropical products. It is also a distributing center for the imports of a large part of the maritime provinces and is the chief winter port of Canada. The exports for 1892 were valued at $7,006,789, and the imports at $7,117,246.

Lines of steamers connect the city with the different ports of the maritime provinces, the leading ports of Great Britain, the West Indies, Boston, and New York. The number of vessels registered at the port for 1892 was 803, with a net tonnage of 49,605. The number of vessels entering the port was 2,217, with a tonnage of 1,258,861. Halifax is connected with the railway system of the continent, being the Atlantic terminus of the Canadian Pacific and Intercolonial Railways. There are two large sugar-refineries, a cotton-factory, a rope-walk and twine-factory, and shoe-factory, together with a large number of smaller industries. There are five local banks, besides branches of the Bank of Montreal and the Bank of British North America.

The city was incorporated in 1842. It is governed by a council consisting of a mayor elected annually by the votes of the citizens, and eighteen aldermen, also elected by popular vote, each for a term of three years. The valuation for assessment in 1892 was $22,364,507. The city debt is about $2,250,000, but almost every dollar of it is represented by the water-works and other valuable public property. Pop. (1891) 38,495.

JOHN FORREST.

Halifax, CHARLES MONTAGUE, Earl of: politician; b. Apr. 16, 1661, at Horton, Northamptonshire, England, and educated at Cambridge. He entered the House of Commons as member for Malden during the convention Parliament, and was appointed a commissioner of the treasury in 1692, and First Lord of the Treasury in 1698. His most famous measures were the incurring of the English national debt in 1694 and the establishment of the Bank of England in 1695. In 1699 he was made Baron Halifax, but in 1701, and again in 1703, he was impeached by the House of Commons, and escaped only by the protection of the House of Lords. During the reign of Queen Anne he was without office, but he took part very actively in the negotiations for the union between Scotland and England and for the succession of the House of Brunswick. On the accession of George I. he was made Premier, Earl of Halifax, Knight of the Garter, etc., but died soon after (May 19, 1715). He wrote poetry and patronized authors and artists.

Halifax, GEORGE SAVILLE, Marquis of: statesman; b. in 1630. During three reigns he held the highest offices and played a most conspicuous part in politics. In 1668 he was made Baron Saville and Viscount Halifax for his participation in the Restoration, and in 1680 it was due to his eloquence that the House of Lords rejected the bill excluding the Duke of York from the succession. This won him the confidence of King Charles, who retained him in the council for the rest of the reign, but James II. distrusted him, and when in 1685 he opposed the repeal of the Test Act and the Habeas Corpus Act, he was dismissed from office. He gave in his adherence to the Prince of Orange, and after the latter's accession Halifax was made Lord Privy Seal, but afterward joined the opposition and even entered into negotia-

tions with the Jacobites. His party was contemptuously called the Trimmers, a name which he adopted and defended. He wrote *Character of a Trimmer*; *Anatomy of an Equivalent*; *Maxims of State*, etc. D. in 1695.

Halifax River: a salt-water tidal channel, in Volusia co., Fla., running N. 30 miles. It is a mile wide throughout, and communicates with the sea through Mosquito Inlet. It is sometimes called Mosquito North Lagoon. It is continuous southward with Hillsborough river. It is navigable, and abounds in fish and oysters.

Halio'tis [Mod. Lat., from Gr. ἅλς, sea, οὖς, ὠτός, the ear]: the genus of molluses which contains the abalones or ear-shells. See EAR-SHELL.

Halite: native rock-salt. See SALT.

Halitheri'idæ [Mod. Lat., liter., belonging to the tribe of sea-beasts; Gr. ἅλς, ἁλός, salt, sea + θηρίον, wild animal + patronymic ending -ίδαι, descended from]: a family of extinct mammals belonging to the order *Sirenia* and closely related to the HALICORIDÆ (*q. v.*), from which they principally differed in the molars having each two or three roots (they were mostly three-rooted above and two-rooted below), and their crowns being studded with obtuse tubercles arranged in transverse yoke-like eminences, and in the posterior ones having an additional narrower tuberculated yoke behind the principal ones. The family was represented in Europe from the Eocene to the Pliocene by several species which appear to be reducible to one genus—*Halitherium*. T. G.

Hall, ARTHUR CRANSTAY ALLISON, D. D.: ecclesiastic; b. in England in 1847; graduated at Christ Church College, Oxford; became a member of the Society of Mission Priests of St. John the Evangelist at Cowley, near Oxford; was sent in 1872 to the Church of the Advent, Boston, in connection with which, and the Mission Church of St. John the Evangelist, he labored until his recall by the head of the society in 1891. At a special convention of the diocese of Vermont, held at Burlington Aug. 30, 1893, Father Hall was elected to the vacant see. He was released by his superior from his obligations to the Cowley order, and was consecrated bishop Feb. 2, 1894. W. S. P.

Hall, ASAPH: astronomer; b. at Goshen, Conn., Oct. 15, 1829. After studying astronomy under Brunnow at the University of Michigan, he became assistant to Prof. W. C. Bond at the observatory at Harvard; was appointed aide at the Naval Observatory at Washington, D. C., 1862, and commissioned Professor of Mathematics in the navy the year following. His principal work at the observatory was done with the equatorial telescopes, but he took part in several expeditions for astronomical observations, the most important being that to Vladivostok, in 1874, to observe the transit of Venus. In 1875 he succeeded Prof. Newcomb in charge of the great equatorial, with which in Aug., 1877, he made his well-known discovery of the satellites of Mars. Until his retirement in 1891 he employed the equatorial in measures of the satellites of the outer planets, determining the masses of Saturn, Uranus, and Neptune, and the orbits of their satellites. He also determined the parallax of α Lyræ, and inaugurated a series of measures of double stars. In 1879 the gold medal of the Royal Astronomical Society of London was awarded him for his discovery and observations of the satellites of Mars, and his determination of their orbits.
S. NEWCOMB.

Hall, BASIL: navigator; b. in Edinburgh, Scotland, Dec. 31, 1788; entered the royal navy 1802; became post-captain 1817. His principal works are *A Voyage to the West Coast of Corea and the Great Loo-Choo Island* (1818); *Extracts from a Journal* (written on the Pacific coast of America, pub. in *Constable's Miscellany*); *Travels in North America* (3 vols., 1829, a work which excited great indignation in the U. S.); *Fragments of Voyages* (9 vols., 1831–40, his best work); and several other volumes of travels. D. at Haslar, Gosport, Sept. 11, 1844.

Hall, CHARLES CUTHBERT, D. D.: Presbyterian clergyman; b. in New York, Sept. 3, 1852; graduated at Williams College 1872; studied at Union Theological Seminary 1872–73, and at the Presbyterian College, London, and the Free Church College, Edinburgh; was pastor of Union Presbyterian church, Newburg, N. Y., 1875–77, and of First Presbyterian church, Brooklyn, N. Y., 1877–97, when he became president of Union Theological Seminary, New York. He has published *Into His Marvelous Light* (1892); *Does God send Trouble?* (1894); *Qualifications for Ministerial Power* (1895); and *The Gospel of the Divine Sacrifice* (1896).

Hall, CHARLES FRANCIS: Arctic explorer; b. at Rochester, N. H., in 1821; became a blacksmith, but removed to Cincinnati, where he was a stationer and journalist. He for a time paid great attention to the subject of caloric engines. He afterward became deeply interested in the fate of Sir John Franklin, and in 1860 sailed from New London in the ship George Henry, Capt. James Buddington, the expedition being fitted out chiefly at the expense of Henry Grinnell, of New York. Hall remained two years with the Esquimos, and in 1862 returned. He published his *Arctic Researches* in 1864, and soon sailed again for the north in the Monticello, Capt. James Buddington, again at the expense of Mr. Grinnell. He remained in the polar regions until 1869, when he returned, bringing many undoubted relics of the Franklin party. In 1871 he sailed on his third expedition in the steamer Polaris, fitted up by the U. S. Government for polar exploration. Capt. Hall died about Oct. 30, 1871, in Greenland, and after great privations and many dangers the Polaris was abandoned in Oct., 1872, a portion of her crew under Capt. Tyson having drifted away on floating ice, from which they were rescued by the steamer Tigress Apr. 30, 1873, after floating 195 days. The remainder of the crew constructed boats, put to sea, and were picked up June 23, 1873, by a whaler, and carried to Dundee, Scotland.

Hall, CHARLES HENRY, D. D. (Hobart and Columbia), LL. D. (Yale), D. C. L. (Trinity): clergyman; b. at Augusta, Ga., Nov. 7, 1820; studied at Phillips Academy, Andover, Mass.; graduated at Yale in 1842, and studied at the General Theological Seminary, New York city; was ordained deacon in the Protestant Episcopal Church 1844, and priest 1845; and after holding various positions became rector of Holy Trinity, Brooklyn, N. Y., 1856. He occupied a distinguished position in the governing bodies of the American Episcopal Church. He published *Notes on the Gospels* (2 vols., New York, 1871); *True Protestant Ritualism* (Philadelphia, 1867); *Spina Christi, or Musings in Holy Week* (1875); *Church of the Household* (1877); *Valley of the Shadow*; *Sermons on the Doctrine of Future Punishment* (1878). D. in Brooklyn, N. Y., Sept. 12, 1895. W. S. P.

Hall, CHRISTOPHER NEWMAN, LL. B., D. D. (Edin.): b. at Maidstone, Kent, England, May 22, 1816; graduated B. A. and LL. B. at University of London, winning a law-scholarship; was 1842–54 a Congregational pastor in Hull, and in 1854 became minister of Surrey chapel, Blackfriars Road, London, the congregation of which afterward removed to a fine new church in the Westminster Bridge Road; pastor emeritus 1893. He is the author of a tract, *Come to Jesus* (1846) which has circulated in millions of copies, of other tracts, also widely circulated, of a *Memoir of Rowland Hill*, and of other writings, mostly devotional in their character.
Revised by GEORGE P. FISHER.

Hall, EDWARD H.: Unitarian clergyman; b. in Cincinnati, O., Apr. 16, 1831; educated chiefly at Harvard College (A. B. 1851) and Harvard Divinity School; pastor of the First church, Plymouth, Mass., of Second church, Worcester, Mass., and of First parish and church, Cambridge, Mass.; chaplain of the Forty-fourth Regiment Massachusetts Volunteer Militia; has contributed to *The Unitarian Review*, *The New World*, and published *Orthodoxy and Heresy in the Christian Church* (Boston, 1883).

Hall, FITZEDWARD, D. C. L. (Oxford, 1860): philologist; b. in Troy, N. Y., Mar. 21, 1825; graduated at Harvard 1846; immediately thereafter went to India, where he studied and taught, rising to the position of school inspector for the Saugor and Nerbudda territories 1856–62. From 1862–69 he was Professor of Sanskrit in King's College, London, but since has lived in literary retirement. He is an authority in philology, and has written much in that department.

Hall, GORDON: missionary; b. in Granville (now Tolland), Hampden co., Mass., Apr. 8, 1784. He graduated at Williams College in 1808 with first honors. He studied theology at Andover (1811–12); was ordained to the Congregational ministry, and set apart to the foreign missionary work by the A. B. C. F. M. with his brethren and colleagues, Messrs. Nott, Rice, Judson, and Newell, Feb. 6, 1812, at Salem, and in the same month sailed on his mission to India. He reached Calcutta in August of the same year, but the East India Company refused to allow him and his fellow missionaries to remain. After having been subjected to the greatest embarrassments through the arbitrary measures of the Government, he succeeded in getting a foothold

in Bombay, where he labored with absorbing devotion and great success, and where he died of cholera, Mar. 20, 1826. He published several tracts and volumes on missionary work, and revised the Mahratta New Testament. He wrote, in connection with Samuel Newell, *The Conversion of the World; or, the Claims of Six Hundred Millions* (Andover, 1818). See his *Memoir* by H. Bardwell (Andover, 1834).

Hall, Granville Stanley, Ph. D., LL. D.: educator; b. at Ashfield, Mass., 1846; educated at Sanderson Academy, Ashfield, and Williston Seminary; A. B., Williams College, 1867, and A. M. 1870; Ph. D., Harvard University, 1878; lecturer in Harvard and Williams Colleges 1880–81; Professor of Psychology, Johns Hopkins University, 1881–88; LL. D., University of Michigan, 1888, and Williams College 1889; president of Clark University since 1888; author of *Aspects of German Culture* (1881); *Bibliography of Education* (1886); *How to Teach Reading and What to Read in Schools* (1887); and numerous articles on psychology and education in reviews and magazines; editor of *The American Journal of Psychology* and *The Pedagogical Seminary*.
C. H. Thurber.

Hall, Isaac Hollister, LL. B., Ph. D., L. H. D.: Orientalist: son of Edwin Hall, D. D.; b. in Norwalk, Conn., Dec. 12, 1837. He graduated at Hamilton College 1859, and was tutor there 1861–63; was a lawyer in New York city 1864–75; Professor in the Syrian Protestant College of Beirut 1875–77; and in 1877 became an associate editor of *The Sunday-school Times* in Philadelphia. He published in various periodicals an important series of articles on the Cypriote writing and language, having been one of the first to read an entire inscription, and was the author of numerous articles on Greek, Phœnician, Himyaritic, and other inscriptions and Oriental matters. In 1876 he discovered in Beirut a Syriac manuscript of the Gospels, Acts, and most of the Epistles, an account of which, with three facsimile pages, he published in 1884. The date of the manuscript is between 700 and 900 A. D., and its Gospels constitute the long-lost Philoxenian version. He discovered in 1884 the Antilegomena Epistles in the "Williams manuscript," and published them in phototype. In 1884 he published a *Critical Bibliography of the Greek New Testament as Published in America*. In 1885 Dr. Hall became curator in the Metropolitan Museum of Art, New York. D. in Mount Vernon, N. Y., July 2, 1896. Revised by C. H. Thurber.

Hall, James: author and journalist; b. in Philadelphia, Aug. 19, 1793; served 1812–18 in the army on duty on the northern frontier, and in the expedition of Decatur against Algiers; became in 1820 a lawyer and editor at Shawneetown, Ill.; was four years public prosecutor, and three years judge of a State circuit court; removed to Vandalia; was four years State treasurer, and was also a successful lawyer and editor there; went in 1833 to Cincinnati, where he edited *The Western Monthly Magazine* 1833–37; was a bank president 1853–65. Author of *Letters from the West* (1829); *Legends of the West* (1832); *The Soldier's Bride*, etc. (1832); *The Harpe's Head* (1833); *Tales of the Border* (1835); *Statistics of the West* (1836); *Life of W. H. Harrison* (1836); *History of the Indian Tribes* (3 folio vols., 1838, written jointly with T. L. McKenny); *Notes on the Western States* (1839); *The Wilderness and the Warpath* (1845); *Life of Thomas Posey* (1846); *Romance of Western History* (1857); *Works* (4 vols., 1853–56). D. at Cincinnati, July 5, 1868.

Hall, James, LL. D., Ph. D.: geologist and paleontologist; b. at Hingham, Mass., Sept. 12, 1811; studied under Amos Eaton in the Polytechnic Institute of Troy, N. Y., 1831–36. Joining the Geological Survey of New York as an assistant in 1837, he was soon promoted and given charge of the work in the western district of the State. After the completion of the geological reports he was appointed State paleontologist (1843), and in that capacity he has devoted the greater part of his life to the fossils of the older North American strata. For a short time he was State geologist of Iowa, and he contributed to the paleontologic work of other State and national surveys. He is called "the Nestor of American geology." He was the first president of the Geological Society of America (1889), and honorary president of the International Congress of Geologists at Washington (1891). His leading works are the *Geology of the Fourth District of New York* (1842) and the *Paleontology of New York*, in eight volumes, of which seven are complete (1847–88). Grove K. Gilbert.

Hall, John, D. D., LL. D.: clergyman; of Scottish descent; b. in County Armagh, Ireland, July 21, 1829; entered Belfast College in 1842; repeatedly won the Hebrew prize; was licensed to preach in 1849, going as a missionary into the west of Ireland; in 1852 became pastor of the First Presbyterian church in Armagh, and in 1858 was called to the Church of St. Mary's Abbey, now Rutland Square, in Dublin. By royal appointment he was commissioner of education for Ireland. In 1867 he went as a delegate from the Presbyterian Church in Ireland to the Presbyterian Churches in the U. S., and soon after returning to his native land was called to take charge of the Fifth Avenue (Nineteenth Street) Presbyterian church in New York, over which he was installed Nov. 3, 1867. In 1875 a splendid church edifice was erected for him on the corner of Fifth Avenue and Fifty-fifth Street. He was chancellor of the University of the City of New York 1882–90. He has published *Family Prayers for Four Weeks* (New York, 1868); *Papers for Home Reading* (1871); *Questions of the Day* (1873); *God's Word through Preaching*, Lyman Beecher lectures (1875); *Foundation Stones for Young Builders* (Philadelphia, 1880); *A Christian Home: how to Make and how to Maintain it* (1883). Revised by S. M. Jackson.

Hall, Joseph: divine and author; "the Christian Seneca"; b. at Ashby-de-la-Zouch, Leicestershire, England, July 1, 1574; became a fellow of Emmanuel College, Cambridge, 1595; Dean of Worcester in 1617; went in 1618 to the Synod of Dort; was consecrated Bishop of Exeter in 1627; translated to Norwich in 1641, but before he could visit his new see he was imprisoned for six months in the Tower by the Puritans in 1642; on his release he went to Norwich, but was ejected in 1646; removed to Higham, Norfolk, where he died Sept. 8, 1656. He was a man of great wisdom, piety, and moderation. His principal works are *Mundus alter et idem* (1607); *Contemplations* (1612–15, on the Old and New Testaments); *Virgidemiarum Liber* (1597–98, a collection of satires); *Epistles* (1608–11); *Explication of Hard Texts* (Exeter, 1633–34); *Christian Meditations* (1640), one of his best works. See n. e. of his complete works by P. Wynter (10 vols., Oxford, 1863), which contains his autobiography.

Hall, Lyman, M. D.: a signer of the Declaration of Independence; b. in Connecticut, 1725; graduated at Yale College 1747; settled near Sunbury, Ga., in 1752; was influential in inducing Georgia to join the other colonies in asserting their independence; was elected a delegate, and then a member to Congress from Georgia 1775–79; and in 1783 was elected Governor of that State. D. in Burke co., Ga., Oct. 19, 1790.

Hall, Robert, M. A.: author; b. at Arnsby, Leicestershire, England, May 2, 1764; the son of a Baptist preacher; was distinguished in childhood for precocity of intellect; was educated at the Bristol College and at King's College, Aberdeen, where he passed M. A. with first honors 1784. He served as a tutor in the Bristol Academy, and later as pastor of the Broadmead Baptist chapel; took a pastorate at Cambridge 1791; was several times between 1804 and 1807 temporarily insane by reason of severe illness; was pastor of a church in Leicester 1807–26; and then again pastor of the Broadmead chapel, Bristol, until his death Feb. 21, 1831. Mr. Hall was an eloquent preacher, and was a man of broad and generous principles. He published political tracts of liberal tendencies; opposed Socinianism and the so-called close communion; and published many sermons, reviews, lectures, etc. His *Works*, with a memoir by Olinthus Gregory, were published in 6 vols., 1831–33.

Hall, Samuel Carter: author; b. at Topsham, Devonshire, England, in 1801; studied law and entered upon his literary career as a parliamentary reporter for the London *Times*. In 1824 he established *The Amulet*, an illustrated annual, and edited many illustrated books; for instance, *The Book of Gems*, *British Ballads*, *Baronial Halls*, *Ireland*, etc. He became the editor of the London *Art Journal* in 1839. His *Trials of Sir Jasper* (1873), a temperance poem, proved very popular. D. Mar. 16, 1889.—In 1824 he married Anna Maria Fielding, b. at Dublin in 1804, who, besides assisting him in many of his literary undertakings, achieved a literary fame by her *Sketches of Irish Character* (1828); *Lights and Shadows of Irish Character* (1838); *Story of Irish Peasantry* (1840); *The Buccaneer*, *Uncle Horace*, and other volumes of stories and sketches to the number of thirty; also wrote two dramas—*The French Refugee* and *The Groves of Blarney*. D. Jan. 30, 1881.

Hal'lam, Arthur Henry: son of the historian Hallam: b. in London, Feb. 1, 1811; was educated at Eton and Trinity, Cambridge, where he passed B. A. in 1832; studied law in the Inner Temple in 1832; went to Germany for his health, and died at Vienna, Sept. 15, 1833. He is memorable as the subject of Tennyson's *In Memoriam*. A volume of his writings in prose and verse appeared in 1834.

Hallam, Henry: historian; b. at Windsor, England, July 9, 1777; educated at Eton and at Oxford; called to the bar and practiced for several years, but his scholarly tastes soon led him to give up the law. He was appointed commissioner of stamps, a position imposing light duties and giving him a fair salary, which, supplemented by his private means, enabled him to devote himself almost wholly to study. A review of Scott's *Dryden* in *The Edinburgh Review* is ascribed to him, but the first of his great works, *A View of the State of Europe in the Middle Ages*, did not appear till 1818, when he at once took a place among the foremost historians of his time. This was followed in 1827 by the *Constitutional History of England, from the Accession of Henry VII. to the Death of George II.*, which takes up the narrative at the point to which he had traced the history of England in a chapter of his former work. In 1837–39 appeared his *Introduction to the Literature of Europe in the Fifteenth, Sixteenth, and Seventeenth Centuries*, a work somewhat unsatisfactory from its wide range necessitating a cursory treatment of important subjects, but remarkable for the diligence and enormous reading of its author and valuable for the good sense of many of his conclusions. Very little has been recorded of his life, which, despite his many friends among prominent men of letters and his influence with the Whig politicians of the time, was for the most part devoid of noteworthy incident. The death of his children, especially of his eldest son, Arthur Henry Hallam, in 1833, saddened his later years. While Hallam's Whig principles appear in his history of England, and his cold analysis of the acts of royalist and High Church heroes provoked Tory indignation, his work is generally regarded as a model of fairness and liberality, and is still a standard, in spite of the researches of later specialists. In the politics of his own day he had little sympathy with what he considered radical tendencies, and, though a Whig, deprecated the Reform Bill as embodying revolutionary principles. D. in London, Jan. 21, 1859. F. M. Colby.

Hal'le: town of Prussia; in the province of Saxony, on the Saale; 21 miles by rail N. W. of Leipzig (see map of German Empire, ref. 4–F). Among the buildings of note are the churches of Our Lady and of St. Maurice, the latter dating from the twelfth century and containing some fine wood-carving; in the market-place is a clock-tower 276 feet high. Halle has some manufactures of agricultural machinery, sugar, woolens, and starch, and very extensive salt-works. The vicinity is rich in salt springs, and the inhabitants around these springs (the so-called Halloren), who are employed in the manufacture of salt, form a peculiar race in features, character, and customs; they are supposed to be of Wendish or Celtic origin. The university (founded in 1694), with which that of Wittenberg (founded in 1502) was united in 1817, has ranked high, especially in theology. Gesenius was one of its professors from 1810 to 1842. In his time there were 1,300 students, subsequently less than 600; in 1892 there were 1,522. The Francke Institution (*Franckesche Stiftungen*) is a remarkable organization which takes care of several thousand orphan children. Its schools are celebrated, and it carries on an extensive publishing business. Halle attained commercial importance in the eleventh century, and during the twelfth and thirteenth centuries it was a member of the Hanseatic League. Pop. of Halle (1895) 116,302.

Hallé, Sir Charles: pianist and conductor; b. near Elberfeld, Germany, in 1819. He studied in Paris and gave concerts there. In the Revolution of 1848 he went to London, and afterward to Manchester, where he became director of the musical institution. From 1857 onward he directed with much renown an annual series of orchestral and choral concerts. In 1888 he was knighted, and married the famous violinist Madame Norman-Néruda. D. Oct. 25, 1895.

Halle, Adam. de la: See French Literature.

Hal'leck, Fitz Greene: poet; b. at Guilford, Conn., July 8, 1790. His mother was a descendant of the missionary John Eliot. He studied in the academy of his native town, and in 1811 became, and remained for twenty years, a clerk in the house of Jacob Barker, of New York. He was afterward (1832–49) employed by John J. Astor, who named him a trustee of the Astor Library. In 1849 he returned to Guilford, Conn., where he died Nov. 19, 1867. The best-known of his poems are that on the death of his friend, J. R. Drake, which appeared in 1820; *Fanny* (1819; enlarged 1821), his longest production: *Alnwick Castle* (1827); *Marco Bozzaris* (first published in *The New York Review* in 1825); and *Burns* (1827). The *Croaker Papers* (1819), by himself and his friend Drake, were first published in a complete edition in 1860. See his *Life* by J. G. Wilson (1869).

Revised by H. A. Beers.

Halleck, Henry Wager, LL. D.: soldier; b. at Westernville, Oneida co., N. Y., Jan. 16, 1815; graduated at West Point Military Academy July 1, 1839; entered the army as second lieutenant of engineers; first lieutenant 1845; captain 1853: he was retained at West Point as Assistant Professor of Engineering till June, 1840, and for a year subsequently was assistant to a board of engineers at Washington, D. C., during which time he prepared a work on *Bitumen, its Varieties, Properties, and Uses*. From Washington he was transferred as assistant in charge of the construction of fortifications in New York harbor, where he remained till 1846, except while absent in 1845 on a tour of examination of public works in Europe. On his return he delivered a course of twelve lectures on the science of war before the Lowell Institute at Boston, which were published in 1846 under the title of *Elements of Military Art and Science*, a second edition of which, with large additions, including notes on the Mexican and Crimean wars, was issued in 1858, and largely used as a manual during the civil war. In 1850 he became director-general of the new Almaden quicksilver mines; in Aug., 1854, he left the army by resignation, and devoted himself to the practice of law. Aug. 19, 1861, at the solicitation of Lieut.-Gen. Scott, Halleck was appointed major-general of the regular army, and assigned to the command of the department of the Missouri, embracing the States of Missouri, Iowa, Minnesota, Wisconsin, Illinois, Arkansas, and Western Kentucky. After the battle of Shiloh, Halleck's forces moved on Corinth by slow and regular approaches, so that it was not until May 27 that his army appeared before that fortified city, to which stronghold the army of Gen. Beauregard had fallen back. Active preparations were made by Halleck on the 28th and 29th for an attack, but on the morning of the 30th it was found that Beauregard had evacuated this stronghold during the previous night, and Corinth was occupied without resistance. After the campaign of Corinth, Halleck was called to Washington as general-in-chief, and exercised that command until the grade of lieutenant-general was revived. He then continued under assignment as chief of staff of the army until transferred to the command of the military division of the James in Apr., 1865. Upon the termination of the war, Halleck was ordered to the military division of the Pacific, assuming command Aug., 1865, and Mar., 1869, was transferred to that of the South, which he retained till his death, which occurred at Louisville, Ky., Jan. 9, 1872. Degrees of A. M. and LL. D. were conferred by Union College, New York. Among the more important of Gen. Halleck's published works may be mentioned his great treatise on *International Law, or Rules Regulating the Intercourse of States in Peace and War* (1861), and a translation of Jomini's *Vie Politique et Militaire de Napoléon*.

Halleflinte, haa'le-flin-te: See Felsite.

Hallelujah [Heb., praise ye Jah, i. e. Jehovah; adopted into Greek in the form ἀλληλούια]: an ancient formula of praise, universally adopted by the Christian Churches.

Haller, haa'ler, Albrecht, von, M. D., F. R. S.: the father of the science of physiology; b. at Berne, Switzerland, Oct. 16, 1708; studied divinity at Tübingen, medicine under Boerhaave at Leyden, and mathematics with the Bernoulli family at Basel; made a botanical exploration of the Alps with Gesner; practiced medicine at Berne 1729–36; held important professorships at Göttingen 1736–53, declining calls to several of the most renowned universities of Europe; became physician to the King of England 1729; retired to private life in Berne 1753. He was a voluminous writer on physiology, anatomy, botany, surgery, and practical medicine; author of several romances and poems, and many reviews and scientific papers. His hypotheses were often short-lived and inadequate, but admirable for their scientific spirit, and for the stimulus which they gave to

physiological study throughout Europe. Among his works are *Icones Anatomicæ* (1743–50); *Opuscula Pathologica* (1755); *Opuscula Botanica* (1749). See the *Life* by Frey (1879). D. in Berne, Dec. 12, 1777.

Hallettsville: town; capital of Lavaca co., Tex. (for location of county, see map of Texas, ref. 5–I); on the Lavaca river and the San Ant. and Aran. Pass Railway; 101 miles W. of Houston, 137 miles E. of San Antonio. It is in a cotton region; contains 3 cotton-gins and a cottonseed-oil-mill; and has water-works, electric lights, Roman Catholic, Baptist, Methodist Episcopal, Lutheran, and Protestant Episcopal churches for white people and several for colored, Roman Catholic and public graded schools, and 3 weekly newspapers. Pop. (1880) 588; (1890) 1,011; (1893) estimated, 1,500. EDITOR OF "HERALD."

Hal'ley, EDMUND, LL. D., F. R. S.: astronomer and mathematician; b. at Haggerston, near London, Oct. 29, 1656; was educated at Queen's College, Oxford, where he chiefly studied mathematics, physics, and astronomy; published in 1675 a method for finding aphelia and planetary eccentricities; was in St. Helena 1676–78, cataloguing the southern stars; published *Catalogus Stellarum Australium* (1679); while traveling on the Continent in 1680 discovered the great comet which bears his name; published in 1683 a paper giving his theory of the variation of the magnet; became a captain in the royal navy 1699, and conducted expeditions to observe the variations of the magnetic needle; became Savilian professor at Oxford 1703, a position which had previously been refused him on account of his alleged infidelity; was secretary of the Royal Society 1713–21, and was appointed astronomer-royal in 1720. Halley was a friend and collaborator of the great Newton, and a member of many learned societies, and one of the ablest physicists of his time. D. at Greenwich, Jan. 14, 1742.

Halley's Comet: See COMET.

Halliwell-Phillipps, JAMES ORCHARD: scholar and antiquarian; son of Thomas Halliwell; b. at Chelsea, England, June 21, 1820; studied for a time in Cambridge, and in 1839 began his great work of the editing and publication of old English authors and MS. texts. He produced numerous works, many of them original. Among these are *Shakspeariana* (1841); *A History of Freemasonry* (1842); *Dictionary of Provincial and Archaic Words* (1844-45); and many volumes of Shakspearian literature, including *Outlines of the Life of Shakspeare* and a folio edition of the *Works of Shakspeare* (16 vols., 1853–65). In 1863 he interested himself in the purchase of New Place for the town of Stratford-upon-Avon. In 1872 he changed his surname to Halliwell-Phillipps. D. near Brighton, Jan. 3, 1889.
Revised by H. A. BEERS.

Hallow-day: See ALL SAINTS' DAY.

Halloween', or **All Hallows' Eve** [short for *All Hallows' Even* < O. Eng. *ealra hālgena æfen*, liter., all saints' evening]: the night of Oct. 31—i. e. the *eve* of All Saints' or All Hallows' Day, which is the first day of November. The word *hallow* is the Anglo-Saxon *halig* and the German *heilig* (holy, sacred, etc.), nearly equivalent to the Latin *sanctus*, from whence comes our word *saint*. All Saints' (All Hallows' or All Hallow Tide) Day takes its origin from the conversion in the seventh century of the Pantheon at Rome into a Christian place of worship, and its dedication to the Virgin and all the martyrs. First celebrated on May 1, the date was subsequently changed to Nov. 1, and under the designation of Feast of All Saints set apart as a general commemoration in their honor, and as such retained by the Anglican and American Episcopal Churches, the collect for which day supplicates God for "grace so to follow Thy blessed *saints* in all virtuous and godly living," etc. On that day it is a custom of Roman Catholic countries (still practiced in Louisiana) to visit the cemeteries for devotions or for laying floral tributes on the graves of relatives. But the "Halloween" has nothing churchly about it, and seems to be a relic of pagan times, or perhaps of mediæval superstitions. It was regarded as the time of all others when supernatural influences prevail, and as a night which was set apart for a universal walking abroad of spirits both of the visible and invisible world; for on this mystic evening it was believed that even the human spirit might detach itself from the body and wander abroad. Halloween seems clearly allied to the "Walpurgis Night" of the Germans, the witch-festival or assembling of evil spirits on the summit of the Brocken in the Hartz Mountains on the eve of May 1—the day, as already noticed, originally dedicated to the Christian martyrs or saints. The Walpurgis legend being almost coeval and early associated with the latter day, it is probable that in England the transference of the festival-day to Nov. 1 carried with it the superstitions attributed to its preceding night. Practically, so far as it is recognized at all, as it is still in Great Britain and in the U. S. in localities where Church usages and traditions survive (as in Maryland and Virginia), it is devoted to sports and practical jokes. Nuts and apples are in requisition, the former giving the name "Nutcrack Night" to Halloween in the south of England. They are not only cracked and eaten, but are made the means of vaticination in love affairs. But the especial sport of Halloween is that of "ducking" or "bobbing" for apples set afloat in a tub of water. The forms "Hallow e'en" and "Hallow-eve" are found in Prof. F. J. Childs's *Ballads*, while Burns uses the simpler form of "Halloween." Revised by W. S. PERRY.

Hallowell: city; Kennebec co., Me. (for location of county, see map of Maine, ref. 9–C); on the Kennebec river and the Me. Cent. Railroad; 2 miles S. of Augusta, 58 miles N. E. of Portland. The principal industry is granite quarrying and cutting for building and monumental purposes. There are two large oilcloth-works, several iron-foundries, wood-working shops, shoe-factory, sandpaper-factory, lumber-mills, and manufactures of soap and leached ashes. The city has excellent facilities for travel and transportation by steam and electric railways, the Boston steamboat line and various steamboats plying on the river. Among the public buildings is a free library. Pop. (1880) 3,154; (1890) 3,181. EDITOR OF "REGISTER."

Hallow-fair: a market held in various parts of Scotland at Hallowtide.

Hallowmas: an abbreviated form used by Shakspeare (*Measure for Measure*, ii., 1) for All Hallows' Mass.

Hallucination: See ILLUSION and INSANITY.

Hallue, ăl'lü': a small river of Northern France, which enters the Somme from the right above Amiens; is noticeable on account of the indecisive battle which took place here Dec. 23, 1870, between the German army under von Manteuffel and the French army under Faidherbe.

Halluin, ăl'lü'ăn': a town of France; department du Nord; on the right bank of the Lys; 10 miles N. N. E. of Lille (see map of France, ref. 1–F); contains several religious and benevolent institutions, and has manufactures of linen and cotton goods, chemicals, bricks, and oil. Pop. (1891) 14,841.

Halm, haalm, FRIEDRICH: a pseudonym. See MÜNCH-BELLINGHAUSEN, ELIGIUS FRANZ JOSEPH, Baron von.

Halm, KARL FELIX: philologist; b. in Munich, Apr. 5, 1809; d. Oct. 5, 1882; was head librarian and professor ordinarius of the University of Munich, and one of the most noted text-critics of the nineteenth century. Among his many editions of classical authors may be mentioned the works of Cicero, in conjunction with Baiter; *Rhetores Latini Minores* (1863); Quintilian (2 vols., 1868); Nepos, Velleius, Valerius Maximus, Florus, and Tacitus (2 vols., 1851; 4th ed. 1883). See Bursian's *Biogr. Jahrbücher* (vol. v., p. 1 ff., 1882). ALFRED GUDEMAN.

Halmahera: See GILOLO.

Halmstad, haalm'städ: a town of Sweden; capital of the province of Halland; on the Cattegat, at the mouth of the Nissa; 75 miles S. S. E. of Gothenburg (see map of Norway and Sweden, ref. 13–D); has very important salmon-fisheries, and carries on quite a brisk trade in deals, lumber, pitch, and tar. It was formerly fortified, and has been the scene of important events in Scandinavian history, being often chosen as the meeting-place of the rulers and representatives of the three northern states. Pop. (1895) 13,362.

Halo [= Fr. *halo* : Ital. *alone* < Lat. *halos* = Gr. ἅλως, disk, especially disk of sun or moon, halo around sun or moon, liter., a threshing-floor (which was disk-shaped)]: the popular term applied to bright circles and attendant optical phenomena seen when the sun or moon shines through or upon fog, haze, or cloud. For the purposes of scientific description in meteorology, halos are classified as greater or lesser halos; the former are the halos proper, while under the lesser halos are included the small rings, aureolæ, or glories known as coronæ and anthelia. According to the numerous physicists who have contributed to the explanation of the phenomena in question, these are all the result

of certain modifications which light undergoes by reflection, refraction, dispersion, diffraction, and interference when it falls upon the crystals of ice, the raindrops, or the minute particles that constitute fog and clouds. The phenomena and their explanations may be considered under the following heads:

(1) A *corona* is a simple ring or concentric rings of light surrounding the sun or other luminary. These rings are generally tinged with colors, the inner being blue or purple, and the outer red; several series of such rings, separated by white spaces, are included within a distance of from one to five degrees from the sun. Fraunhofer first explained the origin of these rings as being the result of the diffraction of the rays of light in passing between the particles of a cloud or fog; by careful experiments upon coronæ artificially produced he rendered his explanation perfectly acceptable; and the undulatory theory of light enables us to conclude the average diameter of the drops of vapor from the measured diameter of the colored rings. The results of this investigation were carefully collated by Kämtz, who showed that the higher the temperature of the air the smaller is the diameter of the vapor-particles, so that, for instance, in winter, the average diameter is 0·00095 of an inch, but in summer 0·00061. Some physicists have maintained that fog-particles are hollow vesicles of vapor, but Bravais has shown that if the thickness of the shell of the vesicle is greater than one-third the exterior diameter of the particle, the latter will then produce halos closely resembling, if not identical with, those of a solid drop. The internal structure of vapor particles need not be considered in the explanation of coronæ, which, being due to diffraction only, depend simply upon the exterior diameter; but is, on the other hand, of importance in explaining the phenomena of aureolas or glories.

(2) *Aureolas or Glories.*—This term includes the bows, circles, etc., surrounding the shadow of the observer when it is projected upon a cloud or fog-bank or dew-covered grass. These colored rings are observed upon the upper surface of clouds by aëronauts, and have been well described by Flammarion. (See Glaisher, *Travels in the Air*, London, 1871.) The phenomena in question are doubtless produced by the diffraction of the light reflected at a nearly perpendicular incidence from the surfaces of the particles of vapor. Aureolas and coronæ are seen in greatest perfection when the vapor-particles are of comparatively large and regular dimensions; the smaller the diameter, and the less of uniformity in the size of the particles, the larger is the breadth of the colored rings, and the more perfectly do they overlap, thereby producing a more perfect commingling of the individual colors, resulting in a simple white and faint fog-bow. The existence of this bow, in connection with the absence of colored bands, is held to be an argument against the existence of vesicles. For an account of the arguments for and against the vesicular theory, see Kober in *Pogg. Ann.* (1871).

(3) *Halos proper* consist of more or less complicated arrangements of arcs and circles of light surrounding the sun or moon, accompanied by others tangent to or intersecting them: near the points of tangency and intersection there appear spots of special brightness, known as parhelia, paraselenæ, sun-dogs, etc. Of these arcs of light, some are colorless, while others are composed of parallel colored bands; the light of some arcs is polarized, while that of others is not. The very various appearances of these halos can only be properly appreciated by means of colored drawings; in general they are due to reflection and refraction from crystals of ice floating in the air; among the prominent features, whose origin has been satisfactorily explained, the following may be noted: (1) A circle of 22° radius, the inner edge well defined red, the outer edge ill defined blue; the light polarized in the direction of a tangent to the circumference. This halo is formed by light passing through the alternate faces of hexagonal prismatic ice-crystals in the direction of minimum deviation. (2) A circle of 46° radius, the inner edge red and the outer edge pale blue. This is formed by the rays passing in the direction of minimum deviation through the base and sides of right prisms of ice. (3) A circle of about 90° radius, of white light. This is probably due to rays that after entering an ice-prism are totally reflected, and emerge through an opposite face of the prism. (4) The parhelic circle. This is a colorless arc extending from the sun to the right and left, parallel to the horizon, and is produced by simple reflection of the sun's light from the outer vertical surfaces of such ice-prisms as are slowly settling down through tranquil air. (5) A vertical arc is similarly produced by the reflections from the horizontal surfaces of ice-crystals. The arc extends to a distance of 5° to 20° above and below the sun. (6) The parhelia and paraselenæ. These are spots of special brightness that are seen at the mutual intersections of the circular arcs; it is a sufficient explanation of these to consider that at these points two causes are combining to turn toward the eye a double portion of the solar rays, thereby producing the increased apparent brightness. This at least suffices to explain the parhelia that are distant 22° and 46° from the sun's center. Anthelion (Germ. *Gegensonne*) would be a term properly applicable to the parhelion that is seen at a point on the parhelic circle directly opposite the sun, and which is probably sometimes due to the combination of reflections from sets of surfaces oblique to the horizon. (7) Tangential arcs. Of these, which are numerous and have variable positions, the most brilliant is that which touches the halo of 46° at its summit; this arc is only seen when the sun's altitude is between 12° and 30°, and is due to a refraction of the sun's light through prisms whose refracting edges are horizontal. (8) The rainbow may be very properly considered as a halo due to the action upon the sun's light of large drops of water, instead of smaller drops or of crystals of ice, and differs from a corona in that it is not due to diffraction. The rainbow phenomena consist principally of one, two, or three main arches of prismatic colors, known as the primary, secondary, and tertiary bows, whose radii, reckoned from a point opposite the sun, are respectively 41½°, 82¼°, and 136¼°, and which are respectively formed by those rays that experience a minimum deviation after one, two, or three total reflections within the drop. The secondary bow is sometimes erroneously spoken of as a reflection of the primary. These arches are, especially near their summits, fringed on their concave sides by narrow supernumerary belts of color, due, as was first explained by Dr. Thomas Young (1804), to the interferences of those rays that enter and leave the drops very nearly at the angle of minimum deviation. CLEVELAND ABBE.

Hal'ogens [Gr. ἅλς, ἁλός, salt + *gen-*, producing, from root of γεννάειν, beget]: those elementary substances which by combination with a metal produced the compounds which Berzelius called haloid salts. The halogens are chlorine, bromine, iodine, and fluorine (simple halogens), while cyanogen was called a compound halogen. The simple halogens form a very natural and strongly marked group. Cyanogen is strongly analogous to them in its character.

Haloid Salts [*haloid* is from Gr. ἅλς, ἁλός, salt + εἶδος, form, likeness; so called because they are analogous in composition to common salt]: a name given by Berzelius to compounds of some halogen with a metal, like common salt and iodide of potassium. The metallic chlorides, iodides, bromides, and fluorides are haloid salts, and to these the metallic cyanides have a close relationship.

Hal'pine, CHARLES GRAHAM: soldier and poet; b. at Oldcastle, County Meath, Ireland, Nov. 20, 1829; graduated at the University of Dublin in 1846. His father was a Protestant clergyman, and editor of the Dublin *Evening Mail*. Young Halpine entered upon the life of a journalist, and in 1847 came with his wife to New York, without money or friends. He was for a long time connected with the New York *Herald*, *Times*, and other papers. For the *Tribune* he wrote that famous piece, *Tear Down the Flaunting Lie*. He also wrote for the Boston *Post*, and was for a time one of the editors of *The Carpet Bag* in that city. In 1861 he enlisted in the Union army, in which he speedily rose, reaching in 1864 a brigadier-generalship of volunteers. He was also a major in the regular army and brevet major-general. He resigned his army commissions in 1864. It was while in the army that he wrote the humorous pieces in prose and verse under the name of "Private Miles O'Reilly," which were universal favorites. In 1864 he became editor and then proprietor of *The Citizen* newspaper. He was afterward register of the county of New York. D. Aug. 3, 1868. A complete edition of his poetical works was published in 1869. Revised by H. A. BEERS.

Hals, haals, FRANS: painter; b. probably at Antwerp, 1580, or perhaps 1584. He is said to have been a pupil of Rubens; he lived chiefly in Antwerp and Haarlem, and left the reputation of having been dissipated and reckless in life. Against these assertions are to be set his long life, the great number of pictures which he painted, and their extraordinary merit. He was one of the greatest of portrait-painters, and he had

an exceptional power of combining a number of portrait-figures in a large composition, such as several of those named below. From 1620 to 1660 is his great epoch, and during that time he was always a colorist and a consummate painter in the technical sense, while his manner changed gradually from a fuller to a paler tone of coloring, and tended more and more toward a kind of luminous monochrome. D. at Haarlem, 1666. Among his many important pictures are the several large canvases in the Haarlem Museum, *Banquets of the Haarlem Marksmen*, and other associations, each picture containing a number of portraits; at Amsterdam a portrait group of *Hals and his Wife*; in the Louvre a celebrated *Portrait of Descartes* and two groups of members of *The Beeresteyn Family*; in the Cassel Gallery the *Jolly Topers*, so called; and the three pictures of a jovial old woman called *Hille Bobbe*, one of which, and perhaps the best, is in the Metropolitan Museum of Art, New York. As his pictures are generally of moderate size and so solidly painted as to be remarkably well preserved, they have been much sought for by wealthy men, and many of the finest are in private collections.

RUSSELL STURGIS.

Halsey, LEROY JONES, D. D., LL. D.: clerical writer; b. in Goochland co., Va., Jan. 28, 1812; graduated at the University of Nashville, Tennessee, 1834, and at Princeton Theological Seminary 1840. After serving churches in Selma, Ala., in Jackson, Miss., and in Louisville, Ky., he became in 1859 Professor of Pastoral Theology, Church Government, and Homiletics in the Presbyterian Seminary in Chicago (now McCormick Theological Seminary), being one of the four original professors. He was made emeritus professor 1882. For some years he was also associate editor of *The Interior*. He has published *Literary Attractions of the Bible* (New York, 1857); *Life Pictures of the Bible* (Philadelphia, 1860); *The Beauty of Immanuel* (1861); *Life and Works of Dr. Philip Lindsley* (1862); *Life and Sermons of Lewis Warner Green, D. D.* (New York, 1868); *Living Christianity* (Philadelphia, 1878); *Scotland's Place in Civilization* (1885). WILLIS J. BEECHER.

Hal'stead: town of England, in Essex; on the Colne; 56 miles N. E. of London (see map of England, ref. 12–J). It has a grammar school and manufactures of crape, silk, and paper. Pop. (1891) 11,226.

Halstead: city; Harvey co., Kan. (for location of county, see map of Kansas, ref. 7–G); on the Little Arkansas river and the A., T. and S. Fé Railroad; 10 miles S. W. of Newton. It is in an agricultural region, and water-power from the river operates several flour-mills. It is the site of a prosperous Mennonite settlement and the center of a Russo-German immigration movement. Pop. (1890) 1,071.

Halstead, MURAT, LL. D.: journalist; b. in Butler co., O., Sept. 2, 1829; graduated at Farmers' College, College Hill, O., in 1851; taught district schools in Hamilton and Butler Counties, and wrote for the papers of his native county and of Cincinnati before his education was completed. After graduation he became a local reporter on the Cincinnati *Enquirer*, then the news-editor of the Cincinnati *Atlas*, and literary editor of *The Columbian and Great West*. In Mar., 1853, he became connected with the Cincinnati *Commercial*. He soon became an important editorial contributor, and in 1856, after the death of his partner, M. D. Potter, the chief editor and proprietor. When the Cincinnati *Commercial* and *Gazette* were consolidated, in 1882, he continued as chief editor. He became editor of *The Standard-Union*, Brooklyn, N. Y., in 1890.

Halsted, BYRON DAVID, D. Sc.: botanist; b. in Cayuga co., N. Y., June 7, 1852; educated in Michigan Agricultural College and Harvard University; for many years editor of *The American Agriculturist*; Professor of Botany in Iowa Agricultural College (1885–88), in Rutgers College (1888). He has written many articles in botanical and agricultural journals, especially on fungi injurious to vegetation and on the weeds of the U. S., and has published *A Century of American Weeds* (1892). CHARLES E. BESSEY.

Halteres: See ENTOMOLOGY.

Halys: See KIZIL-IRMAK.

Ham: town of France; in the department of Somme; on the Somme; about 40 miles S. E. of Amiens (see map of France, ref. 2–F). Its old fortress, built in 1470, is now used as a state prison. Louis Napoleon was confined there from 1840 to 1846. Pop. (1891) 3,082.

Ham: a son of the patriarch Noah, and the brother of Shem and Japheth; also, according to Genesis, the father of those nations which inhabited the southern countries, Egypt, Libya, etc. The Coptic or native name of Egypt is *Kem*, Χήμια with Plutarch, *Chemé* in the Rosetta inscription, which signifies hot or burnt; and this corresponds with the Hebrew name *Ham*, derived from *haman*, to be hot, to be burnt. But it must be remembered that the descendants of Ham were not all African. The Canaanites and Phœnicians, the Cushites of the Euphrates valley, a South Arabian race of importance, all were Hamitic. Some of these peoples were closely associated with the Semitic races, and their languages belonged to the class now described as Semitic.

Revised by WILLIS J. BEECHER.

Hamadan': town of Persia; in the province of Irak-Ajemee; lat. 34° 50′ N. and lon. 48° 32′ E.; at the base of the Elwund Mountains. Its location on one of the routes from Bagdad to Erivan, Teheran, and Ispahan makes it a trading-place of considerable importance; it has many caravanseries and extensive bazaars. The beautiful gardens and orchards which surround it diminish somewhat the dreary aspect of the ruins which cover the ground in the vicinity. Among its most remarkable monuments are the reputed tomb of Mordecai and Esther, and that of Avicenna, yearly visited by crowds of pilgrims. Hamadan occupies the site of Ecbatana (*Achmethan* of the Septuagint), the ancient capital of Media, which, according to the Apochrypha (Jud. i. 2–4), was built by Arphaxad. It was captured by Cyrus in 549 B. C., and became the summer residence of the Kings of Persia. During the reign of the Sassanidæ it lost its importance. Pop. (1891) 27,000.

Hamadry'ads, or **Dry'ads** [*hamadryads* is deriv. of Gr. ἅμα, together with + δρῦς, oak: Teuton. *triu* > Eng. *tree*; *dryads* is deriv. of Gr. δρῦς]: in Greek mythology, the nymphs who were attached to particular trees, with which they came into existence and died. They lived in the deep forests, out of which they never came; they were therefore sometimes called Oreades (from ὄρος, mountain). In the guise of huntresses and shepherdesses they often lay with Apollo, Hermes, Pan, and the Satyrs. They were often named from mountains, rivers, springs, and caves—e. g. the Peliades from Mt. Pelion. They differed from most other nymphs in not possessing immortality.

Revised by J. R. S. STERRETT.

Hamah: modern Arabic name of HAMATH (*q. v.*).

Hamaker, haa'mă-ker, HENDRIK ARENS: Orientalist; b. at Amsterdam, Feb. 25, 1789; studied first the classic languages, then Oriental philology, and was in 1815 appointed Professor in Arabic, Chaldæan, and Syriac at the Academy of Franeker, whence he removed in 1817 to the University of Leyden. Here he died Oct. 10, 1835. He was a very prolific writer and a man of original ideas, but his knowledge was more multifarious than exhaustive, and his representation more striking than accurate. One of his principal works is *Specimen catalogi codicum MSS. orientalium Bibliothecæ academicæ Lugduno-Batavæ* (1820), in which he gives a description of each volume, a *résumé* of its contents, the biography of its author, the manner in which it was acquired, etc. Specially noteworthy among his many other writings are his Punic researches, *Diatribe philologica-critica* (1822); *Lettre à M. Raoul Rochette* (1825); *Miscellanea Phœnicia* (1828). Revised by C. H. TOY.

Hamamelis Virginica, or **Witch Hazel** [Gr. ἁμαμηλίς, name of a tree or shrub, the medlar-tree]: an indigenous shrub belonging to the order *Hamamelaceæ*. It is found in damp woods and by streams in many parts of the U. S.; grows from 5 to 15 feet in height, and has straight veined obovate or oval leaves and small yellow perfect or polygamous flowers which blossom late in autumn. The bark yields a sedative used both internally and externally for the purpose of controlling hæmorrhage and for influencing diseased blood-vessels, as, for example, dilated veins. Examination by Dr. John Marshall fails to show that it possesses any alkaloid, but there is no doubt that it has remedial powers.

H. A. HARE.

Ha'mann, JOHANN GEORG: b. at Königsberg, Aug. 27, 1730; studied theology, law, philosophy, poetry, and philology in a miscellaneous manner; accepted in 1752 a place as tutor in a noble family in Livonia; changed it next year for another position of the same kind in Courland; entered in 1755 into the service of a commercial house in Riga, and visited on business Berlin, Lübeck, Holland, and England,

in which latter country he spent about a year. After 1759 he lived for several years in his father's house in Königsberg in leisure, studying theology and philosophy, but from 1763 to 1787 he held various small offices in the tax department in his native city. In 1787 he was discharged. He then lived alternately in Düsseldorf and Münster, where he died June 21, 1788, and was buried in the garden of the Princess Gallizyn. The public at large took no notice of him as the writer of numerous pamphlets and essays. He was in strong opposition to the reigning fashion of enlightenment. The depth of his religious intuitions, the eccentricity of his humor, and the numerous allusions which crowd his pages made him unintelligible to the general reader and earned for him the title *der Magus im Norden*; but upon men like Herder, Goethe, and F. H. Jacobi he exercised great attraction, and in the subsequent generations all the most prominent minds have studied him with great attention. His influence upon Herder's views and language was especially great. Hamann was a great admirer of *Volkspoesie* and original genius, and his discovery that poetry was the mother-tongue of the human race can in its inspiring influence be traced as far as the Romanticists. His writings were collected and published in eight volumes, in Berlin (1821–43), by Roth. See also Gildemeister, *Hamanns Leben u. Schriften* (1874); Poel, *Johann G. Hamann* (1876); Minor, *Hamann in seiner Bedeutung für die Sturm- und Drangperiode*.

Revised by Julius Goebel.

Ha'math [Heb., fortress; the *Epiphaneia* of the Greeks and Romans, now called *Hamah*]: one of the oldest cities in the world; in Upper Syria; about halfway between Baalbek and Antioch; founded by the youngest (or last-named) of the eleven sons of Canaan (Gen. x. 18). The "entrance of Hamath" (Num. xxxiv. 8), named at first as the northern boundary of the Promised Land, probably was the low screen of hills between the sources of the Leontes (*Litany*) and the sources of the Orontes. The small kingdom or province of which Hamath was the capital was in alliance with David and tributary to Solomon, but regained its independence after the revolt of the ten tribes (975 B. C.). Hamath was reconquered and dismantled by Jeroboam II. (823–772 B. C.), and not long afterward fell under the power of Sennacherib (702–680 B. C.) of Assyria, and became insignificant. Antiochus Epiphanes gave it the name of Epiphaneia, and it was so known to the Greeks and Latins. In 638 A. D. it was taken by the Saracens, and in 1517 came into the hands of the Turks. Under the Arabs it was a place of considerable importance. Aboolfeda, the Arab geographer and historian, was born there in 1273. The city now has 42,200 inhabitants, one-fourth of whom are Greek and Jacobite Christians, and the rest Mohammedans, noted for their bigotry and fanaticism. The Orontes (*el-Asy*), spanned at this point by four bridges, divides the city into two parts. Huge Persian water-wheels (*nâ-ûrah*), 70 or 80 feet in diameter, turned by the current, supply the houses and gardens with water. The houses are built of sun-dried bricks and wood. The city keeps up a lively trade with the Bedouin. Several black basalt stones with hieroglyphic inscriptions, supposed to be Hittite, discovered at Hamath (the first by Burckhardt in 1812), have excited much interest among archæologists, but thus far no clew has been discovered to their decipherment. The stones were removed to Constantinople in 1873. A few seals from Nineveh in the British Museum have the same characters. See E. Robinson's *Later Biblical Researches* (Boston, 1856); R. F. Burton and Drake's *Unexplored Syria* (London, 1872); and the Palestine Exploration Society's *Second Statement* (Sept., 1873).

Revised by S. M. Jackson.

Hambato: same as Ambato (*q. v.*).

Hamburg (Germ. pron. haam boorch): a state and a city of the German empire (see map of German Empire, ref. 2–E). The state, which has a total area of 158 sq. miles, comprises (1) the city of Hamburg, which with its suburbs had a population of 625,552 in 1895; (2) the neighboring territory of Bergedorf and some smaller districts; and (3) Ritzebüttel (including Cuxhaven), at the mouth of the Elbe, and had a total population in 1895 of 681,632, including a garrison of two battalions. The free city of Hamburg was one of the principal members of the old Hanseatic League and is the most important commercial port of the German empire. It is the first seaport of the mainland of Europe, and after London and Liverpool the most important commercial center of Europe. The imports into the port of Hamburg by sea for the year 1890 equaled 1,376,929,000 marks, and the exports by sea were valued at 1,260,475,000 marks, exclusive of the precious metals. The vessels entering and clearing the port of Hamburg during 1890 numbered 16,361, and had a tonnage of 10,417,096. The extent and value of the commerce of the city is more than double that of any other city in the empire. The manufactures are also very important. Jan. 1, 1882, the lower Elbe was included in the Zollverein or Customs Union, and on Oct. 15, 1888, the whole of the city, with the exception of a small portion of the actual port and warehouses connected with it, became incorporated in the Zollverein. The alterations in the port necessitated by this change involved the expenditure of some $30,000,000, to which the imperial Government contributed one-third. For 1891 the revenue was estimated at 55,341,500 marks, and expenditure 55,889,600 marks, leaving a deficit of 548,100 marks. The largest source of income is direct taxes, amounting to more than one-third of the whole revenue, and next to that of proceeds of domains, quays, railways, etc. The largest item in the expenditure in 1891 was for the debt, 10,095,000 marks; for education the expenditure was 5,460,000 marks. The direct tax amounts to 30 marks per head of the population. The public debt of Hamburg on Jan. 1, 1891, amounted to 233,963,656 marks. The debt was incurred chiefly for the construction of public works. A large number of German emigrants pass through Hamburg, the aggregate from that port in 1890 being 99,350. The Government is republican in form. The present constitution came into force Jan. 1, 1861, and was revised Oct. 13, 1879. The Government consists of two chambers of representatives, the Senate, and House of Burgesses. The executive power is exercised chiefly but not entirely by the Senate, which is composed of eighteen members, elected for life by the House of Burgesses; a first and second burgomaster, chosen annually in secret ballot, preside over the meetings of the Senate. The House of Burgesses consists of 160 members, elected half by secret ballot of all tax-paying citizens, half of the remainder by the owners of a certain amount of city property, and the remainder appointed by various guilds, corporations, and courts of justice. A military convention was entered into with Prussia Sept. 30, 1867. With Lübeck and Bremen, Hamburg furnishes as its military contingent the Seventy-fifth and Seventy-sixth Regiments of infantry.

The city forms a semicircle on the right bank of the Elbe, the depth of whose waters at high tide allows sea-going vessels drawing not more than 18 feet to enter the harbor, while an extensive river-traffic establishes a brisk communication with the interior. Hamburg, which formerly was fortified, consists of the old and the new city, the former suburb of St. Georg, situated to the N. E., and the suburb of St. Pauli, situated to the W. Besides the Elbe, it has two other small rivers: the Alster, which, coming from the N., forms within the city a small basin, called Binnen-Alster, and outside of it a larger one, called Aussen-Alster and the Bille. Both are finally discharged through canals into branches of the Elbe. The harbor affords room for 400 sea-going vessels and 400 large and several hundreds of small river-craft. The westernmost part of the harbor is chiefly occupied by British coal-ships and the Hamburg-American Steamship Company steamers; the lower harbor, situated more to the E., and safe against drifting ice, is especially intended for sailing vessels; farther to the E. stretch the Sandthorhafen and the Grasbrookhafen, with fine quays for steamboats. The easternmost part, the Brookthorhafen, the upper harbor and the lumber harbor, consist of shallow basins, and are occupied by lumber-craft and other small vessels coming down the river. The great station belonging to the railway line through Bremen, Osnabrück, Wesel, and Maestricht to Paris, is situated between the Brookthorhafen and the upper harbor. The Berlin station is situated in the eastern part of the old town.

The best view of the city and the river is from the Elbe Hill, near the harbor. The finest part of the city is the Binnen-Alster, generally called the Alster Basin, and its surroundings. The quadrangular basin, nearly 1¼ miles in circumference, is on three sides lined with elegant buildings, among which are the best hotels, and has fine quays planted with trees—Jungfernstieg and Alsterdamm. The northern side of the basin is formed by a dike which separates the Binnen-Alster from the Aussen-Alster, over which is a promenade that crosses the channel connecting the two basins by the Lombard bridge, to the W. of which stands a column with the bust of Prof. Büsch, and to the E. a statue

of Schiller by Lippelt. At the northeast corner of the Alster Basin, on the Alster Hill, the art gallery is situated. The fortifications, extending from the art gallery to the Berlin station, have been transformed into promenades. Similar promenades stretch from the other end of the Lombard bridge to the Elbe Hill and the harbor, separating the city proper from the suburb of St. Pauli, and connecting with the fine botanical garden and with the zoölogical garden one of the best in Germany, having been organized by the famous naturalist Brehm. Other remarkable buildings are the Bourse, which contains a commercial library; the bank; the Nicolai church, built in 1842 after the plan of Gilbert Scott, of London; the Catharine church, containing a remarkable altar and fine glass-paintings; the Grosse Michaelis church, built in the middle of the eighteenth century; the Johanneum, containing a library of 400,000 volumes and 5,500 manuscripts; and the Thalia theater, built in 1842, in the Renaissance style. The vicinity of Hamburg, especially the right bank of the Elbe, is covered with fine villas, beautiful promenades, and charming villages, such as Blankenese, Flottbeck, and others.

It is probable that Hamburg originated from one of the castles which Charlemagne built against the Slavi, and more especially from the so-called Gammerburg. In 831 it was made a bishopric, and in 834 an archbishopric, although at that time it was only a miserable fishing-village. In 980 it had grown into a small town, but in that year it was destroyed by the Obotrites. In 1215 it was made a free city by the Emperor Otho IV., but in 1223 it was taken by the Danish king Knut VI. His son Waldemar sold it for 700 marks silver to the Count of Schaumburg-Orlamunde, and he sold it again for 1,500 marks silver to the citizens. Thus Hamburg again became a free city. It chose Count Adolph IV. of Holstein for its patron, and he protected it successfully against the Danes, leaving it all its rights and conferring many benefits on it. In 1242 it made a covenant with Lübeck, by which the foundation was laid for the Hanseatic League, to which Hamburg owes much of its commercial importance and all of its political influence. After the fall of the league it still increased, and during the Thirty Years' war no foreign soldier entered it. After a series of internal disturbances, caused by the jealousy between the Senate and the citizens, it formed a new constitution in 1712, and in 1770 it acquired a vote in the German Diet. Its commerce increased immensely during the North American war of independence, as Great Britain allowed neutral vessels free entrance to the colonies. On Dec. 13, 1810, it was incorporated into France, and suffered very much during the sieges of 1813 and 1814. In 1842, by a terrible conflagration, 4,219 houses were burnt. In 1867 Hamburg became a member of the North German Confederation, and in 1871 of the German empire. Revised by C. H. Thurber.

Hamburg: city; Fremont co., Ia. (for location of county, see map of Iowa, ref. 7–D); at the junction of the Missouri and the Nishuabotua rivers, and on the Chi., Burl. and Q., and the Kan. City, St. J. and C. B. Railroads; 50 miles S. of Council Bluffs. It is in an agricultural, fruit-growing, and stock-raising region, and contains 6 churches, large public school, several flour-mills, and 1 monthly and 2 weekly periodicals. Pop. (1880) 2,036; (1890) 1,634; (1895) 1,905. Editors of "Democrat."

Hamburg: borough; Berks co., Pa. (for location of county, see map of Pennsylvania, ref. 5–I); on the Schuylkill river and canal and the Penn. and Phila. and Reading Railroads; 18 miles N. by W. of Reading, 76 miles N. W. of Philadelphia. It is at the foot of the Blue Mountain, and has a rolling-mill, iron-foundries, stationary-engine works, hat-factories, handle and bending works, and three brick-manufacturing plants. There are incandescent and arc electric-light plants, an improved system of water-works, new public-school building that cost $25,000, and 1 semi-weekly and 2 weekly newspapers. Pop. (1880) 2,010; (1890) 2,127; (1893) estimated, nearly 2,500. Editor of "Item."

Hamburg White: See Baryta.

Hameln, haa'meln: town of Germany; in Hanover, on the right bank of the Weser, which here is crossed by a suspension bridge 780 feet long; 25 miles S. W. of Hanover (see map of German Empire, ref. 3–E). It has a very interesting aspect of antiquity with its walls and towers, and its old houses ornamented with wood-carving with their gables turned toward the streets. It has large breweries, foundries, and manufactures of paper, chemicals, and leather. The legend set forth in an inscription on the Rattenfängerhaus (built in 1642) is familiar to English readers from Browning's *Pied Piper of Hamelin*. Pop. (1890) 13,676.

Hamerik, haa'merčk, Asger: composer; b. in Copenhagen, Apr. 8, 1843; was a student under Gade, Berlioz, and von Bülow. He settled in Baltimore, Md., 1871, as director of the Peabody Conservatory of Music, where he has remained teaching and composing, and exercising a powerful influence on the musical life of that city. His principal compositions are *Symphonie Poétique* in F (1880); *Symphonie Tragique* in C minor (1884); *Symphonie Lyrique* in E (1884); *Friedenshymne*, cantata (1868); *Christian Trilogy*, oratorio, and some minor works. In June, 1890, he was knighted by the King of Denmark in recognition of his services to musical art. D. E. Hervey.

Hamerling, Robert: poet; b. at Kirchberg am Wald, an Austrian village, near the Bohemian border, Mar. 24, 1830; studied at the gymnasium in Vienna, and while still a mere lad wrote several dramas. After the insurrection of 1848, during which he was a member of the "Academic Legion," he devoted himself to the study of philology and philosophy, became teacher in the academic gymnasium in Vienna, held a similar position in Graz, and in 1855 was appointed professor in the gymnasium at Trieste, where he taught till 1866, when ill-health compelled him to resign. Returning to Graz, he devoted the rest of his life to authorship. His first volume, *Ein Sangesgruss vom Strande der Adria* (1857), was followed by a collection of lyical poems, *Sinnen und Minnen* (1860; 7th ed. 1886). Later he published *Schwanenlied der Romantik* (1862; 4th ed. 1873); *Germanenzug* (1864; 4th ed. 1873); *Ahasver in Rom* (1866; 14th ed. 1884); *Der König von Sion* (1869; 8th ed. 1879); *Danton und Robespierre* (1871; 4th ed. 1877); *Die sieben Todsünden* (1873; 4th ed. 1876); *Aspasia* (1875; 3d ed. 1884); *Die Waldsängerin* (1880); *Amor und Psyche* (1882); *Hesperische Früchte* (1884); *Die Atomistik des Willens* (1891); *Stationen meiner Lebenspilgerschaft* (2d ed. 1889). D. in Graz, July 13, 1889.

Ham'erton, Philip Gilbert: artist and author; b. in Manchester, England, Sept. 10, 1834; devoted himself to landscape-painting, living much in the wildest parts of Scotland; married a French lady in 1859, and thereafter lived chiefly at Autun; brought forward a new process for etching; and in 1869 established *The Portfolio*, an art review, devoted mainly to etching. Author of *Observations on Heraldry* (1851); *Isles of Loch Awe* (poems, 1855); *Painter's Camp in the Highlands* (1862); *Thoughts about Art* (1862), these two having been issued together as one work, but separated in later editions; *Etching and Etchers* (1866), an important and useful treatise which has been twice re-issued with important changes in the form and the illustrations; *Contemporary French Painters* (1867); *Etcher's Handbook* (1868); *Painting in France* (1869); *Wenderholme* (a novel, 1869); *The Unknown River*† (1870); *The Intellectual Life* (1873); *Chapters on Animals*† (1873); *Round my House* (1876); *Modern Frenchmen*, a volume containing biographies of artists and thinkers (1878); *The Life of J. M. W. Turner* (1879); *The Graphic Arts*, a large quarto, treating of the different kinds of drawing and painting, their peculiarities, and what should be expected of each, and finely illustrated (1882); *Human Intercourse* (1884); *Landscape*, a similar treatise, illustrated by forty admirable full-page prints (1885); *Imagination in Landscape Painting*† (folio, 1887); *Man in Art*, a work of the same class as *The Graphic Arts* and *Landscape*, but treating of figure-painting, etc., and illustrated in the same thorough way (1892). The titles marked † are of books reprinted from *The Portfolio*. A collected edition of his works appeared in Boston in 1882, in 10 vols. D. in London, Nov. 6, 1894.

Hamil'car: the name of several Carthaginian generals, the most celebrated of whom was Hamilcar Barca (lightning), the father of Hannibal. While very young he was appointed commander of the Carthaginian army in Sicily (247 B. C.) during the first Punic war. At this time the Romans had nearly succeeded in driving the Carthaginians from the island, but Hamilcar took up positions on Mt. Ercta and Mt. Eryx successively, from which he could not be dislodged, until in 242 B. C. the Romans offered battle on the open sea off the Ægates islands, and succeeded in defeating the Carthaginian fleet and in compelling the capitulation of Hamilcar. Peace was concluded shortly after, and Carthage lost Sardinia and Sicily. On his return to Carthage he was called upon to suppress the mutiny of the mercenary troops, and after a most obstinate struggle, last-

ing for more than three years, he succeeded. In order to procure for his native city territory that should at once compensate for the loss of Sardinia and Sicily, and afford a vantage ground for operations against Rome, he entered upon his Spanish campaigns in 236 B. C. He was eminently successful, and had brought the whole southern and eastern part of Spain under Carthaginian rule when he was killed in a battle against the Vettones, in 228 B. C.

Revised by G. L. Hendrickson.

Hamilton: town of Scotland; in the county of Lanark, on the Clyde; 11 miles S. E. of Glasgow (see map of Scotland, ref. 12–G). Close by is Hamilton Palace, a fine building in the midst of extensive pleasure-grounds. Pop. (1891) 24,863.

Hamilton: city, port of entry, and capital of Wentworth County, Ontario, Canada (for location, see map of Ontario, ref. 5–D); on Hamilton Bay, the W. extremity of Lake Ontario and the Grand Trunk Railway; 40 miles S. W. of Toronto, 43 miles W. N. W. of Suspension Bridge. The bay, which constitutes a capacious harbor, is connected with the lake by a canal, and a deepened channel, locally known as Desjardins Canal, leads to the town of Dundas. The city has a large trade and manufactures of machinery, cotton goods, tobacco, cigars, whisky, beer, paper, sewing-machines, carriages, fertilizers, wire goods, glass, gunpowder, screws, nails and tacks, etc. It is the see of an Anglican and of a Roman Catholic bishop, and has 8 chartered banks, electric street railways, inclined railway to the top of the mountain, and 3 daily, 4 weekly, 1 semi-monthly, and 2 monthly periodicals. Pop. (1881) 35,961; (1891) 48,980. Editor of "Spectator."

Hamilton: capital of the Bermuda islands; on the Great Bermuda, at the head of Great Sound. It was founded in 1790, and consists essentially of an irregular half street fronting a line of wharves. Pop. 8,000.

Hamilton: city; Hancock co., Ill. (for location of county, see map of Illinois, ref. 5–B); on the Mississippi river and the Tol., Peo. and W. and the Wabash Railways; opposite Keokuk, Ia. It is at the foot of the Des Moines rapids, has an immense water-power, and contains a number of important manufacturing establishments. The adjacent country is noted for fruit-growing. Pop. (1880) 1,025; (1890) 1,301.

Hamilton: town (founded in 1858); Caldwell co., Mo. (for location of county, see map of Missouri, ref. 2–E); on the Ham. and Kings. and the Han. and St. J. Railroads; 50 miles E. of St. Joseph, 69 miles N. E. of Kansas City. It is in an agricultural, fruit-growing, and stock-raising region, and is an important point for shipping cattle, horses, swine, and grain. There are 8 churches, 3 public schools, 2 grain elevators, 2 feed-mills, roller flour-mill, planing-mill, canning and cider factories, 3 weekly newspapers, 2 coal mines in operation, and fair-grounds with a half-mile race-track. Pop. (1880) 1,200; (1890) 1,641; (1893) 2,480.

Editor of "Hamiltonian."

Hamilton: village; Madison co., N. Y. (for location of county, see map of New York, ref. 5–G); on the Chenango river and the N. Y., Ont. and W. Railway; 30 miles S. W. of Utica. It is the seat of Colgate University (*q. v.*), and has 1 bi-monthly and 2 weekly periodicals. Pop. (1880) 1,638; (1890) 1,744.

Hamilton: city; capital of Butler co., O. (for location of county, see map of Ohio, ref. 6–C); on both sides of the Great Miami river, and on the Cin., Ham. and Day., and the Pitts., Cin., Chi. and St. L. Railways; 25 miles N. of Cincinnati. The river and the Erie Canal (which passes through it) afford unlimited water-power for manufacturing purposes, and among its industries are the manufacture of railway supplies, burglar and fire-proof safes, reapers, mowers, threshers, engines, wood-working machinery, cordage, paper, woolen goods, flour, bent wood, bran dusters, sash and blinds, etc. It has a board of trade, paid fire department, electric fire-alarm telegraph, electric street railway, 3 parks, and 3 daily, 1 semi-weekly, and 4 weekly newspapers. Pop. (1880) 11,122; (1890) 17,565. Editor of "News."

Hamilton, Alexander: statesman; b. in Nevis, an island of the West Indies, Jan. 11, 1757. His father was from Scotland; his mother was of Huguenot stock. His father failed in business, and his mother died while her son was a child. He was sent to the mother's relatives in Santa Cruz, where in 1769 he became a counting-house clerk of Mr. Nicholas Cruger; but on his manifesting some literary taste, he was sent in 1772 to a grammar school at Elizabethtown, N. J. In 1773 he entered King's (now Columbia) College. In 1774 his speeches, pamphlets, and newspaper articles on the political affairs of the day attracted very general attention and admiration. In 1776 he received a captain's commission in the artillery, and served with honor in the army of Washington, whose aide-de-camp he became in 1777, with the rank of lieutenant-colonel. In this capacity he was employed by the commander in the most delicate and important trusts. In 1780 he married Eliza, a daughter of Gen. Schuyler. In 1781 he resigned his commission in consequence of a reproof received from Gen. Washington. He next received command of a New York battalion of light infantry, of which he was lieutenant-colonel, and at the battle of Yorktown charged the redoubts at the head of his troop. With this brilliant exploit his military career came to an end. He then studied law, was a member of Congress (1782–83 and 1787–88), and served in the convention which drew up the Federal Constitution, where all his powers were exerted to give strength to the federal authority in opposition to the independent authority of the individual States. He was the principal author of the papers afterward called collectively *The Federalist* (see Federalist); and thus exerted a very powerful influence in behalf of the adoption of the Constitution by the several States. He was (1789–95) the first Secretary of the U. S. Treasury, and as such was the author of the funding system, the founder of the U. S. bank, and restorer of public credit. He afterward had some share in the preparation of Washington's farewell address. In consequence of his political doctrines as leader of the Federalists, he was at about this time involved in personal and political controversies with Jefferson and Monroe; but subsequently, when the House of Representatives was called upon to choose between Jefferson and Burr for the presidency, he used his powerful influence for the former. In 1798, during the troubles with France, he was made inspector-general of the army, with the rank of major-general, and was for a short time in 1799 commander-in-chief. In 1800 he was chosen president-general of the Cincinnati. He declined the chief justiceship of the U. S. In 1804, when Aaron Burr unsuccessfully sought the governorship of New York, he was opposed earnestly, though not actively, by Hamilton, to whose influence Burr ascribed his defeat. Burr, smarting under his supposed injuries, challenged Hamilton; and the latter, though repudiating the code as barbarous and wrong in principle, accepted the challenge. The parties met at Weehawken, N. J., July 11, 1804. Hamilton did not fire at his adversary, but at Burr's first fire was mortally wounded, and died on the following day. The importance of Hamilton's work in the formation of the government, and especially in the organization of the Treasury Department, has become more and more obvious with the passage of time. See his *Life*, by his son, John C. Hamilton (1834–40); by J. Renwick (1841); Hamilton's complete *Works* (7 vols., 1851; 8 vols., 1888); Morse, *Life of Alexander Hamilton* (2 vols., 1876); Lodge, *Alexander Hamilton* (1882).

Revised by C. K. Adams.

Hamilton, Frank Hastings, A. B., A. M., M. D., LL. D.: physician; b. at Wilmington, Vt., Sept. 10, 1813; graduated in medicine at University of Pennsylvania in 1835; in 1846 became Professor of Surgery at Buffalo Medical College; in 1858 Professor of Principles and Practice of Surgery in Long Island College Hospital, Brooklyn, N. Y.; in 1861 Professor of Military and Clinical Surgery in Bellevue Hospital Medical College, New York; from 1868–75 Professor of Principles and Practice of Surgery with Operations in same institution; military surgeon and medical director for two years during civil war. Dr. Hamilton was one of the consulting surgeons in the case of President Garfield (assassinated). He was the author of many valuable books on surgery, among which are *Treatise on Fractures and Dislocations* (1st ed. 1860; 7th ed. 1884); *General Treatise on Military Surgery* (1862); and *The Principles and Practice of Surgery* (1872; revised ed. 1886). He invented many surgical instruments, and was president of many medical societies. D. in New York, Aug. 11, 1886.

Hamilton, Lord George Francis: b. at Brighton, England, Dec., 1845; educated at Harrow; entered the army 1864; returned to Parliament 1868 and 1874 as a Conservative at the head of the poll in what had formerly been a strong Liberal district. He was Under Secretary of State for India in Disraeli's administration 1874; First Lord of the Admiralty in Lord Salisbury's administrations 1885–86 and 1886–92. C. H. T.

Hamilton, James: politician; b. at Charleston, S. C., May 8, 1786; the son of Maj. James Hamilton of Washington's staff. The younger Hamilton received a good education, became a lawyer, served as a major in the war of 1812, and was for some years mayor of Charleston, besides holding other public offices. In 1822 he detected a Negro conspiracy headed by Denmark Vesey. As a member of Congress (1822–29) he earnestly advocated State rights, free trade, direct taxes, and armed resistance to the tariff of 1828. As Governor of South Carolina (1830–32) he recommended the passage of the Nullification Act. Afterward he was made major-general commanding the State troops; removed to Texas; was influential in securing the recognition of the republic by Great Britain and France, and was appointed minister plenipotentiary from Texas to the European powers. He was elected from Texas to the U. S. Senate in 1857. On Oct. 15, 1857, he was drowned off the coast of Texas by the collision of the steamers Opelousas and Galveston.

Hamilton, Schuyler: soldier; b. in New York, July 25, 1822; a son of John Church Hamilton (b. 1792), and a grandson of Gen. Alexander Hamilton; Schuyler Hamilton was graduated at West Point in 1841, and was appointed second lieutenant of infantry; first lieutenant Mar., 1848; served on frontier duty and at Military Academy 1841–44. In the Mexican war he was twice wounded—once at Monterey, and again near Milflores, while in command of a scouting-party, with which he fought desperately a superior force. He was (1847–54) an officer on the staff of Gen. Scott. In 1855 he resigned and removed to Branford, Conn. In 1861 he enlisted as a private in the Seventh New York, but soon received a commission: became in 1861 a colonel and aide to the general-in-chief, and afterward a brigadier-general of volunteers. He took a prominent part in the actions at New Madrid, Mo., and Island No. 10, for meritorious conduct at which he was promoted major-general of volunteers, Sept. 17, 1862. On account of ill-health he resigned from the service in 1863. He published in 1853 a *History of the American Flag*, and in 1877 *Our National Flag, the Stars and Stripes, its History in a Century.*

Revised by James Mercur.

Hamilton, Sir William, Bart.: philosopher; b. in Glasgow, Scotland, Mar. 8, 1788. He was the elder of two sons of Dr. William Hamilton, Professor of Anatomy and Botany in the University of Glasgow. The only brother of Sir William was Capt. Thomas Hamilton, who served for a time in the British army. Having been severely wounded in the Peninsular war, Capt. Hamilton retired on half-pay and became a literary man. He was a frequent contributor to periodical literature. He was author of *Cyril Thornton*, a novel, and a book of travels in America. Sir William Hamilton belonged to an ancient Scotch family, several members of which are distinguished either in Church or state. One of these, Sir Robert Hamilton, was the commander of the Covenanters at Drumclog and Bothwell Bridge. (See Scott's notes to *Old Mortality*.) In 1603 the head of the family was made a baronet, but the family estate having been lost, the title had been in abeyance for nearly a century before Sir William's time, no one caring to claim the title. In 1816 Sir William made good his claim to it in the Scottish courts. From 1803 to 1806 Hamilton attended the yearly sessions of the University of Glasgow. In 1807 he entered Balliol College, Oxford, on the Snell foundation. This endowment was made for the education of students of Scottish birth, and it is worthy of remark that it secured the intellectual training (in addition to many others) of Adam Smith and Sir William Hamilton. Hamilton graduated at Oxford in 1810 with unprecedented honor, both for the extent of his reading and the difficulty of the authors which he presented for examination. Up to the time of his leaving Oxford he had been destined for the medical profession, and had made considerable progress in anatomical and physiological studies. Soon after this time, however, he decided upon the study of law, and in 1813 passed his examination as an advocate. In 1817 he visited Germany and again in 1820. He does not seem to have been eminently successful as an advocate, and in 1820 he became a candidate for the chair of moral philosophy in the University of Edinburgh, made vacant by the death of Dr. Thomas Brown, but was not elected by the town council. The following year, however, Hamilton was elected Professor of Civil History in the University of Edinburgh by the Faculty of Advocates. In 1826 he read a paper before the Royal Society of Edinburgh on phrenology, which had found strenuous advocates in Scotland under the leadership of George Combe. This was followed by another paper in 1827, and by a controversial correspondence with Mr. Combe on the subject. In preparation for these papers he dissected a great number of brains, and made detailed examinations of the whole subject, which he published from 1831 to 1850. Sir William says that his tables gave the results of an examination extended to 1,000 brains of 50 species of animals—a wider examination "than had hitherto been instituted by any professional physiologist." In Oct., 1829, he wrote for *The Edinburgh Review* his celebrated criticism of Cousin's *Cours de Philosophie*, under the general title of the *Philosophy of the Unconditioned*. This was followed in 1830 by his criticism of Brown; in 1831 by his discussion of the authorship of the *Epistolæ Obscurorum Virorum*, and by two articles on the state of the English universities. In 1832 he wrote his articles on the revolutions of medicine and on Johnson's translation of Tennemann. From 1833 to 1836 he wrote five articles upon general and professional education. In 1836 the chair of Logic in the University of Edinburgh became vacant, and Hamilton presented himself as a candidate. After an exciting canvass he was elected by a majority of two. In 1846 he published his edition of the works of Reid. In 1856 he completed his edition of the works of Dugald Stewart. It was his intention to add to this edition a memoir of Stewart, but he did not live to complete it. He continued to lecture till Apr., 1856. Although he had been stricken by paralysis in 1844, his intellectual capacity continued unabated to the last. D. May 6, 1856.

Hamilton seems never to have been willing to give the results of his own reflection upon any subject in a systematic form without previously studying the entire literature of the subject. He often exhausted his powers of production in the process of accumulating materials, and as a consequence has left no coherent systematic treatises which adequately represent either his learning or his power of thought. His mind was critical and dialectic, rather than constructive. He approached every subject from the point of view of an intellectual gladiator. This attitude of mind, connected with great power for clear and vigorous expression, renders his writings stimulating and suggestive almost without parallel. For the same reason they do not furnish safe guidance to a learner or to a person untrained in the processes and history of speculative thought. He manifestly had a constitutional dislike to regular and systematic composition. His works are all comparatively incomplete and fragmentary. In fact, with a partial exception in favor of his lectures on logic, his works are a series of magnificent torsos, grandly suggestive of range of learning and intellectual power.

Logic.—In the department of logic he awakened an interest which has steadily increased to the present time. In the reaction against the authority of Aristotle which marked the period of the renaissance a prejudice was excited against the works of that great thinker which was unintelligent and undiscriminating. In Scotland this reaction took the form of opposition to the study of logic in any vigorous or systematic form. Though it formed a part of the Oxford curriculum, the subject was studied through meager and inadequate manuals totally deficient in breadth of view and range of application. Hamilton's review articles and his lectures to his classes created a new epoch in the study of logic in Great Britain. The publication of his lectures since his death has opened up an immense range of logical literature, illustrated the history of the science, and vindicated its uses as a means of academic discipline and as a test of right thinking in all departments of human inquiry. The actual advances in logical science due to Hamilton are not easily estimated. He never fully developed the doctrines which he claimed as new, and possibly overrated their importance. It is claimed for him that he simplified logical processes by his quantification of the predicate and by extending the possible significance of the copula, and thus has enabled teachers of logic to dispense with the cumbrous apparatus of figures and the complicated terminology which they involved. It is in great part due to the impulse which he communicated and left behind him that so many able and vigorous works have been written on the subject since his death.

Philosophy.—The relations of Sir William Hamilton to psychology also are not easily defined. In his lectures and in the supplementary dissertations to his edition of Reid

and his review articles he has left on record a great amount of acute discussion and profound remark, illustrated by an immense range of philosophical learning. These hold a distinguished place among the contributions which the present century has made to psychological science. But he has left no logically developed and coherent system. He began his philosophical career as a critic of the fundamental principles of Schelling so far as they had been expounded and adopted by Cousin. The celebrated article in *The Edinburgh Review* which contains this criticism was written hurriedly, under pressure, with a distinctly polemical aim. His object was to annihilate by one crushing blow that philosophy of the absolute which had seized the control of continental thinking. For the purposes of this discussion he availed himself of the methods and formulas of Kant. In his anxiety for a victory that should be complete he denied to man all knowledge of the infinite whatever, and set aside as untrustworthy those facts in the human consciousness which impose upon us the belief in an infinity of real existence, which quantitatively the same consciousness affirms itself unable to define and measure. In his anxiety to show the inability of our powers to comprehend or "go around" the infinite in the form of time, space, or power, he was led to a positive denial of the existence of the notion as an ineradicable element in the human consciousness. See INFINITE for a discussion of his supposed refutation of the doctrine of the conceivability of the infinite.

Hamilton sought also, through his doctrine of the Unconditioned, to explain the origin and nature of the causal judgment. He makes the causal judgment the mere inability to think an absolute beginning. This statement is purely negative. The causal judgment comes into the mind in the presence of a change in what already exists. It is a change, a manifestation of power. No new existence appears. It affirms the event or the change to have had a cause. This affirmation is positive, both as a law of thought and a law of the objective change which calls out the affirmation from the mind of the observer. This effort on the part of Hamilton to account for the positive causal judgment by referring it to the impotence of the human mind, purely negative in its character, must be admitted to be a failure. The causal judgment is in the most emphatic sense positive, and no acuteness of psychological analysis can resolve it into a "fasciculus of negations."

In like manner, the doctrine of the "relativity of knowledge" which plays so large a part in Hamilton's discussions is a distinctly Kantian doctrine, and entirely foreign from the teachings, spirit, and aims of Scottish philosophy properly so called. It is equally irreconcilable with that doctrine of "natural realism" which, in his lectures and his celebrated criticism of Brown, Hamilton so emphatically taught. This word "relativity," as connected with the theory of knowledge, is used in different senses. If by "relativity" we mean that the knowledge of any object is impossible unless that object comes into relation with the mind, the term is simple and contains an intelligible idea. But if by "the relativity of knowledge" is meant that the external object as existing, and the internal percept which that object has determined in the mind, are different from each other in such a sense that our knowledge of the object is untrustworthy, the notion strikes at the foundation of all evidence and all knowledge. It is, besides, an assumption purely gratuitous. For if it be a fact that our mental apprehension of external objects is different from the objects themselves, and that the "thing in itself" is for ever shut out from our knowledge, how can we ever know the fact? How can we legitimately affirm that the form of our percept is unlike that of the object, which by its relation to our minds has marked out and determined our knowledge? By the conditions of the hypothesis the "thing in itself" is unknowable, consequently a comparison between it and the percept is impossible. No dialectic skill can harmonize this Kantian "relativity" with "natural realism" in any proper sense of the term.

There are few facts in the history of philosophy more remarkable than the attempt of Hamilton to combine into one system the Kantian doctrine of "relativity" and the direct and immediate knowledge of the external world which Hamilton taught with so much earnestness and zeal. The truth seems to be that the criticism on Cousin in *The Edinburgh Review* was so able, so learned, and so profound that it startled the British public into admiration, and made Hamilton famous all over the Continent. When he had once taken a position he was as incapable as any one of his old Covenanting ancestors of receding from it. When he took the position against Brown of a defender of the Scottish philosophy of Reid, he was called upon to defend a system in many essential particulars entirely foreign from that which furnished him with his weapons in his battle with the absolutists. He was publicly committed to the defense of two antagonistic systems. Instead of rejecting either, he attempted to hold to both and reconcile them. In this he failed, for the task was simply impossible. The Kantian portion of Hamilton's philosophy, formulated as the Philosophy of the Unconditioned, has been adopted by Spencer and Mill, for it harmonizes with the "reasoned" materialism which is the basis of the psychology which they hold in common with their masters, Hobbes and James Mill. It was accepted also by Mansel as the foundation-principle of his *Limits of Religious Thought*, but it has been very generally repudiated by cautious psychologists, who are as earnest as Hamilton in repudiating the extravagant claims for the human capacities which distinguished the system of Cousin and the earlier teachings of Schelling.

Hamilton's effort to clarify, supplement, and give systematic form to the doctrine of immediate perception somewhat vaguely set forth by Reid is a clear contribution to psychological science. For this purpose he revived and defended that doctrine of the relation of the soul to the body which the mediæval philosophers adopted from Aristotle, and which has since then been adopted by Stahl and Berard, and is now known under the designation of Animism. Unfortunately, Hamilton failed to perceive that the analysis of the qualities of body into primary and secondary is unnecessary in a system which recognizes sensible knowledge as the result of a face-to-face relation established between the different human senses and the various forms of matter. This discussion of Hamilton, which has been so much admired by his unquestioning followers, is also defective in confounding facts of physics and facts of psychology. The "natural realism" which in one part of his *Psychology* Hamilton so rigorously taught, requires and receives no aid from such an analysis of the qualities of body. Sound-waves are directly apprehended. The instrumentality which sets them in motion is, so far as the ear is concerned, a matter of inference. A similar statement may be made regarding the senses of smell and sight. In vindicating the doctrine of synchronous perception, and making clear the analysis of the formula of consciousness, as a condition of all forms of perception, Hamilton's labors are beyond all praise. It is true that he has limited the application of this formula to the case of perception of what he calls the primary qualities of body. In this limited range of application he has discussed it with great clearness and power. Although the formula of consciousness is implicated with greater or less clearness in all psychological systems, and in all analyses of the elements necessary in the construction of sentences in every human language, we know of no writer who has discussed this formula so successfully as Hamilton. He has failed only in limiting its application to the most obstrusive and emphatic forms of perception. Herbert Spencer, in his *First Principles*, has taken notice of this limited application of the formula by Hamilton, and for this reason has set aside as valueless the argument which Hamilton founded upon it for the real existence of the conscious self as distinct from all forms of matter.

In respect to the doctrine of consciousness, Hamilton departed somewhat from his immediate Scotch predecessors. With him consciousness is not a distinct faculty of the soul, but that fundamental fact of which all powers of the mind are so many different modifications. He affirmed also, as a consequence, the direct and immediate consciousness of all forms of matter coming into relation with their appropriate senses. See J. H. Stirling's *Sir William Hamilton, being the Philosophy of Perception* (London, 1865.); John Stuart Mill's *Examination of Hamilton's Philosophy*; Veitch's *Memoir of Hamilton* (ed. 1869); and Prof. Seth's *Scottish Philosophy* (1890).

Revised by WM. T. HARRIS.

Hamilton, Sir WILLIAM ROWAN, LL. D.: mathematician; b. in Dublin, Aug. 3, 1805; educated at the Dublin University, graduating with high mathematical honors; became Professor of Astronomy and astronomer-royal for Ireland in 1827; was knighted in 1835; became president of the Royal Irish Academy in 1837. He was author of valuable papers

on physics and mathematics, but his fame rests upon his great invention, the calculus of quaternions. His principal works are *Lectures on Quaternions* (1853) and *Elements of Quaternions* (1866). (See QUATERNIONS.) See *Life* by Graves (3 vols., 1883–89). D. in Dublin, Sept. 2, 1865.

Hamilton College: a college at Clinton, Oneida co., N. Y., founded in 1793 as the Hamilton Oneida Academy by the zeal and labor of Rev. Samuel Kirkland, whose earlier influence with the Oneida Indians had been of great account in winning them from the British side. The cornerstone was laid by Baron de Steuben. Alexander Hamilton was the generous helper and first trustee. The college charter was granted by the State in 1812. It is thus the twenty-eighth in the line of colleges in the U. S. The first class graduated in 1814. It has sent more than 800 men into the ministry, and more than 500 into the law; 142 have become college professors and presidents, and 183 served in the war for the Union. The whole number of classical graduates is 2,002, of graduates of the Maynard Law School 261, of all its alumni (including honorary degrees) 2,780.

The college has two courses, classical and Latin-scientific, and its standards of admission, personal instruction, hours of work, close examinations, and impartial exclusion of persistent low-grade students establish its thoroughness. Its faculty numbers sixteen. Particular attention has always been given to rhetoric and oratory. The prize system is elaborate. The college societies are strong. The Alpha Delta Phi was founded here in 1832. The Perry H. Smith Library Hall contains a rapidly growing library of 40,000 volumes. The Soper gymnasium is a model for amplitude and equipment. The campus, 300 feet above the Oriskany, is a romantic park of 40 acres with stately and historic trees, and commands a fine view. The climate is dry and wholesome.

The Edwin Litchfield observatory has long held an important scientific repute. Here Dr. Christian H. F. Peters discovered forty-eight asteroids, and did other work even more valuable and of international fame. Special attention is given to physics, biology, social statics, pedagogy, and American history and geology. The college is pronouncedly Christian, but is under no ecclesiastical control. By affinity it is largely Presbyterian, but its administration is wholly undenominational. *The Literary Monthly* is the official publication of the students. The commencement is always the last Thursday of June. For recent years the classes have averaged forty-five entering men.

The presidents of the college have been Rev. Azel Backus, D. D., 1812–16; Rev. Henry Davis, D. D., 1817–33; Rev. Sereno Edwards Dwight, D. D., 1833–35; Rev. Joseph Penney, D. D., 1835–39; Rev. Simeon North, D. D., LL. D., 1839–57; Rev. Samuel Ware Fisher, D. D., LL. D., 1858–66; Rev. Samuel Gilman Brown, D. D., LL. D., 1866–81; Rev. Henry Darling, D. D., LL. D., 1881–91; Rev. Melancthon Woolsey Stryker, D. D., LL. D., 1892.

Revised by M. W. STRYKER.

Hamilton Group: in the geology of North America a division of rocks corresponding to the middle portion of the Devonian period. The name was derived from the town of Hamilton, N. Y. In a narrow sense it includes a heavy body of dark shale, with some layers of limestone, which traverses the State of New York from its western extremity to its southern, being limited above by the Genesee shale and below by the Marcellus. More broadly it includes these shales also, and thus comprises all rocks between the Corniferous and Portage formations. Southwestward from New York the Hamilton outcrop follows the Appalachian uplands, acquiring locally a more sandy character in Pennsylvania and Virginia. In Ohio it is recognized as a thin shale, and farther West it appears to be represented by calcareous rocks. Among its fossils are plants, both terrestrial and marine, invertebrates in great abundance, and fishes. Its harder layers include flagstones of excellent quality, which under the name of bluestone are extensively used, especially in New York city. Many of its shaly members are bituminous, and these, lying deep beneath the oil districts of Pennsylvania, West Virginia, and Eastern Ohio, are believed to be the most important original source of the petroleum and natural gas stored in the overlying sandstones.

G. K. GILBERT.

Hamirpur': a district in Allahabad division, Northwestern Provinces, British India; between 25° 5′ and 26° 10′ N. lat., and 79° 23′ and 80° 25′ E. lon.: S. of the Jumna and E. of the Betwa and Dhasan rivers. It incloses the three native states, Sarila, Jigni, and Bihat. Area, 2,289 sq. miles. It is a part of the great plain of Bundelkhand, and incloses the picturesque artificial lakes of Mahoba constructed about 1100 A. D. The soil is deep, black, and fertile, and there is little waste land. The staple crop is grain, and cotton is extensively grown. The climate is hot and dry; the rainfall is 37 or 38 inches, but fluctuating and severe droughts are occasionally experienced. The towns are all small, only six having a population exceeding 5,000. From the ninth to the fourteenth century this district was the basis of the Chandal kingdom, with its center at Mahoba, which was then an important and beautiful city. From this time it became the possession of the Mohammedans, the Bundelas, and the Mahrattas successively. It was the scene of a fierce rebellion during the mutiny. The population numbers about 500,000, and is decreasing. Nearly all are Hindus. Capital, Hamirpur (see map of North India, ref. 6–F), with a population of 7,200.

MARK W. HARRINGTON.

Hamlet and **Hamleth**: See AMLETH.

Hamlin: See HAMELN.

Hamlin, ALFRED DWIGHT FOSTER: architect; b. at Constantinople, Turkey, Sept. 5, 1855; son of Cyrus Hamlin, D. D., founder of Robert College; educated at Amherst College and Massachusetts Institute of Technology and at the École des Beaux-Arts, Paris; instructor 1887–89, assistant professor 1889–90, adjunct professor 1891, all of Architecture in School of Mines, Columbia College. Author of series of papers on *Architectural Shades and Shadows* and *Handbook of the History of Ornament*.

C. H. T.

Hamlin, CYRUS, D. D., LL. D.: missionary and scholar; b. at Waterford, Me., Jan. 5, 1811; graduated at Bowdoin College 1834 and at Bangor Theological School (Congregational) 1837. He was a missionary of the American Board of Missions in Turkey 1838–59, when he became president of Robert College (1860–76), which he placed on a sure footing after a long struggle with the Turkish authorities. In 1877 he became Professor of Dogmatic Theology in Bangor Theological School; was president of Middlebury College, Vermont, from 1880 to 1885, when he removed to Lexington, Mass. His writings are partly in the Armenian language. In 1877 he issued in New York *Among the Turks*, and in 1893 in Boston *My Life and Times*.

GEORGE P. FISHER.

Hamlin, HANNIBAL, LL. D.: Vice-President of the U. S.; b. at Paris, Me., Aug. 27, 1809; was for a time a printer; admitted to the bar in 1833, and several times was elected Speaker of the Maine House of Representatives. He was (1843–47) a Democratic representative in Congress; U. S. Senator 1848–57, 1857–61, and 1869–81; Governor of Maine in 1857, to which position he was chosen as a Republican, but resigned on his re-election to the U. S. Senate. He was (1861–64) Vice-President of the U. S. during Mr. Lincoln's first term, and in 1865 was for a time collector of the port of Boston. He was again elected U. S. Senator in 1869, and re-elected 1875; U. S. minister to Spain 1881–83. D. in Bangor, Me., July 4, 1891.

Hamlin, TEUNIS SLINGERLAND, D. D.: preacher; b. in Glenville, N. Y., May 31, 1847; studied at Charlton Academy; graduated at Union College 1867 and at Union Theological Seminary 1871. He taught in Ypsilanti, Mich., 1867–68; was pastor of a Presbyterian church in Troy, N. Y., 1871–84, and in Cincinnati, O., 1884–86; and in 1886 became pastor of the Church of the Covenant, Washington, D. C. He has been one of the editors of *The Presbyterian Observer*, and is a trustee of the United Society of Christian Endeavor. His work is mainly that of an active preacher and organizer of Christian work, but he has published various sermons, articles, and addresses, and one volume, *Denominationalism versus Christian Union* (New York, 1891).

W. J. BEECHER.

Hamline University of Minnesota: a collegiate institution under the auspices of the Methodist Episcopal Church; located at Hamline, St. Paul, Minn., and named in honor of Bishop L. L. Hamline, of the Methodist Episcopal Church, who established the nucleus of its endowment; was founded in 1854 and opened the same year at Red Wing, Minn., where it continued in operation fifteen years. Owing to financial embarrassment, instruction was suspended 1869–80, during which time its board of trustees decided to change the location of the institution, and erected on the present site of the university a college building which was opened in 1880 with Rev. D. C. John, D. D., as president; in 1883

it was destroyed by fire, but was immediately rebuilt, instruction being continued without a day's interruption. In 1883 Rev. G. H. Bridgman, D. D., became president. During the first two years of his administration three buildings for the university were completed at a cost of $90,000, the debts of the university were paid in full, and large additions were made to the chemical and philosophical apparatus and to the library. The grounds and buildings of the university are valued at $180,000; in addition to these the corporation owns other unencumbered real estate of the value of $200,000, and has $26,000 invested in securities. The corps of instruction consists of Rev. G. H. Bridgman, D. D., president, and twelve professors and instructors.

The university is open to both sexes, and has a preparatory department embracing music. The collegiate department offers two courses of study, the classical and the scientific, each extending through four years.

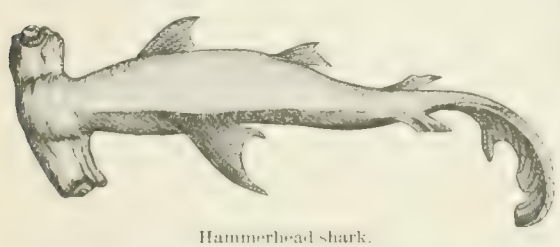
Hamm: town and railway center of Prussia; province of Westphalia, on the Lippe at its junction with the Ahse; 22 miles N. W. of Arnsberg (see map of German Empire, ref. 4–D). It has extensive wire-factories, also puddling and rolling works, foundries, machine-shops, and manufactures of gloves, baskets, wadding, sago, starch, chemicals, varnish, oil, beer, linen, and leather. Hamm was formerly a fortified town, and belonged to the Hanseatic League. Pop. (1890) 24,975.

Hammamat: the Wadi or valley extending from Koptos (26° N. lat.) on the Nile to Kossier, a seaport on the Red Sea (about 110 miles), used in ancient times as a caravan route. It was of importance as the avenue of communication in the trade in spices and incense carried on with the inhabitants of the land of PUNT (*q. v.*). In the valley were valuable quarries, whence was obtained all the dark-green or black diorite used by the Egyptians for statues. These quarries were worked during the fifth, sixth, eleventh, twelfth, and thirteenth dynasties, and also during the New Kingdom. Record is preserved of several large expeditions sent out to quarry large blocks for various Pharaohs, one of which consisted of a total of 8,368 men commissioned by Ramses IV. It is significant that among these men were 800 "Aperiu," a name long considered to be the Egyptian designation of the Hebrews. The god of the region was MIN (*q. v.*), the Greek Pan. CHARLES R. GILLETT.

Hammer, JULIUS: poet and author; b. in Dresden, Germany, June 7, 1810; studied literature and philosophy in Leipzig; conducted the feuilleton of the *Sächsische Konstitutionelle Zeitung* from 1851 till 1859; in 1853 was one of the founders of the "Schiller-Stiftung" in Dresden. Among his works are the comedies *Das seltsame Frühstück* (1834); *Das Leben ein Tanz* (1841); *Auch eine Mutter* (1859); the play *Die Brüder* (1856); the poems *Schau um dich und schau in dich* (1851; 30th ed. 1886); *Zu allen guten Stunden* (1854); *Fester Grund* (1859); *Lerne, liebe, lebe* (1862); the collections *Unter dem Halbmond* (1860); *Psalmen der Heiligen Schrift in Dichtungen* (1861); *Leben und Heimat in Gott* (10th ed. 1886). D. in Pillnitz, Aug. 23, 1862.

Ham'merfest: town of Norway; in Finmark (see map of Norway and Sweden, ref. 1–H). It is the northernmost town in Europe; situated in lat. 70° 40′ N.; it was founded in 1787. In the summer, during which the sun does not set from May 13 till July 29, the harbor of Hammerfest is the rendezvous of more than 200 fishing-vessels; the fishing can be carried on, however, the whole year round. Furs and eiderdown are exported. The place suffered severely from fire in 1890, but was rebuilt. Pop. 2,160.

Hammerhead: any shark of the genus *Sphyrna*. These sharks when adult have the two sides of the head produced



Hammerhead shark.

laterally till the head has somewhat the shape of a double-headed hammer. There is an eye on each end of the head. These fishes are very voracious, and extremely prolific, especially in warm seas. The *Sphyrna zygæna*, a man-eating shark, has been often caught on both sides of the North Atlantic.

Hammerich, haa'mer-rēk, MARTIN JOHANNES: philologist; b. in Copenhagen, Dec. 4, 1811; studied philology and mythology; was director of the gymnasium of Christianshavn 1842; retired in 1868 to his estate, Islinge, in the island of Seeland. D. there Sept. 20, 1881. His principal works are *On the Myth of Ragnarokr* (1836); translation of the *Sakúntala* (1845); *Life of Thorwaldsen* (1870); besides a great number of minor essays relating to the Danish language and literature, and distinguished as much by their sound and broad views as by their elegant form.—His elder brother, PETER FREDERIK ADOLPH HAMMERICH, b. in Copenhagen, Aug. 9, 1809, studied theology, and became a minister in 1845, and in 1858 Professor in Theology at the University of Copenhagen, where he represented the ideas of Grundtvig. He published several works relating to the history of Denmark and Scandinavia—*Danmark under Waldemarerne* (1847); *Danmark under Adelsvælden* (1854); *Den hellige Birgitta* (1863); distinguished alike for their novel ideas and for their vigorous style. D. Feb. 9, 1877.

Hammer-Purgstall, haa'mer-poorch'staal, JOSEPH, von, Baron: b. at Grätz, Austria, June 9, 1774; studied the Eastern languages at the Oriental Academy, Vienna; became in 1799 interpreter to the internuncio at the Porte; inspector of consulates 1800; secretary-dragoman in the Anglo-Turkish army 1801; secretary of Austrian legation in Turkey 1802; consular agent at Jassy 1806; court interpreter at Vienna 1816; aulic counselor 1817; baron 1837; president of the Academy at Vienna 1847–49; grand officer of the Medjidie 1855. He was an earnest student and furtherer of Oriental learning, publishing a very large number of learned works on Eastern history, etc. Among them are *Encyklopädische Uebersicht der Wissenschaften des Orients* (1804); *Die Staatsverfassung und Staatsverwaltung des Osmanischen Reichs* (1815–16); *Geschichte der schönen Redekünste Persiens* (1818); *Umblick auf einer Reise von Konstantinopel nach dem Olympos* (1818); *Geschichte der Assassinen* (1818); *Montenebbi* (1824); *Geschichte des Osmanischen Reichs* (2d ed. 1834–36, 10 vols.); *Geschichte der Osmanischen Dichtkunst* (1836–38, 4 vols.); *Geschichte der goldenen Horde* (1840); *Literaturgeschichte der Araber*, his most important work (7 vols., 1850–56). D. at Vienna, Nov. 24, 1856. Revised by C. H. TOY.

Hammersmith: parliamentary borough; in Middlesex, on the Thames; 4 miles above London; since 1885 a part of the metropolis (see map of England, ref. 12–J). A suspension bridge was opened in 1827, and another in 1887. One member is returned to Parliament. Pop. (1891) 97,237.

Hammond: city; Lake co., Ind. (for location of county, see map of Indiana, ref. 2–B); on the Grand Calumet river, and the Erie, the Penn., the Mich. Cent., and the Louisv., New Alb. and Chic. Railways; 20 miles E. of Chicago. It contains 15 churches, 20 schools, 3 daily and 4 weekly newspapers, 25 manufacturing establishments, a slaughter-house where 2,500 cattle are killed daily, extensive steel-works, nail-mills, distillery, axle and spring factories, foundry, starch-works, and improved system of water-works, electric street railways, and electric lights. Pop. (1880) 699; (1890) 5,428; (1893) estimated, 13,000. EDITOR OF "LEADER."

Hammond, HENRY, D. D.: prelate; b. at Chertsey, Surrey, England, Aug. 18, 1605; educated at Eton and Oxford, took holy orders in 1629, and was in 1633 made rector of Penshurst in Kent, in 1643 Archdeacon of Chichester. He was a stanch adherent of Charles I., and, having taken part in the unsuccessful rising at Tonbridge, he fled to Oxford, at that time the headquarters of the royalists. He served as chaplain to the king 1645–47, and was in 1648 made sub-dean of Christ Church; in the same year he was expelled by the Parliament, and even kept in prison for a short time. In 1649 he removed to Westwood, where he spent the remainder of his days. He published *A Practical Catechism* (1644); *Paraphrase and Annotations upon the New Testament* (1653), etc. His *Miscellaneous Theological Works* were published at Oxford (1847–50, 3 vols.). The edition also contains the *Life* by Fell. D. at Westwood, Worcestershire, Apr. 25, 1660.

Hammond, WILLIAM ALEXANDER, M. D.: b. at Annapolis, Md., Aug. 28, 1828; graduated M. D. at the New York University in 1848, and entered the U. S. army as assistant

surgeon in 1849, in which he remained till Oct., 1860, when he resigned and accepted the appointment of Professor of Anatomy and Physiology in the University of Maryland at Baltimore, where he also obtained a large practice. At the outbreak of the civil war he offered his services to the Government, and was reappointed assistant surgeon May, 1861; on the reorganization of the medical department in 1862 he was appointed surgeon-general of the army, in which capacity he displayed great energy and ability. In the midst of these official duties he prepared and published *Physiological Memoirs* (1863) and *Lectures on Venereal Diseases* (1864). Leaving the service, he became a professor in Bellevue Hospital Medical College, New York. Author of *Military Hygiene* (1863); *Sleep and its Nervous Derangements* (1869); *The Physics and Physiology of Spiritualism* (1870); *A Treatise on Diseases of the Nervous System* (1871); *Insanity in its Relations to Crime* (1873); *Mental Work and Emotional Disturbances* (1878); *Cerebral Hyperæmia* (1878); *Fasting Girls* (1879); the novels, *Dr. Grattan* (1884); *Mr. Oldmixon, A Strong-minded Woman* (1885); *Tales of Eccentric Life* (1886); *On the Susquehanna* (1887), and other works.

Hammonton: town; Atlantic co., N. J. (for location of county, see map of New Jersey, ref. 7–C); on the Cam. and Atl. and the Phila. and Read. Railroads; 28 miles S. E. of Camden. It is in a remarkably rich agricultural region, and is widely known for the extent and variety of its orchard productions. Pop. (1880) 1,776; (1890) 3,833; (1895) 3,428.

Hamon, ää′mōn′, Jean Louis: genre-painter; b. near Plouha, Côtes-du-Nord, France, May 8, 1821. Pupil of Paul Delaroche and Gleyre; third-class medal, Salon, 1853; second-class, Paris Exposition, 1855; Legion of Honor 1855. His work lacks robustness, but is graceful in drawing. His *The Elder Sister* and *Mountebank* are in the Nantes Museum; *Among the Flowers* is in the Metropolitan Museum, New York. D. at St.-Raphaël, Var, May 29, 1874. W. A. C.

Hampden, Sir Henry Bouverie William Brand, Viscount: statesman; b. in Dec., 1814; entered the House of Commons 1852; Parliamentary Secretary to the Treasury 1859–66; 1859 became senior whip of the Liberal party, and filled the office with great energy for nine years; elected Speaker of the House of Commons Feb., 1872; re-elected when the Conservatives came into power Mar., 1874; third time elected Apr. 29, 1880; retired from the Speakership 1884, when he was created Viscount Hampden. C. H. T.

Hampden, John: statesman; b., it is believed, in London, in 1594. His father, William Hampden, of Hampden, Buckinghamshire, belonged to an old Saxon family; his mother, Elizabeth Cromwell, of Hinchingbrooke, Huntingdonshire, was the aunt of Oliver Cromwell. When he was three years old his father died and left him a fortune, consisting chiefly of landed property. He entered the University of Oxford in 1609, where he pursued his classical studies with earnestness and success, and in 1613 began the study of law in the Inner Temple. In Jan., 1621, he took his seat in the House of Commons as member for Grampound. He sat for Wendover in the first three Parliaments of Charles I. (June, 1625, Feb., 1626, and Mar., 1628), and for Buckingham in the last two (Apr., 1640, and Nov., 1640, the Long Parliament). He allied himself with the party in opposition, and took part, under James I., in the protest against the marriage of Prince Charles with a Spanish princess, in the impeachment of Bacon, etc.; and under Charles I. in all the measures which Parliament took against the encroachments and arbitrary rule of the crown. But his position was in the beginning subordinate, and later, although always respectable, still in the second rank, until in the spring of 1637 he at once arose to great popularity. He was no republican; he considered royalty as the natural, consequently as the best, form of government. But the royal power, whether more or less circumscribed, must be clearly defined and kept strictly within its legal boundaries. If the crown encroached on the rights of the subjects, he considered it their duty to resist such encroachments, first by what legal means they might possess, and, if this proved ineffectual, then by rebellion. These ideas he adhered to with unconquerable firmness, and, when attacked he defended them with undaunted courage, and even with fierceness. In 1636 the king, in order to procure money, which Parliament would not vote him, and in spite of the fact that the kingdom was at peace, arbitrarily extended the so-called "ship-money" tax to the inland countries. Hampden was taxed twenty shillings, but refused to pay, and asked for a decision by the courts. In May, 1637, process was opened and lasted for thirteen days; but, although Hampden was condemned by a bare majority of the judges, the impression which the procedure produced on the English people was fatal to the king. It now became apparent that private property was not safe in England, and when, shortly after, the revolution broke out in Edinburgh, it found in England, too, the popular mind prepared for armed resistance against the king. Shortly after his condemnation, Hampden, Pym, Cromwell, and others, determined to migrate to America, and even were about to embark, when they were detained by royal order. In the Parliament of Apr., 1640, and in the Long Parliament of November of the same year, he stood as one of the most prominent leaders of the opposition; and he was one of the five members of the House of Commons whom the king accused of high treason (Jan. 3, 1642), but whom the House refused to deliver up for imprisonment. The king gave order to arrest the five members in their seats, but they were warned and concealed themselves. In August the civil war began. Hampden showed great energy and wisdom during the contest, and great bravery as colonel in the parliamentary army, especially at the battle of Edgehill and in the capture of Reading. But on June 18, 1643, in an encounter at Chalgrove Field between the royal cavalry under Prince Rupert and that of Parliament under Hampden, the latter was mortally wounded, two balls entering his body at the first charge. He was taken to the house of one of his friends at Thame, and died there six days after (June 24, 1643).

Revised by C. K. Adams.

Hampden, Renn Dickson, D. D.: Anglican theologian; b. in Barbados, Mar. 29, 1793; graduated B. A. as double first at Oriel College, Oxford, 1813; became a fellow of Oriel 1814; public examiner 1829, 1831, and 1832; delivered 1832 the Bampton lecture on *The Scholastic Philosophy in its Relation to Christianity*, the orthodoxy of which was sharply assailed; principal of St. Mary's Hall, Oxford, 1833; Professor of Moral Philosophy 1834; Regius Professor of Divinity 1836, greatly to the discontent of the Anglo-Catholic party, then dominant at the university, the convocation of which in the same year passed a vote of censure upon him, High and Low Church parties uniting in the vote; but in 1842 he was unanimously chosen to the theological examining board, and in 1847, after a bitter controversy, he was consecrated Bishop of Hereford. He contributed able philosophical and biographical matter to the *Encyclopædia Britannica* and the *Encyclopædia Metropolitana*; and was author of *Philosophical Evidence of Christianity* (London, 1827); *Lectures on Moral Philosophy* (1836); *Sermons* (1836, 1847); *Lecture on Tradition*; *The Fathers of Greek Philosophy* (1862). D. in London, Apr. 23, 1868.

Revised by S. M. Jackson.

Hampden-Sidney College: a college in Prince Edward co., Va., 7 miles from Farmville; founded in 1775 by the presbytery of Hanover, and incorporated 1783 by the Legislature of Virginia. Its first president was Rev. S. S. Smith, D. D., afterward president of the College of New Jersey. Among its incorporators were James Madison, Patrick Henry, Paul Carrington, William Cabell, Sr., Nathaniel Venable, and others illustrious in the history of Virginia and of the U. S. While undenominational, the college has ever been affiliated with the Presbyterian Church. It has adhered strictly to college methods and to the college curriculum, allowing proper latitude in the selection of studies. It is the only college in Virginia S. of the James river and E. of the Blue Ridge. It is beautifully located on a tract of land given by Peter Johnston in 1773, which has been increased by purchase and gifts, so that the college now owns about 250 acres. The standard of scholarship has always been high, and the alumni have filled some of the most important positions in the U. S. In 1893 the president was Richard McIlwaine, D. D.; the faculty numbered eight and the students 134. The library contained 10,000 volumes.

Richard McIlwaine.

Hamp'shire, Southamp'ton, or Hants: county of England; bordering S. on the English Channel, comprising, together with the Isle of Wight, which belongs to it, an area of 1,625 sq. miles. It is traversed by the North and South Downs, but the soil is in most parts sandy or gravelly, and not very fertile. Hops are extensively cultivated, and a fine breed of sheep is reared. The southwestern portion is covered by the New Forest, from which the dockyards of the British navy are supplied with oak and beech timber. Pop. (1891) 690,086.

Hamp'stead, ancient village of England, now part of the suburbs of London. It is a parliamentary borough and returns one member to Parliament. The mineral wells discovered on the common about 1620 were long famous. In the chapel-yard of St. John's are buried Sir James Mackintosh (d. 1832), Joanna Baillie (d. 1851), and Constable, the painter (d. 1837). In a tavern at Hampstead the famous Kit-Cat Club, of which Addison, Steele, and Pope were members, held its first meetings. Hampstead Heath is a favorite resort for holiday parties.

Hamp'ton: village of England; in the county of Middlesex, on the left bank of the Thames; about 15 miles W. S. W. of London (see map of England, ref. 12 J). A mile from the village lie the palace and park of Hampton Court, erected by Cardinal Wolsey in 1514, afterward presented by him to Henry VIII., and thereafter, until the time of George III., a royal residence. The palace contains an interesting collection of pictures, including specimens by Holbein, Lely, Kneller, and West.

Hampton: town; capital of Franklin co., Ia. (for location of county, see map of Iowa, ref. 3–H); on the Chi., Gt. W. and the Ia. Cent. Railway; 28 miles S. of Mason City, 60 miles N. of Marshalltown. It is in an agricultural and stock-raising region, and has water-works, electric lights, 5 churches, excellent high school, and 3 weekly newspapers. Pop. (1880) 1,598; (1890) 2,067; (1895) estimated, 3,000; (1895) 2,527.

EDITOR OF "CHRONICLE."

Hampton: town (incorporated as Kecoughtan in 1705); capital of Elizabeth City co., Va. (for location of county, see map of Virginia, ref. 7–I); on Hampton river and the Ches. and O. Railway; 3 miles N. W. of Fort Monroe, 16 miles N. by W. of Norfolk. It has a good harbor for small craft, several public and private schools, a college for women, three periodicals, and in its suburbs a national cemetery and asylum for disabled soldiers. It has a large trade in lumber, fish, oysters, canned crabs, and garden produce. Pop. (1880) 2,684; (1890) 2,513; (1895) estimated, 5,000.

EDITOR OF "HOME BULLETIN."

Hampton, WADE: soldier; b. in South Carolina in 1754; served under Sumter and Marion; was a member of Congress 1795–97 and 1803–05; became a colonel in the U. S. army in 1808, a brigadier-general in 1809, and was major-general 1813–14; commanded (1809–12) at New Orleans and (1813–14) on the Canadian frontier. He resigned in 1814, and afterward acquired great wealth, at one time owning 3,000 slaves. D. at Columbia, S. C., Feb. 4, 1835.

Hampton, WADE: grandson of Gen. Wade Hampton; b. at Columbia, S. C., 1818; graduated at South Carolina College; has served as member of both Houses of the Legislature of South Carolina. Commanded the Hampton Legion at the first battle of Bull Run, July, 1861, where he was wounded; promoted to be brigadier-general, and in command of a brigade at Seven Pines, May 31, 1862, where he was again wounded; engaged at the battle of Antietam, Sept., 1862, and upon the raid into Pennsylvania the following month; at Gettysburg, July, 1863, and a third time wounded; promoted to be lieutenant-general, and in command of body of cavalry in Lee's army during campaign of 1864, being frequently engaged; subsequently transferred to South Carolina, where in 1865 he commanded the cavalry forming the rear-guard of the Confederate army retiring before Gen. Sherman's advance northward; a spirited correspondence regarding the destruction of the city of Columbia by fire established the fact that it was not ordered by either Gen. Hampton or Gen. Sherman, but was owing to the vast quantity of cotton and other combustibles which had been accumulated here, and ordered to be destroyed before the evacuation of the city. He was prominent in the Democratic national convention in New York city in 1868 that nominated Seymour and Blair for President and Vice-President. He was Governor of South Carolina 1878; U. S. Senator 1879–1891; and became U. S. commissioner of railways 1893.

Hampton Roads: the broad and deep channel leading from Chesapeake Bay into the James, Nansemond, and Elizabeth rivers. Its name is derived from Hampton, Va., a village situated on Hampton creek, an arm of the roads. Forts Monroe and Wool serve for defense. Lat. of Thimble Shoal light, north side of entrance, 37° 42′ N., lon. 76° 14′ 5″ W. Hampton Roads was Mar. 8 and 9, 1862, the scene of important naval operations—the sinking of the U. S. frigates Congress and Cumberland, and the contest between the ironclads Monitor and Virginia.

Hamsters: rodent mammals of Europe and Asia of the rat family and of the genus *Cricetus*. *C. frumentarius* is the best known, but there are a number of other species. They all have large cheek-pouches, and all are very destructive to grain, which they store away in great quantities in

The hamster.

their holes. They are vigorously hunted, not only for their skins, which are valuable, but for the grain they have buried. They are found throughout the dry region of Central Europe and Asia, from the Rhine eastward to the river Ob, and southward to Persia and the Caucasus.

Hamuli [Lat., little hooks]: See FEATHERS.

Han'aford, PHEBE ANN: daughter of Capt. George W. Coffin; b. in the island of Nantucket, May 6, 1829; educated in the public schools and under Rev. Ethan Allen, rector of St. Paul's Episcopal church there; became a teacher and writer at fifteen; in 1849 married Joseph H. Hanaford, a teacher; in 1868 ordained as minister in the Universalist church in Hingham, Mass.; called to New Haven, Conn., in 1870, thence to Jersey City. In 1870–72 she was at various times chaplain of the Connecticut Legislature. She has been grand worthy chaplain of the Good Templars, and represented the grand lodge in the right worthy lodge at Detroit in 1867. Besides poems, addresses, and contributions to current literature, she has published *Lucretia the Quakeress* (Boston, 1853); *Lucretia, or Truth Sought and Found* (Philadelphia, 1857); *The Best of Books and its History* (1857); *Abraham Lincoln* (Boston, 1865); *Frank Nelson, the Runaway Boy* (1865); *The Soldier's Daughter* (1866); *The Capture Boy of Tierra del Fuego* (New York, 1867); *Field, Gunboat, Hospital, and Prison* (Boston, 1867); *The Young Captain* (1868); *George Peabody* (1870); *From Shore to Shore and other Poems* (1870); *Charles Dickens* (1870); *Women of the Century* (1877); *Ordination Book* (New Haven, 1887).

Revised by C. H. THURBER.

Hanau: a town of Hesse-Nassau, Southwestern Prussia; at the confluence of the Kinzig river with the Main; 12 miles E. of Frankfort, and junction of the railways from that city to Fulda and Würzburg (see map of German Empire, ref. 5–D). It consists of an old and a new city, the latter founded in 1507 by the Flemish and Walloon refugees. The old fortifications have been demolished and replaced by unusually agreeable parks and promenades. It is an important industrial center, and manufactures silks, gloves, hose, playing-cards, ornaments of various kinds, cigars, leather, and carriages. It has several metallurgical establishments and uses much platinum, and has a large trade in lumber, wood, and wine. Among the principal buildings are the ancient castle of the Counts of Hanau, the old collegiate Church of St. Mary containing their tomb, and a beautiful new Roman Catholic church. In the vicinity are the baths of Wilhelmsbad, which are much frequented by the residents of Frankfort. The number of Roman antiquities found in the vicinity of Hanau suggest a Roman origin. It became the seat of an independent count in the twelfth century, was raised to the rank of a town in 1303, became a county of the empire in 1429, and was fortified by Count Philip in 1528. It was taken by the Swedes in 1631, became independent in 1803, but soon fell into French hands, and was the place of Napoleon's victory of Oct. 30, 1813. It was annexed to Prussia in 1866. Pop. (1890) 25,027.

MARK W. HARRINGTON.

Hancock: village; Houghton co., Mich. (for location of county, see map of Michigan, ref. 1–E); on Portage Lake and the Mineral Range and Hanc. and Calumet Railroads; opposite Houghton. It is in the heart of the famous Lake Superior copper region, is connected with Lake Superior by

a ship-canal, and has several copper mines, smelting-works, stamp-mill, steam sawmills, foundries, and two weekly newspapers. Pop. (1880) 1,783; (1890) 1,772; (1894) State census, 1,662.

EDITOR OF "MICHIGAN COPPER JOURNAL."

Hancock: village; Delaware co., N. Y. (for location of county, see map of New York, ref. 6–H); at the junction of the two branches of the Delaware river, and on the Erie and the N. Y., Ont. and W. Railways; 50 miles E. S. E. of Binghamton, 164 miles N. W. of New York. It has four churches, union school, bluestone quarries, tanneries, flour-mills, wood alcohol factory, and extensive lumber interests. Pop. (1880) 686; (1890) 1,279; (1893) estimated, with suburbs, 1,600.

EDITOR OF "HERALD."

Hancock, CAPE: See CAPE DISAPPOINTMENT.

Hancock, JOHN, LL. D.: statesman; b. in that part of Braintree, Mass., now called Quincy, Jan. 12, 1737; the son of the Rev. John Hancock. He graduated at Harvard in 1754, and in 1764 inherited the business and the greater part of the large fortune of Thomas, his uncle, in whose counting-house he had been trained to business. The young Hancock was present in 1760 at the coronation of George III. In 1768 his sloop Liberty was seized for evading the laws of commerce, and a riot followed; and in 1770 he delivered a fearless and eloquent address at the funeral of those slain at the Boston massacre. In 1774 he was president of the Provincial Congress. His conduct exposed him to the ill-will of the authorities, and the arrest of Hancock and his fellow patriot, Samuel Adams, was one of the objects of the expedition to Concord which led to the conflict at Lexington. Both made their escape, but were excepted from the general pardon issued to the rebels by Gen. Gage, June 12, 1775. From 1775 to 1777 he was president of the General Congress at Philadelphia. He was the first of the signers of the Declaration of Independence. In 1778, as major-general of the Massachusetts militia, he took part in the expedition against Rhode Island under Sullivan. He was Governor of Massachusetts 1780–85; member of Congress 1785–86; again Governor 1787–93, and held at times various other offices of honor. He was a man of strong and decided character, and dignified, courtly, and pleasing manners, and made a liberal use of his large fortune for benevolent purposes. D. at Braintree, Mass., Oct. 8, 1793.

Hancock, WINFIELD SCOTT, LL. D.: soldier; b. in Montgomery co., Pa., Feb. 14, 1824; received his early education at Norristown (Pa.) Academy; after graduation was promoted in the army to be brevet second lieutenant of infantry July 1, 1844, receiving his full commission of second lieutenant in 1846; promoted to be first lieutenant 1853; in 1855 transferred to the quartermaster's department with the rank of captain; promoted to be major in same department 1863. After serving on the frontier he took part in the war with Mexico (1847–48), and for conspicuous gallantry was breveted first lieutenant. From 1848 to 1855 he served with his regiment in the West, as quartermaster and adjutant; served in the quartermaster's department in Florida during the Seminole hostilities, in Kansas during the disturbances of 1857, and in California, at Los Angeles, as chief quartermaster of the southern district, where, on the outbreak of the civil war in 1861, he was assigned to Kentucky as chief quartermaster of Gen. Anderson's command, but before entering on that duty he was (Sept. 23, 1861) appointed a brigadier-general of volunteers. During the fall and winter of 1861–62 he commanded a brigade at Lewinsville, Va.; in Mar., 1862, he accompanied Gen. McClellan to the Peninsula, being actively engaged at the siege of Yorktown and the subsequent pursuit which resulted in the battle of Williamsburg, where he led the brilliant charge which captured Fort Magruder and gained the day. His services at Golding's Farm, Garnett's Hill, Savage's Station, and White Oak Swamp, and during the retreat to Harrison's Landing, were conspicuous and valuable; and the brevets of major, lieutenant-colonel, and colonel were conferred upon him, and he was recommended by Gen. McClellan for promotion to major-general. He took part in the movement to Centreville, Va., Aug.–Sept., 1862; in the Maryland campaign he led his brigade at Crampton's Pass, South Mountain, and at Antietam, where he took command of the first division Second Corps on the death of Gen. Richardson; Oct. 10–11, 1862, he conducted an important reconnoissance from Harper's Ferry to Charlestown, Va. Promoted major-general of volunteers Nov. 29, 1862, he continued in command of the first division of the Second Corps, which he led at Fredericksburg, Dec., 1862, in the assault on Marye's Heights, and at Chancellorsville, May, 1863; in the following month he was placed in command of the Second Corps. At Gettysburg (July 1, 1863), after Reynolds had fallen, Hancock was sent from Taneytown by Gen. Meade to assume command; arriving on the field just as the rear of the beaten Union army was coming through Gettysburg, he at once made his presence felt, and, after staying the retreat, extended the Union lines to Culp's Hill, when the enemy's farther advance was checked. Perceiving its advantages, Gen. Hancock sent Gen. Meade such a report of the nature of the vicinity of Gettysburg as determined him to fight his battles there. On the following days (July 2–3), Hancock commanded the left center, repulsing the grand final assault of Lee's army, July 3, falling severely wounded at the moment of victory. In Mar., 1864, he returned to his command, and in the campaign of that year he bore a prominent part; in the battle of the Wilderness (May 5–7) his command amounted to more than 50,000 men; at the battle of the Po (May 10) he commanded the Second and Fifth Corps, as well as in the assault near Spottsylvania Court-house, May 12; at Spottsylvania he led his corps in its famous assault on the enemy's works, capturing upward of 4,000 prisoners, twenty pieces of artillery, and thousands of small-arms; in the subsequent operations, including Cold Harbor and the assault of the lines before Petersburg, Hancock was indefatigable until compelled (June 17) by the outbreaking of the wound received at Gettysburg to relinquish his command for ten days, when he returned to the command of his corps in front of Petersburg. On Aug. 12 he was appointed a brigadier-general in the regular army. During the months of July and August the battles of Deep Bottom and Ream's Station, and of Boydton Plank-road (Oct. 27), were fought under his direction and command. From Nov., 1864, till Feb., 1865, he was in Washington organizing; from February till July commanded the First Army-corps of veterans, remaining in Washington on that duty until Feb., 1865, when he was assigned to the command of the middle military division; from July till Aug., 1866, commanded the middle department, when he was transferred to the command of the department of Missouri, having in the meantime (July 26) relinquished his volunteer commission and been promoted to be major-general in the regular army. While commanding this department he conducted an expedition against hostile Indians on the plains. From Sept., 1867, to Mar., 1868, he commanded the department of the Gulf; the military division of the Atlantic, Mar., 1868, to Mar., 1869; the department of Dakota 1869–72, when he was assigned the command of the division of the Atlantic, which he held till his death. In 1869 he declined the Democratic nomination for Governor of Pennsylvania. He was nominated June 24, 1880, by the Democratic convention at Cincinnati, O., for President of the U. S., but was defeated at the following election by Gen. Garfield, who received a popular majority of 7,018 and an electoral majority of 59. Gen. Hancock died on Governor's island, New York harbor, Feb. 9, 1886.

Hand [< O. Eng. *hand*: O. H. Germ. *hant* (> Mod. Germ. *hand*): Goth. *handus* < Teuton. *handus*]: in mammals, the foremost extremity, always present, though often very much modified. When contrasted with the foot in size, there is much variety. The kangaroo has a small hand and a large foot. In the mole there is a broad shovel-shaped hand and a delicate foot. The sloth has an exceedingly long hand. The foot of the beaver and the seal is much larger than the hand. The differences between the hand and foot usually consist in greater delicacy and slenderness of the fingers, with corresponding refinement of function, since the hand has the more to do in protection, defense, nourishment, and delicate operations than has the foot, which is mainly of use in propelling and maintaining the attitudes of the body.

The hand presents for study the carpus, metacarpus, and phalanges, corresponding in general plan of structure to the tarsus, metatarsus, and phalanges of the foot. The relative dimensions of these parts vary exceedingly. The hoofed animals, the elephant, and those animals which use the fore legs mainly for support, have short and robust bones. On the other hand, the bat and pterodactyl have enormously developed fingers to support the web which gives them the wing. Climbing animals have the whole hand developed into slender and delicate manipulating organs. And in general, animals which do not enjoy *free lateral movements* of the fore legs have small and diminu-

tively modified hands. The typical idea of the hand is so nearly the same with the foot that reference is made for information to the article on Foot.

The Human Hand.—The human hand is probably the most remarkable organ, not vital, in the whole animal kingdom. Its mechanism is somewhat complicated, and quite unlike human machinery, and its sensitiveness, suppleness, delicacy of movement, and beauty of form are marvelous in the range of animal organisms. "The consummation of all perfection as an instrument," says Sir Charles Bell. The hand bears a very close relation in its plan of structure to the foot, or is the analogue of the foot. Thus the foot has a tarsus of seven bones, a metatarsus of five, and phalanges numbering fourteen. The hand has its carpus of eight bones, its metacarpus of five bones, and fourteen phalanges. And each of these members is joined to the two bones of the limb above it. The ideal structure of the hand is well shown by the diagram devised by Dr. G. M. Humphry, of Cambridge, England, and the exact framework of the hand is seen in the cut from Holden's *Osteology*. The carpus is united to the radius and ulna by its peculiar articulations, which permit the motions of the hand as a whole in all directions, and almost as perfectly as the ball-and-socket joint. The eight bones of the carpus are arranged in two more or less complete rows running across the hand. The peculiar arrangement of the two rows, and four segments in each row as represented in the eight bones, is designed to give flexibility, suppleness, and the peculiar strength to resist violent blows which the hand must so often receive. The long metacarpals, five in number, give the back and palm of the hand, which furnish a broad and firm surface for the apposition of the fingers in grasping anything and delicately manipulating minute and multiform objects. The slenderness and delicacy of the fingers are what give the elegant and beautiful proportions to the hand. The supination and pronation, or the turning of it on its longitudinal axis, is a prominent characteristic of the human hand. No animal equals or nearly approaches man in this respect. And the muscles which enable him to *point with the index-finger* are supplied to man alone, thus indicating a superior grade of being in him, as this movement could only be required for higher purposes than mere sense-gratification or means of gaining a subsistence or self-protection.

Fig. 1. — Diagram of the human hand.

Fig. 2. — Bones of the hand.

Why are the fingers of different lengths? Regarding it in a typical sense, Prof. Owen says it is in obedience to the law of "simplification of the digits," or that the longest digit is the most permanent one, and the shortest the first to disappear. Thus the thumb (*pollex*), or first digit, is the shortest, the fourth finger, or fifth digit, the second in length, the second digit the next, the fourth next, and the third digit, or second finger, the longest of all. Another reason of the unequal lengths of the fingers is shown by placing a small rod—say, a lead-pencil—across the palm of the hand, and bending the fingers' ends down upon it. In this experiment all the tips of the fingers reach the pencil at the same instant and press upon it with nearly equal force. This shows that the lengths of the digits and the muscles controlling them are so arranged as to make the hand most effective in grasping even small objects.

Each hand, with its fingers, is moved directly by thirty-one pairs of muscles, which are located between the elbow-joint and the tips of the fingers. They vary in length from about 18 inches to 1 inch in length, and many of them are provided with very long tendons. Those of peculiar interest are the two used in flexing the fingers. These have their origin near to the elbow-joint, their fleshy portions lie one above the other in the fore arm, and their tendons are attached to the inner surface of the base of a part of the phalanges. The most superficial one sends its tendons to the second phalanx of the first, second, third, and fourth digits, and the other (deepest one) sends corresponding tendons to the last phalanx of the same digits. But in order to secure slenderness and delicacy to the fingers, with strength also, a peculiar mechanical arrangement is devised. The tendon supplying the second phalanx is split just above its point of attachment, so as to allow the tendon sent to the third phalanx not only perfect facility of motion, but also to supply the place of ligaments to keep it in place as it passes by the joint. Thus both of these sets of tendons can act singly or conjointly; and not only does each set act by itself, but each division of the muscle may act on its own finger if the will only so directs. The relative lengths of the fingers of man and the gorilla are shown in Fig. 3. Another interesting point in the muscles of the hand is that the thumb and little finger are the most abundantly supplied with muscles, and hence muscular power. This is so arranged in order that the hand may more firmly grasp any object, and be especially efficient in the acts of pronation and supination; and peculiar care is always exercised by the surgeon in treating a mutilated hand to save, if possible, one or both of the extreme digits, as they are of much more relative importance in manipulation than are the other digits.

Fig. 3. The human hand.

Hand of the gorilla.

The sensitiveness of the skin of the hand to external impressions is one of the most important characteristics of this organ. This property resides in minute elevations of the skin called *papillæ*. These measure from the $\frac{1}{100}$th to the $\frac{1}{200}$th of an inch in height, and contain always a lymphatic, blood-vessels, and nerves. They are the most numerous on the palm of the hand and at the tips of the fingers, rather than at the other joints. Thus on a square line of the palmar surface of the tip of the last joint of the forefinger are 108 papillæ; on the second joint, same space, 40; and on the first phalanx, 15. It has been assumed that each nerve-fiber ends in a pencil of delicate filaments which gives sensibility over a circular or oval area of the hand covering $\frac{1}{100}$th of a square inch; and on many of the terminal nerve-fibers of the hand and foot, in addition to the simple filaments, there are minute oval bodies found somewhat sparsely, and very small, called "Pacinian bodies," which doubtless aid the sense of touch. The theory of touch is that pressure gives the sensation. But if this be the case, why does tickling with a feather or a speck in the eye produce so marked an impression? The sense of touch is more improvable by education than any other of the senses. This is well seen in blind people, who use their fingers as eyes with great delicacy of perception. The Bengalese throwsters are able to detect by touch twenty degrees of fineness in the fibers of the cocoon.

Edward Hitchcock.

Handel (in German, *Händel*, hen'del), Georg Friedrich: composer; b. in Halle, Saxony, Feb. 23, 1685. His father, who intended to educate him as a doctor, kept him from the public schools and forbade him to use any instrument, but young Handel learned to play on an old spinnet hidden in the garret. At eight years of age he was so proficient that when on a visit at the court of Saxe-Weissenfels, the duke, who overheard him playing on the chapel organ, exacted from the surprised father a promise that the boy should be educated as a musician. He began his studies at once under Zachau, organist of Halle. During the five years spent there he analyzed all the most important German and Italian compositions of that epoch, passed the severe ordeal of fugue and counterpoint, and finally composed every week a motet or a cantata for the church of Halle. At thirteen (1699) he was sent to study the operatic school in Berlin, where he remained but a short time, and then entered as a violinist the orchestra of the opera-house at Hamburg. His playing was poor, but at the age of nineteen (1704) he one day assumed the direction of the orchestra during the ab-

sence of the leader, and displayed such ability that he was at once advanced to that position. At twenty-one (1706) he went to Florence. At this age he was eminent as an organist and learned in the severe, scientific style of composition. But his early works are somewhat dull, lacking melody and sentiment. During two years he lived in Florence, Vienna, Rome, and Naples, composing operas which earned him some reputation, but little money. Failing to obtain an engagement, he returned to Germany. At twenty-five (1710) he was made chapel-master to the Elector of Hanover—afterward King George I. of England—and given a salary of £200. While there he gained in grace and melody from association with the elegant Italian composer Steffani. The elector twice gave him leave to visit London. His first visit was made in 1710 and his first opera, *Rinaldo*, was produced in London Feb. 24, 1711. On his second visit (1712) he received a pension of £200 from Queen Anne, and unceremoniously prolonged his absence to a permanent residence. In 1714 the elector ascended the throne of England, and, naturally being angry with Handel, forbade him the court. But Handel's music was popular in London, and it was not easy to ignore him. He wrote his *Water Music* (1715) for a royal festival on the Thames, and it so charmed the king that he forgave his truant chapel-master and raised his pension to £400. For a few years Handel lived under the roofs of Lord Burlington and of the Duke of Chandos, enjoying the patronage of the nobles, the society of wits and poets, and a quiet, studious life. At thirty-five (1720) he was appointed director of the Royal Academy of Music at the Haymarket theater. Then began a period of twenty years in which he passed through the severest trials of party warfare. His haughty, irritable manner soon created enemies among his patrons and his singers, who formed a rival opera troupe, in which Bononcini and other composers led the most eminent artists of the day. He poured from his fertile brain scores of mediocre Italian operas, generally lacking the charming qualities of the Italian school, which just then were the demand of the times. Some of these works had a short run on the stage. He gradually lost his noble patrons, social position, health, fortune, passed twice through bankruptcy, and finally sank into neglect, almost oblivion. Not till he was fifty-five years old (1741) did Handel give himself entirely to oratorio, his true work. He had written up to this time about 100 large works, and he wrote afterward but a few, each of which is now a familiar masterpiece. The people of Dublin, for whom he wrote his greatest work, *The Messiah* (produced 1742), were the first really to appreciate his genius. By this and other oratorios he suddenly rose to the pinnacle of fame, and before his death became the idol of the British. He was stricken blind in 1751, but notwithstanding this calamity his closing years were prosperous and happy. He died in London, Apr. 14, 1759, and was buried in the Poets' Corner in Westminster Abbey.

Handel's industry was extraordinary. He wrote *Rinaldo* in fourteen days and *Israel in Egypt* in twenty-seven days. He associated with only three friends—Smith, his copyist, Goupy, a painter, and Hurter, a dyer. It is believed that he never loved a woman, and was a strict celibate. He was economical in his personal expenses, but not parsimonious. The concerts given in his aid during the last years of his life enabled him to pay his debts, leave £1,000 to the Foundling Hospital of London, and £20,000 to his poor relatives in Germany. He was very fond of pictures, which were his only interest besides music. He was uncommonly isolated in his profession, having no companionship with musicians, and but little interest in their productions. Excepting a smattering of Latin, he knew almost nothing but music and the Italian language. Although he had a violent temper he was not habitually ill-natured or unkind, and in his prosperous days he was even a genial companion.

The prominent characteristics of Handel's music are sublimity and strength. Around these, grouped in secondary importance, are other qualities equally precious. He excelled all other composers in writing choruses, in which vigor of thought and clearness of form unite to carry the interest in crescendo through the most colossal effects. His most remarkable works are the oratorios *The Messiah*, *Judas Maccabæus* (1746); *Israel in Egypt* (1739); and *Samson* (1742). He wrote no fewer than 52 operas, 23 oratorios, 22 compositions for the church, 13 for chamber-music, and 3 collections for organ and piano—in all 113. Even when it is remembered that he borrowed freely from other composers, this amount must be considered enormous, for most of the works are colossal in conception and proportion. See the *Life* by Rockstro (1883), and that in German by Chrysander (Leipzig, 1858–67, unfinished). The best edition of his works is the one by Chrysander (98 vols., 1856, *et seq.*).

Revised by Dudley Buck.

Hand-tree [transl. of Span. *manï'ta*, deriv. of *mano*, hand]: the *Cheirostemon platanoïdes*, a tree of Central America; rarely found in Mexico, where it was anciently worshiped. It is one of the family *Malvaceæ*. Its flower has no corolla, but its large calyx has five curved anthers, bearing some resemblance to a hand, whence the name.

Hangchow-foo: a large and populous city of China; capital of the province of Cheh-kiang; long noted for its magnificence, wealth, and luxury, sharing with the neighboring city of Suchow the reputation of equaling paradise. It is situated at the southern end of the Grand Canal (*q. v.*), about 2 miles from the banks of the Tsien-tang river, and about 50 miles from its mouth (see map of China, ref. 6–K). Its walls are now about 12 miles in circuit; but Marco Polo, who visited the city several times near the close of the thirteenth century as an officer of the Mongols, and who gives a very elaborate and enthusiastic account of it, says they measured 100 miles, and inclosed the beautiful Si-hu or "Western Lake," which now washes the city walls on the W. To Marco it was known as *Kinsay* (a corruption of Chinese King-sze, metropolis), Hangchow having been the capital of the Sung dynasty rulers after the Kin Tartars had gained possession of Northern China.

The chief industry of Hangchow is its silk manufactures, which give employment to 60,000 persons. Population 800,000, including a Tartar garrison of 7,000. Hangchow was captured by the Taipings Dec. 29, 1861, after a protracted siege. Opened to foreign residence and trade Sept. 26, 1896. R. L.

Hanging: See Capital Punishment and Gallows.

Hanging Garden of Babylon: one of the Seven Wonders of the ancient world; built probably by Nebuchadnezzar (604–561 B. C.) to please his wife, the Median princess Amyitis, who pined for the bolder scenery of her native country. The garden consisted of several acres of made land lifted, some say, 150, others say 300 feet, above the plain, and supported by several tiers of arches; Oppert thinks as many as nine. But the data are too scanty for a satisfactory reconstruction of the garden. Our information comes mainly from Diodorus Siculus (ii., 1) and Strabo (xvi., 1, 5). There is a good description in the novel *The Master of the Magicians*, by Elizabeth Phelps Ward. See Rawlinson's *Ancient Monarchies*, ii., 553; iii., 59.

Revised by S. M. Jackson.

Han-kiang: a river of China; the most important of the affluents of the Yang-tse. It rises in the Ta-Pa range, in the province of Shensi, about 50 miles W. of the important city of Hanchung-foo, and flows E. and S. for 1,300 miles through Shensi and Hupeh, emptying its waters into the Yang-tse at Hankow. It is navigable almost from its source, though rapids are both frequent and dangerous almost as far down as Lao-ho-k'ow, 1,390 *li* (about 460 miles) above Hankow. The upper valley of the Han is regarded as an earthly paradise, and is often called the "Garden of China." It contains many populous towns and villages, produces wheat, cotton, tobacco, silk, etc., and is noted for the manufacture of glue (especially at Si-hiang) and of steel (especially at Tie-lu-chwang, near the source of the river). The chief towns on the upper and middle courses of the Han are Sin-pu-wan (at the limit of navigation), Hanchung-foo, Tsz'-yang-hien, Hing-ngan-foo, Lao-ho-k'ow, and Fan-ching (noted, like Siang-yang-foo on the opposite bank, for successfully withstanding the besieging armies of Kublai Khan from 1268 to 1273, when Marco Polo's father and uncle came to the assistance of the Mongols with mangonels which they had constructed). Below Fan-ching the banks are low, and the surrounding country is frequently flooded. The chief towns are Nei-ho-k'ow, An-luh-foo, Sha-yang, Wu-kia-k'ow, Tien-mŭn-hien, Mien-yang, Han-chwan-hien, etc. The traffic on the river is very great. Steam navigation is possible as far as Lao-ho-k'ow. R. Lilley.

Hankow (literally, mouth of the Han): a river-port of China; in the province of Hupeh, on the left bank of the Yang-tse, at the point where it receives the waters of the Han (hence the name), and 582 geographical miles W. of Shanghai; lat. 30° 32′ 51″ N., lon. 114° 19′ 55″ E. (see map of China, ref. 6–J). It is one of the five chin or chief commercial emporia of the empire, and is splendidly situated in the very heart of the country in the center of a network

of rivers and lakes unsurpassed elsewhere. The native town lies on the east bank of the Han, along which it extends for 2½ miles, in the angle formed by the Han and the Yang-tse, along which it stretches for a mile. It is poorly built, dirty, and foul-smelling. To the E. of the native town is the foreign settlement, with a frontage on the Yang-tse of 800 yards. Here the streets are wide and regular, and kept in fine order. The custom-house lies to the E. of the settlement. Hankow was designated as a treaty-port in the treaty of 1858, but was not thrown open to foreign trade until Mar. 11, 1861. The Yang-tse is here a mile wide, and presents a scene of great commercial activity. The largest ocean steamers come to Hankow to load tea, and there is regular steam communication with Shanghai and the other river-ports both above and below Hankow. The trade of Hankow is chiefly distributive. Exclusive of the junk and overland trade the total value of imports and exports, as shown by the reports of the Imperial Maritime Customs, amounted in 1892 to 48,574,509 haikwan or custom-house taels (or to about $51,000,000 U. S. gold), of which taels 17,010,216 were foreign imports, taels 12,000,353 native products from other Chinese ports, and taels 19,563,940 exports. The direct shipments to foreign countries, amounted to taels 3,224,582, a decrease of about taels 5,000,000 as compared with 1891, due in part to a falling off in the quantity of tea shipped to Russia on account of the famine, but chiefly to a great fall in the price of tea itself. The direct trade with foreign countries was carried in fourteen steamers, ten of which were tea-steamers. The chief imports are cotton and woolen goods, opium, metals, aniline dyes, ginseng, machinery, kerosene oil, seaweed, and sugar; and the exports tea, rice, silk, tobacco, beans, bean-cake, coal, hemp, hides, vegetable tallow, medicines, and wood-oil.

The population of Hankow is estimated at 800,000; but with Hanyang-foo (to which it is subordinate), also on the left bank of the Yang-tse, but to the W. of the Han, and Wu-chang-foo (directly opposite Hanyang), the capital of the province of Hupeh, it may be put at 1,500,000. Toward the end of summer, when both rivers are swollen with the melted snows of the mountains of the west, the river rises at this point 50 feet or more, flooding the town. R. Lilley.

Han'ley: town of England; in Staffordshire; 18 miles N. of Stafford (see map of England, ref. 9–G); in the district called The Potteries; forms with Shelton one town. The inhabitants are mostly engaged in the manufacture of earthenware and china. It is a municipal and parliamentary borough, returning one member to the House of Commons. Pop. (1891) 54,846; of parliamentary borough (including Burslem), 86,845.

Hanli: a cloister of Tibet, celebrated as one of the highest inhabited places in the world; elevation, 15,117 feet above sea-level. It is in lat. 32° 50′ N., lon. 79° E., on the upper Indus river, E. of Kashmir. There are many other inhabited places in Tibet at altitudes between 14,800 and 15,000 feet. M. W. H.

Hann, haan, Julius Ferdinand, Ph. D., Kk. Hofrath: meteorologist and climatologist; b. in Schlosshaus, Upper Austria, Mar. 23, 1839; educated at the gymnasium of Kremsmünster and the University of Vienna. He is Professor of Physics in the University of Vienna, an editor of the *Deutsche Meteorologische Zeitschrift*, and director of the Imperial Meteorological Institute of Austria. He is a prolific writer on meteorological subjects. The most of his briefer papers have appeared in the *Zeitschrift der österr. Gesellschaft für Meteorologie* (1866–85), the *Deutsche Meteorologische Zeitschrift* (1886 to date of writing), and in the *Sitzungsberichte* and *Denkschriften der Wiener Akademie*. Among the longer memoirs and books may be mentioned *Allgemeine Erdkunde* (Prague, 4th ed. 1886); *Handbuch der Klimatologie* (Stuttgart, 1883); *Atlas der Meteorologie* (Gotha, 1887); *Die Vertheilung der Luftdruck über Mittel- und Südeuropa* (Vienna, 1887); *Die Temperaturverthelung in den österr. Alpenländern* (Vienna, 1884–85). M. W. Harrington.

Han'nay, James: journalist and novelist; b. at Dumfries, Scotland, Feb. 17, 1827. He served in the navy from 1840 till 1845; in 1857 contested Dumfries, unsuccessfully, for Parliament; from 1860 to 1864 edited the Edinburgh *Courant*; and in 1868 was appointed British consul at Barcelona. His publications include *Singleton Fontenoy* (1850) a novel; *Biscuit and Grog* (1848); *Hearts are Trumps* (1848); memoirs of Thackeray and Dickens, and several volumes of nautical sketches, literary essays, and miscellanies. D. at Barcelona, Jan. 3, 1873. Henry A. Beers.

Hannibal: city; Marion co., Mo. (for location of county, see map of Missouri, ref. 2–H); on the Mississippi river and the Chi., Burl. and Q., the Han. and St. J., the Mo., Kan. and Tex., the St. L. and Han., the St. L., Keo. and N. W., and the Wabash Railways; 102 miles W. of Springfield, Ill., 150 miles above St. Louis by river. The river is here crossed by an iron and steel railway and wagon bridge, 1,600 feet long between abutments, built in 1872. The city is handsomely located and substantially built, with many fine residences on the hills which nearly surround it, and from which a large quantity of lime is annually taken. It contains 14 churches, 6 public-school buildings, free public library, U. S. Government building that cost $150,000, a German Lutheran and a Roman Catholic seminary, and 2 daily and 5 weekly newspapers. The city has a lumber trade with Missouri, Kansas, and Texas, with average annual sales of 150,000,000 feet, and manufactures machinery, foundry products, cigars, tobacco, stoves, and railway cars. Pop. (1880) 11,074; (1890) 12,857.

Hannibal [Lat.; Gr. Ἀννίβας, from Phœnician *Channi-Ba'al*, liter., mercy of Baal]: a Carthaginian general of transcendent genius, who became celebrated for his skill in the conduct of the second Punic war. At the middle of the third century B. C. it was not yet determined whether Rome or Carthage was to be the leading power on the Mediterranean Sea. The first Punic war had resulted in the annexation to Rome of nearly all of Sicily and the islands between Sicily and Italy. But Carthage still had control not only of the African coast, but also of nearly the whole of the Spanish Peninsula. By the peace of 241 B. C. the greater part of Sicily, notwithstanding its agricultural and strategic importance, had been forced out of the control of Carthage, after it had been occupied by that power about 400 years. It is not singular that this loss, which presaged the final ascendency of Rome over all the shores of the Mediterranean, should rankle in the Carthaginian heart. Hannibal was the great leader of the desperate struggle that was practically to settle the momentous question at issue.

The son of Hamilcar Barca, the great general of the first Punic war, Hannibal was born B. C. 247, six years before the humiliating peace. At the age of nine he besought his father to allow him to accompany the army to Spain, but this was not permitted until the old general had required his son to take upon the altar an oath of eternal enmity to Rome. During the next nine years Hannibal's life was in a military camp under the eye of his father. Hamilcar was killed in 228 and was succeeded by his brother Hasdrubal, who fell at the hand of an assassin in 221. The unmistakable spirit and ability of Hannibal had so impressed themselves upon the army that the soldiers at once recognized him as their natural leader, though he was only twenty-six years old. On assuming command he entered at once upon a vigorous policy of thoroughly overawing Spain for the purpose of making it the base of operations against Rome. He crossed the Tagus, pushed into the interior for the subjugation of rebellious tribes, and in the course of two campaigns gained control of all that part of Spain which lies S. of the Ebro, excepting Saguntum. This rich old Greek city enjoyed friendly relations with Rome; but Hannibal determined to attack it, though it must have been plain that such a step would be regarded as a declaration of war. Roman ambassadors sent to Hannibal were told that they could not see him, whereupon they went to Carthage, with little better result. In the course of eight months the siege of Saguntum was successful. Hannibal secured abundant stores for the equipment of his army. As Carthage refused the demand to give up Hannibal, Rome declared war in 219 B. C.

Hannibal at once began preparations for the invasion of Italy. In the spring of 218 his army was ready, and he set out from New Carthage with 90,000 foot, 12,000 horse, and 37 elephants. The people along the route were easily conciliated, and the Roman army, sent to intercept the advance, was left in the rear. He crossed the Rhône probably not far from the modern village of Roquemaure. Marching up the left bank to the Isère, he followed that mountain stream through the hostile country of the Allobroges until he reached the narrow defiles of the Alps. Fifteen days were occupied with the passage. Modern efforts to identify the route have not been completely successful, but the best authorities favor the belief that the passage was made by the Little St. Bernard. The rocky defiles, the hostile tribes, the seemingly impassable chasms, the deep snows, and the se-

vere autumn frosts reduced his army to 20,000 foot and 6,000 horse. In October he reached the valley of the Aosta, and was welcomed by the friendly tribes of the Insubrian Gauls. After a short rest the army advanced and first met the Romans on the river Ticino. The engagement was not important, save as it demonstrated the superiority of the Carthaginian cavalry. The defeated Roman general Scipio fell back to Placentia, where he was joined by the other consul, Sempronius. The Romans now had 40,000 men, and under the lead of Sempronius advanced across the Trebia on a bitter cold day in December. The onset of Hannibal and of his brother Mago could not be resisted. The utter defeat of the Romans gave Northern Italy into the hands of the invader.

After giving his troops a winter's rest, Hannibal determined in the spring of 217 B. C. to cross the Apennines and make himself master of Central Italy. In the marshy lands of the Arno the army was obliged for several days to march through swamps covered with water. Many perished, and Hannibal himself lost an eye from ophthalmia. But at length he emerged at Fiesole. The armies of the two Roman consuls were at Arezzo and Rimini. Hannibal, instead of meeting them at once, marched past them toward Perugia, ravaging the country and drawing the enemy on in pursuit. The road passing along the northern shore of Lake Trasimene is peculiarly adapted for an ambuscade. The mountains approach the shores at both ends of the lake, while opposite the middle a broad plain extends back for a considerable distance. Hannibal concealed his army so as to attack simultaneously at the defiles and on the flank opposite the lake. The ensuing battle was little less than a slaughter of the Roman army. An immediate march on Rome was anticipated, but the invader chose to take the chance of first arousing the Italian allies. With this end in view he marched through Umbria and Picenum into Apulia. Meanwhile the Romans had placed Fabius Maximus at the head of affairs as dictator. He adopted the method to which the term "Fabian policy" was forever after to be attached. He determined on no account to bring on a general engagement on equal terms, but to harass the enemy by hanging upon his rear and so gradually to wear him out. Under this policy the fairest fields of Southern Italy were laid waste. Once, after Hannibal had ravaged the Campagna, Fabius came near entrapping him as he was about to escape into Samnium. But the Carthaginian general, by the ingenious device of tying faggots to the horns of oxen and lighting them, decoyed the Roman army away from the defile, and thus made good his escape. The general tactics of Fabius soon disgusted the Roman people as well as the army, and in the spring (216) Æmilius Paulus and Terentius Varro were placed in the field as consuls at the head of an army of 80,000 men and 6,000 horse. Hannibal's army was drawn up in a loop of the Aufidus, near Cannæ, the strong infantry on either side, the weak infantry in the center. When the attack of the Romans came the center of the Carthaginian force fell back, as had been planned, and the veterans advanced with irresistible force upon the flanks. Pressed into a dense mass the Romans were cut down without the possibility of escape. The slaughter is said to have gone on for eight hours, and the Roman army was practically annihilated.

Though this was the most important battle of the war, it did not give Hannibal the advantage that might have been anticipated. He was 200 miles from Rome, and did not yet venture to advance upon the capital. His policy still was to arouse the provinces, to attach them to himself, and in this way to accumulate strength for the final struggle, but he was unsuccessful on account of Rome's provincial policy, which insured the fidelity of her allies. In 212 she put six armies into the field, all of which pursued the Fabian method. About the same time the policy of "carrying the war into Africa" was adopted. First of all Syracuse was taken and thus the last Carthaginian stronghold in Sicily became subject to Rome. The Romans prosecuted a vigorous campaign in Spain. Meanwhile Hannibal received very inconsiderable support from Carthage. In the year 208 Rome had twenty-three legions, or about 200,000 men in the field, while Hannibal's army could scarcely have amounted to one-tenth of that number. In 207 the battle of the Metaurus was fought, in which the Carthaginians under Hasdrubal were utterly defeated. All now seemed decided. Hannibal remained in Italy for four years longer, but was obliged during the whole of this period to act on the defensive. Still no Roman general dared bring on a battle with Hannibal himself. In 204 Scipio the Younger had been victorious in Spain, and now was permitted to cross into Africa and bring the war to an issue by attacking Carthage herself. Hannibal at once received an order of recall and reluctantly embarked. In Italy he had never lost a battle, but in Africa he confronted the Romans with an evident lack of heart. The armies met at Zama in 203, and the Carthaginian force was annihilated, though it fought with desperate valor. Hannibal, with a very small force, escaped to Adrumetum. The result of the war and of the consequent treaty of peace was to render Carthage tributary to Rome, and to deprive her of all political independence.

At the age of forty-six Hannibal was now made chief magistrate of Carthage, and he at once showed that his abilities were scarcely less conspicuous in peace than they had been in war. In the course of the next seven years he so far restored the power of Carthage that Rome began once more to look with apprehension upon the new development of her old enemy. The Romans demanded the surrender of Hannibal. Not wishing that Carthage should be disgraced the Carthaginian hero betook himself to voluntary exile. He visited Tyre, Ephesus, and Crete, and finally took refuge with Prusias, King of Bithynia. The Romans again demanded their old enemy, and Prusias decided to give him up, but Hannibal, unwilling to fall into their hands, took his own life by poison, probably in 183 B. C. All writers since his time have agreed in ascribing to him military genius of the highest order.

AUTHORITIES.—The most important sources of information are Polybius, *Bk. iii.*; Livy, *Bks. xxi., xxii.*; Arrian, *Wars of Hannibal*; Plutarch, *Fabius Maximus*, and *Marcellus*. Of modern histories of the period the best is that contained in Arnold's *History of Rome*. C. K. ADAMS.

Han'no [Lat.: Gr. *Ἄννων*, from Phœnic. *Chan'non*, liter., pitying, merciful]: the name of many historic Carthaginians, among whom the following are especially noteworthy: HANNO, a navigator, who (probably in 570 B. C.) set sail with sixty ships and a large number of intended colonists, and coasted southward along the shores of the African continent, founding several towns on the way. On his return he set up in a temple a tablet containing an account of his voyage. Of this tablet a Greek version, the *Periplus*, is still extant. —HANNO THE GREAT, in the third century B. C., was the leader of the aristocratic party and the chief opponent of Hamilcar Barca and of Hannibal his son. Hanno himself was an able general.

Hanoi, hȧ̆-noi', formerly **Keicho** and **Cachao**: the capital of Tonquin; near the southern boundary of China (see map of China, ref. 9–G); in lat. 21° 2′ N., lon. 105° 48′ E.; on the Songka; 60 miles by the most direct route from its port, Haiphong, and 80 miles from the sea. The streets are fairly wide and the houses built of brick. The principal trade is in silk and rice, and is largely in the hands of the Chinese. The Dutch and Portuguese formerly had commercial establishments here, and French missionaries have long been resident in the district. The principal official French resident is stationed here. Hanoi came into the hands of the French in 1873, and is an open port. Pop. about 150,000. M. W. H.

Hanoteau, ȧ̆'nō'tō', HECTOR: landscape-painter; b. at Decize, Nièvre, France, May 25, 1823. Pupil of Gigoux; medals, Salons, 1864, 1868, and 1869; first-class medal, Paris Exposition, 1889; Legion of Honor 1870. A naturalistic painter, whose work is distinguished by good color and faithful rendering of nature. His *Village Pond* (1870) and *Frogs* (1875) are in the Luxembourg Gallery, Paris; the *Paradise of Geese* (1864) is in the Marseilles Museum. D. at Briey, Nièvre, Apr. 9, 1890. W. A. C.

Han'over (in Germ. *Hannover*): a province of Prussia; bounded N. by the German Ocean and the Elbe, E. by Mecklenburg and Prussian Saxony, S. by Hesse-Cassel and Westphalia, and W. by the Netherlands; area, 14,853 sq. miles. Pop. (1890) 2,278,361, of which only about 10 per cent. are Roman Catholics, about 13,500 Jews, and the rest Protestants; (1895) 2,422,020.

DISTRICTS.	Area, sq. miles.	Pop. in 1890.	CHIEF TOWNS.	Pop.
Hanover	2,481	528,094	Hanover	165,499
Hildesheim	1,708	476,256	Hildesheim	[illegible]
Lüneburg	4,293	419,937	Lüneburg	20,681
Stade	2,595	338,831	Stade	[illegible]
Osnabrück	2,388	299,899	Osnabrück	[illegible]
Aurich	1,144	218,004	Aurich	[illegible]

With the exception of the inhabitants of the districts bordering on the German Ocean and the Netherlands, who are of Frisian descent, the Hanoverians are Saxons. The lower classes speak Platt-Deutsch (Low German), and in the districts bordering on the Netherlands, Dutch and Frisian. The southern part of Hanover is covered with hills and low mountains, branches of the Hartz, which here seldom rise to the height of 3,000 feet. They are covered with dense forests, and are very rich in minerals—gold, silver, lead, iron, coal, and salt. The northern part of the country is a low plain. The basins of the rivers Elbe, Weser (with its affluent, the Leine), and Ems, all of which run to the German Ocean, are fertile, and the soil is well suited to agriculture. Rye and flax are grown in great quantities. Along the German Ocean are extensive marshes and peat-moors. Wherever these marshes have been well drained they afford excellent pasturage, and the trade in cattle is considerable. A large portion of Central Hanover is occupied by the Lüneburg Heath, a sandy and unproductive tract, with no other resources than the rearing of sheep and bees.

The territory which forms the province of Hanover belonged from ancient times to the family of Brunswick-Lüneburg, and at times was divided up between the different lines of the family. In 1692 it was made an electorate, and when in 1714 its elector, George Louis, came to the British throne as George I., it began to play quite a conspicuous part in the history of Europe. In 1814 it was made a kingdom by the Congress of Vienna, and in 1837, at the death of William IV., it fell to Ernest Augustus, Duke of Cumberland, as the Salic law, which excludes heirs female, prevented Queen Victoria from inheriting it. In 1866 it was conquered by Prussia, and incorporated by that kingdom as a province, but the interest on the sum of 48,000,000 marks was to be paid as indemnity to the sovereign and the heirs of the Brunswick-Lüneburg family. King George V., however, who was blind, and who had settled at Hietzing, near Vienna, issued a solemn protest against the incorporation, and even threatened warlike proceedings and supported a corps of vagabonds. Prussia accordingly recalled the grant. George died in 1878, and his son, Ernest Augustus, Duke of Cumberland, continued for many years in his father's course. But in 1892 he publicly renounced his claims, and the income of the Guelph Fund was restored to him. See BRUNSWICK and GUELPH FUND. Revised by C. H. THURBER.

Hanover: capital of the Prussian province of Hanover; on both sides of the Leine, which here receives the Ihme; 78 miles S. E. of Bremen (see map of German Empire, ref. 3–E). The Ihme separates the suburb Linden from the city proper. The old city, irregular and partly old-fashioned, is surrounded to the N. and E. by new and elegant quarters which have arisen since 1840, and, steadily increasing, group themselves around the railway station. Magnificent promenades extend to the N. W. of the city, and to the N., E., and S. a large forest, the Eileriede, surrounds it in a semicircle. The new quarters, of which Georg Street, Theater Street, Schiller Street, Dépôt Street, and King Street are especially noticeable, are distinguished by the original architecture of many of their buildings. The most remarkable public places are the Bahnhofsplatz, surrounded with large hotels and containing the equestrian statue of King Ernest Augustus, cast in bronze after a model by Wolff, and raised on a pedestal of granite; the Theater Platz, in the center of which stands the theater, one of the largest and most beautiful in Germany, containing seats for 1,800 persons, and built 1845–52 by Laves; the Georgs Platz, with the statue of Schiller by Engelhardt; the Markt, in the center of the old city; and the Waterloo Platz, a parade-ground, with the lofty Waterloo column. The most remarkable buildings are the Museum, in Sophie Street, finished in the round style by Hase in 1856, and containing collections of art, history, and natural science; the Polytechnic School, in Georg Street; the Lyceum, on Georgs Platz; the former town-house, in the market-place, a Gothic structure of the middle of the fifteenth century; the royal palace, an extensive building of the eighteenth century, situated on the Leine, and containing a chapel with a celebrated altar-piece by Lucas Cranach. The palace overlooks the Waterloo Platz, containing large barracks and a fine arsenal. On going from the palace to the Waterloo Platz, the statue of Gen. Count von Alten, who commanded the Hanoverians at Waterloo, stands to the right, and behind it the library building arises, containing 170,000 volumes and 4,000 MSS., among which are the literary bequests of Leibniz. A monument to Leibniz, consisting of a circular temple containing his bust, stands on a hill near the library, on the Waterloo Platz. The Market church, of the fourteenth century, restored in 1855, has a quadrangular tower, and contains some beautiful glass-paintings and an altar carved in oak wood. Christ church, built of brick and finished in 1864 by Hase, also contains fine glass-paintings. In the vicinity of Hanover stands the palace, Herrenhausen, situated in an extensive park laid out in French style by Le Nôtre. Connected with the palace is an art-gallery with a collection of antique and modern sculptures. An avenue of large linden-trees stretches from Hanover to Herrenhausen, and has magnificent promenades on both sides. To the E. of the avenue the colossal Welfenschloss arises, in the round style, with five towers. Since 1866 it has been occupied by the Polytechnic High School.

Hanover is first mentioned in history in 1163. It was at that time the residence of Henry the Lion, and with a few interruptions it has remained in the possession of the Guelphs. In 1481 it entered the Hanseatic League, and soon its commerce and wealth increased considerably. It suffered, however, very much from internal disturbances, brought on by the introduction of the Reformation. In 1837 it became the residence of the King of Hanover, and from that time it has made steady progress; especially since its annexation to Prussia it has increased both in size and splendor. Pop., with suburbs (1895), 209,560.

Revised by C. H. THURBER.

Hanover: town; Grafton co., N. H. (for location of county, see map of New Hampshire, ref. 6–E); on the Connecticut river; 55 miles N. E. of Concord. It is connected with Norwich, Vt., by a bridge, is bisected by Moose Mountain, and is the seat of DARTMOUTH COLLEGE (*q. v.*). The principal business is farming and lumbering. Pop. (1880) 2,147; (1890) 1,817. EDITOR OF "GAZETTE."

Hanover: borough (founded 1764); York co., Pa. (for location of county, see map of Pennsylvania, ref. 6–G); on the Penn. and the West. Md. Railways; 35 miles S. by E. of Harrisburg. The surrounding country abounds in iron ore, and is exceedingly fertile. The borough has 9 churches, 16 public schools, including a high school, 1 daily and 5 weekly newspapers, and manufactures of leather, cigars, carriages and wagons, and flavine. Pop. (1880) 2,317; (1890) 3,746; (1893) estimated, 4,500. EDITOR OF "HERALD."

Hanseat'ic League, or **Hanse Towns** [*Hanseatic* is from M. H. Germ. *hanse*, an association of merchants < O. H. Germ. *hansa*, band of men]: an association of free cities of Northern Europe formed in the thirteenth century to protect their common commercial interests.

There are traces of some joint defensive action as early as the middle of the twelfth century. In 1239 Hamburg, Ditsmarsh, and Hadeln joined in measures to keep the Elbe and the sea at its mouth clear of marauders. In 1241 Lübeck and Hamburg concluded a formal treaty to provide ships and soldiers to make trade secure between the Elbe and the Trave, and on the waters from Hamburg to the ocean, and to promote their common interests. This is usually regarded as the date of the organization of the league. Six years later Brunswick joined the compact. In 1252 deputies from the three cities met at Lübeck and took steps for establishing factories at London, Bruges, and Novgorod in Russia. Later a factory was also established at Bergen. The door was open for other towns to enter the association, and its manifest advantages inclined them rapidly to seek admission, till at its height it embraced 85 cities. Many other cities, not regular members, came into commercial relations with the league, to their own advantage, while they added also to its influence and power. In 1260 its affairs were regulated by a convention which ordained a diet of delegates to assemble triennially, and an extraordinary meeting every ten years to renew the league. Lübeck was made the capital of the Hansa and the depository of its treasury and archives. The meetings were generally held at Lübeck, but occasionally at Hamburg, Cologne, and other places. For the details of administration the cities were distributed into four circles: (1) The Vandalic or Wendish towns of the Baltic, with Lübeck as capital. (2) The Westphalian, Rhenish, and Netherland towns, capital Cologne. (3) The Saxon and Brandenburg towns, capital Brunswick. (4) The Prussian and Livonian towns, capital Dantzic. The magistrates at the head of each circle were charged with sovereign power to carry out the decrees of the league.

In the outset the league aimed simply to resist the extortions of feudal lords and sovereigns, to prevent robbery and piracy, to regulate and expand commerce, and to stimulate production. It did much to define general principles of mercantile law, and to increase the wealth of the cities themselves. In its leading ideas and policy, though crude and only partially developed, are found the germs of that law of reciprocity and freedom which is now so generally recognized as the basis of modern commerce.

Through its organized association and system, with the privileges secured, the league to a great extent monopolized the trade of Northern Europe. By concessions from Henry III. and the sovereigns who succeeded him the London factory gained command of both the import and export trade of England, and engrossed the carrying trade almost to the exclusion of British merchants. Similar advantages were gained in each of its great centers. The power of the league was thus rapidly and strongly developed. It reached its culmination in the latter half of the fourteenth century. But now its aims and policy were changed. It abused the power it had gained, for the maintenance of separate interests of its own, and exercised sovereign authority to perpetuate an oppressive monopoly. So it maintained armies and navies; by a victory over the Kings of Denmark, Sweden, and Norway gained control of the Sound; assumed to depose the King of Sweden; carried on war against Denmark; and by a declaration of war compelled Edward IV. of England to grant larger concessions. Through the fifteenth century it maintained its power with growing haughtiness and arrogance till it became intolerable and declined as rapidly as it rose.

Among the causes of its dissolution may be mentioned—(1) the general development of commercial activity. This at the same time created competition and awakened jealousy of the exclusive privileges enjoyed by the league. (2) The centralization of national life on the decay of feudalism, and the consequent desire of both sovereign and people that each nation should control its own commerce. This led to the repeal of the concessions which had been granted, and broke up the monopolies enjoyed. Thus England in 1597 revoked all special privileges of the Hanseatic merchants. (3) The new direction and the new impulse and methods given to the commerce of the world by opening the passage to India by the Cape of Good Hope and the discovery of America. In 1630 a last general assembly was summoned to meet at Lübeck, but the deputies from the remaining towns went only to notify their withdrawal. Thus, after nearly 400 years, this confederacy was dissolved. Then the cities of Hamburg, Lübeck, and Bremen formed a new association called the Free Hanse Towns. Frankfort-on-the-Main was subsequently added. The four were recognized as the free cities of Germany, each exercising independent and sovereign jurisdiction till 1810, when Napoleon I. incorporated them with the French empire. In 1813 they became free members of the German Confederation. In 1866 Frankfort-on-the-Main fell to Prussia. Bremen, Hamburg, and Lübeck are still independent members of the German empire; and it is only since 1891 that they have relinquished the right of separate tariff legislation.

Revised by A. T. Hadley.

Hansen, haan'sen, Hans Christian Peter: critic; b. in Copenhagen, Denmark, Apr. 27, 1840. At the age of twenty-three he won a university prize by a treatise on Greek tragedy. Since 1865 he has been engaged in journalism; 1872–80 he edited *Nær og Fjærn*, generally regarded as being the most important critical weekly ever published in Denmark; and on its merging in *Illustreret Tidende*, he became editor of the latter. In 1883 he received the title of professor. In addition to a large number of critical articles, poems, and short stories, he is the author of a novel, *Christian Kjöbenhavner* (1882); *Illustreret dansk Literatur Historie* (2 vols., 1886); and *Den danske Skueplads*, not yet completed. His most valuable contribution to Danish literature is his translation of Goethe's *Faust* (part i., 1881; part ii., 1889). D. K. Dodge.

Hansen, haan'sen, Peter Andreas: astronomer; b. at Tondern, in the duchy of Schleswig, Dec. 8, 1795; was apprenticed to a watchmaker in Flensborg, but his talent for mathematics and his interest in physical science brought him in connection with the astronomer Schumacher, director of the observatory of Altona. In 1823 he became Schumacher's assistant, and in 1825 he was made director of the observatory of Seeberg, near Gotha, where he spent the rest of his life. His *Tables de la Lune* were published in 1857 at the expense of the British Government, and are used in the calculations of the *Nautical Almanac*. Among his other works are *Darlegung der theoretischen Berechnung der in den Mondtafeln angewandten Störungen* (Leipzig, 1862–64); *Geodätische Untersuchungen* (1865–68), etc. D. at Gotha, Mar. 28, 1874.

Hansteen, haan'stayn, Christopher: astronomer; b. at Christiania, Norway, Sept. 26, 1784; studied mathematics at the University of Copenhagen, and was appointed teacher at the Latin school of Frederiksborg, in Seeland. While there he began his researches concerning terrestrial magnetism, and a paper he prepared on this subject received a prize from the Academy of Science, Copenhagen. In 1814 he received a chair as Professor of Mathematics at the newly established University of Christiania, where he continued his scientific labors, the result of which he published in 1819 in Christiania. The book (*Researches Concerning the Terrestrial Magnetism*), of which, however, only the first volume, with atlas, appeared, attracted much attention. Hansteen traveled from 1828 to 1830 through Western Siberia at the expense of the Government. He published in 1863 *Magnetical, Astronomical, and Meteorological Observations on a Journey through Siberia*. Besides his strictly scientific labors, he developed a great activity in a practical direction. In 1833 an observatory was erected at Christiania under his superintendence. In 1835 he published a manual of geometry, and in 1836 one of mechanics. He also was president of a committee for the regulation of weights and measures, and had chief charge of the triangulation of Norway. After 1823 he edited, in connection with Mashmann and Sandh, a magazine for natural science. D. in Christiania, Apr. 15, 1873.

Hants, England: See Hampshire.

Hanuman: See Entellus Monkey.

Haparanda: a town of Sweden; in lat. 65° 51′ N.; at the head of the Gulf of Bothnia; on the western shore of the Torneå, a short distance from its mouth (see map of Norway and Sweden, ref. 5–H). It has only about 1,000 inhabitants, but its meteorological station, established in 1859, is one of the most important in Europe, partly on account of its northern location, and partly on account of the great variations of temperature there.

Haplo'mi [Mod. Lat., nom. plur. of *haplomus*: Gr. ἁπλόος, simple + ὦμος, shoulder]: a sub-order of fishes belonging to the order *Teleocephali*, which have the brain-case confined behind the orbits; symplectic bones developed; pterotics normal; the usual opercular bones all present; lower pharyngeal bones distinct and sub-triangular; upper in three or four pairs; anterior as well as other dorsal vertebræ normal and distinct; shoulder-girdle with the meso-coracoid atrophied (whence, probably, the name); and the air-bladder communicating through a duct with the intestinal canal. The fishes embraced in this group vary in form and general appearance, and to it belong the pikes, killy-fishes or minnows, and kindred types; these have been arranged under the families *Esocidæ*, *Umbridæ*, and *Cyprinodontidæ*. The *Cyprinodontidæ* were referred, by the older naturalists, near the *Cyprinidæ*, but they have no real relations with those fishes. Theodore Gill.

Hapsburg, or **Habsburg, House of** [named from the old castle of *Habsburg* (in Aargau, Switzerland). Older name *Habichtsburg*, Hawk-castle; Germ. *habicht*, hawk + *burg*, castle]: an ancient and illustrious family, to which belongs the reigning sovereign of Austria. The castle, which was erected by Werner, Bishop of Strassburg, 1001–29, is now in ruins, only the walls of the tower remaining. The founder of the house, however, was Albert, who is mentioned as Count of Hapsburg in 1153. Under him and his son, Rudolf I., the family became one of the most powerful in Southern Germany, and gained control of a considerable part of Switzerland. In 1233 the line parted into two branches—Hapsburg-Hapsburg and Hapsburg-Lauffenburg. The latter parted again into two lines—Hapsburg-Lauffenburg proper (extinct in the male line 1408, but still represented by the Feilding family in England), and the Hapsburg-Kyburg line (of which the last count died 1415). The first German emperor of this family was Rudolf I., who founded the Austrian house, which from 1438 to 1806 held the German imperial crown, and since that time has held that of Austria. In Spain, Burgundy, Tuscany, and Modena, Hapsburg monarchs, but of the Spanish line, have also borne

sway. The Spanish line sprung from Charles V., whose father was a son of Maximilian I., and whose mother was a daughter of Ferdinand and Isabella. When he abdicated, in 1555, he left his Austrian possessions and the imperial crown of Germany to Ferdinand I.; Spain and the Netherlands to his son, Philip II. With Charles II. the Spanish line of the house of Hapsburg became extinct, 1700, and the Spanish War of Succession begun, which finally left Spain to the house of Bourbon. In 1881 it was proposed to purchase the ancient Castle of Hapsburg and present it to the Crown Prince of Austria, but the opposition of the people of Aargau was so violent that the project was abandoned.

Revised by C. K. Adams.

Harafora: same as Arafura (*q. v.*).

Hara-kiri, haa'raă-kee'rĕe, or **Seppuku**, sep'pŏŏ'kŏŏ [Japanese, from *hara*, belly + *kiri*, stem of *kiru*, to cut. Seppuku has the same meaning. It is of Chinese origin, and is considered more elegant than the purely native term. It is from *setsŭ puku*, the Japanese pronunciation of two Chinese words *ts'ieh* or *tsit*, to cut, and *fuh* or *fuk*, belly, the syllable *tsu* in modern Japanese being assimilated (except when initial) to a following *k*, *p*, or *s*]: self-disembowelment; a ceremonious form of judicial suicide permitted in feudal Japan among daimios and the military class, in order to save them the degradation of submitting to the headsman's ax or the hangman's rope. In point of fact, however, and especially during the last 200 years, it has been customary for the second or assistant—usually a kinsman or intimate friend—to strike off the head of the condemned person with his sword just at the moment the suicide plunged, or appeared to plunge, his dirk into his abdomen, or reached out to seize the dirk. Self-disembowelment has long been practiced in Japan by members of the military class who were unwilling to survive some disgrace, but it was only during the Ashikaga dynasty of Shoguns (1336–1568) that it was recognized as a method of capital punishment, and began to be invested with the elaborate formalities and ceremonies which afterward characterized it. These formalities refer (1) to the *place of execution*, which should be in the palace or garden of a daimio, according to the rank of the individual. In an emergency, as when on the march, a temple might be hired for the purpose. (2) The *arrangements* made there, including the kind, number, and position of the mats to be used, the screens, curtains, lights, etc. (for night was the proper time), all of which were usually attended to with the most punctilious care. (3) The *kaishaku*, or seconds. These were three in number; one to strike off the head, usually a kinsman or intimate friend, who ought to consider himself honored to be asked to officiate in this capacity, and it was the bounden duty of every samurai to qualify himself for such a task. The assistant second had to bring forward the tray containing the dirk to be used in the disembowelment. The inferior second carried the head to the witnesses for identification. He had also to be prepared to act as a substitute of either of the others should any accident occur. (4) The *witnesses*, whose duty it was to read the sentence, instruct the seconds in their duties, and identify the head after decapitation. (5) The *suicide* himself, who, having bathed and donned his dress of ceremony, took his place on the mats in the usual Japanese squatting fashion, but facing the N. As soon as he had removed his upper garments it was time for the second to poise his sword, and to strike while the principal's head was bent forward as he stretched out his hand to draw the tray toward him. With the identification of the head the ceremony ended.

The word *hara-kiri* is frequently but erroneously spelled harri-karri. See Mitford's *Tales of Old Japan* (London, 1871; 3d ed. 1876); and B. H. Chamberlain's *Things Japanese* (London and Yokohama, 1891). R. Lilley.

Haran [Heb. *Chārān*; Arab. *Charrānum*; Gr. Κάρραι, or Χάρρα; Lat. *Carræ*]: the name of a district of Northern Mesopotamia with a town situated on the Belike, 50 miles N. of its influx into the Euphrates, and 10 miles S. E. of Edessa. The fertility of the district was probably the reason why Terah and Nahor stopped there, while Abraham and Lot pushed onward to Canaan. As the city stands at the very point at which the highways from Media, Assyria, and Babylonia meet to follow the same road to the Cilician coast, it was of great strategical importance to Assyria, and became the center of a considerable trade (Ezra xxvii. 23). Later on it was the scene of the defeat of Crassus by the Parthians (53 B. C.), and of the assassination of Caracalla by the soldiers of Macrinus (217 A. D.). It also flourished under the Arabs; but Abulfeda mentions that in his time it lay in ruins, and it has never since been rebuilt.

Harar', or **Adari**: a city of Northeastern Africa; situated in lat. 9° 20′ N.; S. of the Gulf of Aden, at an elevation of 5,500 feet above the level of the sea (see map of Africa, ref. 4–H); its population is estimated at 35,000. The city became in 1876 a dependency of Egypt, and later came under Italian protectorate, but it was formerly the capital of a small but independent country governed by an emir. The people are Mohammedans of the strictest description, but their ethnology is very obscure. The country is very fertile and well cultivated. Coffee and cotton are raised in great quantities and of excellent quality; also wheat, fruit, and tobacco. Besides in its own products and manufactures, the city carries on a brisk trade in gums, ivory, mules, slaves, etc. It was first visited by Richard F. Burton, who succeeded in getting admission under the guise of an Arab and spent ten days there in 1855. See his *First Footsteps in East Africa; or, An Exploration of Harar* (London, 1856). In the *Bulletin de l'état Major-Général de l'Armée égyptienne* (1876) is found a sketch of the history of the city, drawn up by the Egyptian general Mohammed Moktar from native documents which he brought with him to Cairo. Revised by M. W. Harrington.

Har'baugh, Henry, D. D.: minister of the (German) Reformed Church in America; b. near Waynesborough, Pa., Oct. 24, 1817; entered Marshall College at Mercersburg, Pa., in 1840; after a partial course in academical and theological studies was ordained in 1843; held pastorates in Lewisburg, Lancaster, and Lebanon, Pa., and in 1864 became Professor of Theology at Mercersburg. He was during the last year of his life editor of the Mercersburg *Review*, and had been for sixteen years previous to this editor of *The Guardian*. He was an advocate of the "Mercersburg theology," and belonged to the High Church school of his denomination. Author of *Heaven* (Philadelphia, 1848); *The Heavenly Recognition* (1851); *Heavenly Home* (1853); *Life of Michael Schlatter* (1857); *The Fathers of the German Reformed Church* (3 vols., 1857–58); *Christological Theology* (1854); a volume of *Poems* (1860); and *Birds of the Bible* (1854). D. in Mercersburg, Pa., Dec. 28, 1867.

Harbor Grace: next to St. John's the most important town of Newfoundland; the capital of Harbor Grace district. Lat. 47° 41′ 28″ N., lon. 53° 12′ 33″ W. Its harbor is large, and the inner port is very secure. Harbor Grace has a courthouse, jail, and a fine cathedral. It is the seat of a Roman Catholic bishopric. Has an extensive trade, one weekly newspaper, a Government savings-bank, a fire-company, gasworks, a water-supply, a convent, schools, literary institute, and various benevolent societies. Pop. (1884) 7,054.

Harbors [M. Eng. *harbor*, changed (appar. by analogy of *harbor*, arbor) from *hereberge*; from Dan. *herberge* or Low Germ. *harbarge*: O. H. Germ. *heriberge*, military station: *heri*, army + *bergan*, to shelter]: re-entrants or inlets of the shore line of a sea or lake, having a depth of water sufficient for navigation and sheltered from heavy seas. Natural harbors are determined, practically in all cases, by the submergence of an uneven coast-line, or more fully they are those where the conditions requisite to safety, such as depth, area, anchorage, protection from winds and waves, facility of egress and ingress, and freedom from other destructive agencies, exist in a state of nature. The best instances of natural harbors in the track of commerce are those of Queenstown, Ireland; Rio de Janeiro, Brazil; Portland, Me.; New York, N. Y.; Norfolk, Va.; Port Royal, S. C.; Pensacola, Fla.; San Francisco, Cal.; Puget Sound, Wash.; King George's Sound and Princess Royal harbor in Southwestern Australia; Port Jackson, Port Phillip, and on the Great Lakes may be mentioned Grand Marais, Grand Island, Copper harbor, Portage, Superior, Saginaw, Presque Isle, and others.

Most of the *artificial harbors* are within the shore-line at points where the beach is pierced by a river or inlet, advantage being taken of the tidal flow to effect an entrance for ships. Where, as in some foreign ports, the tidal range is great (from 20 to 40 feet), and vessels of deep draught can pass in or out with the tides to the wet docks provided for their berths, the principal works to be provided are seawalls and docks, as at Liverpool, London, Cardiff, Boulogne, Calais, Havre, etc.; but in most instances the works are designed to effect a safe passage of the outer bar, so characteristic of alluvial coasts, by the creation of a deep-water channel across its crest.

This *outer bar* is the submerged embankment whereby the littoral drift traverses the breach in the shore-line, and its improvement becomes a complicated problem involving a consideration of all the phenomena attending its formation and maintenance. The physical elements to be considered are the fresh-water volume and velocity, the tidal prism, wave-action, winds, currents, form of basin, evaporation, latitude, character of material, and exposure. These factors sustain to each other the relation of cause and effect, leading to intricate combinations of many variables which it is hopeless to attempt to formulate mathematically. But a careful analysis of the effects produced by the forces as revealed by the changes in the submerged topography will prove invaluable, as indicating the relative direction and intensity of the resultant forces.

Many failures have resulted from the attempt to follow precedents which were not applicable, and to determine this question it is important to distinguish the physical conditions existing at various harbors. Thus they may be analyzed as follows:

(*a*) A class in which there are large tidal fluctuations, with but small interior reservoirs and little or no fresh-water drainage.

(*b*) The tidal range may be great and the inner lagoons large, while the land-water is insignificant.

(*c*) The mean tides may be small and the inner bays extensive, with not sufficient fresh water to cover the evaporation, as at Galveston.

(*d*) There may be feeble tides and no intervening basins, but the rivers may debouch directly into the sea, as at the Mississippi, Brazos; or

(*e*) The river may empty into tideless seas or lakes, as the Danube, Volga, etc.

By a careful examination of existing conditions the engineer may select the plan which will give greatest promise of success. Thus the jetties which have removed the bars of the Danube and Mississippi would not be applicable to the conditions prevailing at Galveston. In most cases two jetties have been proposed for the purpose of concentrating the ebb tides upon a certain section of the bar, with the hope of producing sufficient scour between them, but experience has shown that the tidal prism is reduced by these obstructions to the ingress of the flood tide and hence the volume of the ebb movement is diminished, thus rendering the problem indeterminate. Moreover, it has been observed that there is in general a prevailing or resultant direction of drift to the sand of the foreshore as impelled by the flood tide and by waves breaking at an angle to the shore-line. This movement, where it exists, furnishes a key to the proper solution of the problem of effecting an entrance; for the primary conditions to be fulfilled are to prevent the filling of the ebb channel by the external forces, or, 1, to arrest the littoral drift; 2, to concentrate the ebb energy upon a well-defined path by developing a *reaction* by means of a concave breakwater extending across the bar and located on the "windward" side of the channel; 3, to admit the full tidal prism for effective scour. These fundamental conditions are believed to be best fulfilled by a peculiar form of breakwater (described later on), designed by the writer in 1887.*

Many instances have been cited of the successful use of jetties to maintain entrances by ebb scour, but a careful analysis of these cases reveals the fact that the function of the jetties is mainly to protect the channel from littoral drift, while the depth is maintained by dredging. The jetties also have been advanced from time to time, as the groins between them and the shore have filled with sand, and the bar has been pushed bodily seaward without increase of depth. On the contrary, where the plan approximates to a single rectilinear or concave structure, the improvement in channel depth has been marked, and the cost of construction and maintenance a minimum, as in the case of the single jetty at Bilbao, Spain, or at the mouth of the Columbia river, Oregon, or at Swinemünde, on the Baltic, or at Greytown, Central America. The success of the work at Karachi, India, may be attributed entirely to the deflection of the drift which formerly passed around Manora Point and was dropped in the lee thereof in the channel.

The well-known instance of beneficial results obtained from the convergent jetties at Dublin harbor, where the mean tide is 13 feet, may be explained by reference to the peculiar physical conditions existing at that site, whereby an excess of ebb movement is obtained by an opening of 600 feet near the shore end of the north wall, which admits a large amount of the flood tide which has passed over the North Bull sands and can escape only through the harbor. This channel has, however, been aided by dredging also. Thus it will be seen that the cases belonging to classes *d* and *e* give much greater promise of success by jetties than any others. But there are many harbors which are wholly or in part artificial, created by the construction of moles or landing-piers from some projecting cape or headland, whereby an area is embayed sufficiently large for refuge. These differ much in plan and method of construction from the riprap mound to the concrete in block or in mass. So rapidly has improved machinery been introduced for this class of construction that masses weighing from 50 to 100 tons can be readily put in place at one time by larger hopper barges. The concrete in bags is used for foundation on sand, surmounted by blocks or monoliths. (For the inclined block-work at Kustendjie, Colombo, etc., see BREAKWATER.) Large counterpoised cranes have also been successfully used by Dr. B. Bindon Stoney at Dublin; by Mr. Philip J. Messent at Tynemouth, and by Messrs. M. T. Endicott and R. E. Peary, U. S. civil engineers at the League island works. These cranes have a capacity of over 50 tons, and are extremely useful in building out piers and jetties. At the mouth of the Brazos river, Texas, the jetties were made of mattress-work suspended from a trestle, and lowered in place by means of ropes as rapidly as the mattresses were completed and loaded with sand and stone. This method, as practiced by Mr. George Y. Wisner, constructing engineer, was found to be very rapid, cheap, and effective, and the jetties constructed at that point, 600 feet apart, have resulted in producing 18½ feet of water. Equally good results have been attained by riprap jetties at Tampico, Mexico, under the supervision of Mr. E. L. Corthell, C. E. The physical conditions of these sites are about the same, and bring them under class *d*. They have resulted in giving some relief to the commerce of the Gulf of Mexico by providing the western section with comparatively deep-water ports. Other efforts are also being made to obtain deep water by a single reaction jetty (Fig. 1), intended to be built of caissons lined with concrete walls and divided by traverses into wells, which will be floated into position, filled with sand, and covered with riprap and large blocks; by this method masses weighing 1,000 tons or more may be put in place in a few hours' time. Wherever there is a littoral drift this structure will arrest and deflect it, while it will also produce a reaction on the ebb currents as they cross the bar and freely admit the flood tide, as well as afford ample facility for navigation.

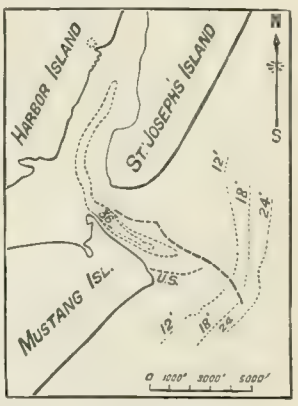


FIG. 1.—Plan for deepening Aransas Pass, Texas.

The most important harbor on the west Gulf coast is Galveston, where the normal depth over the outer bar is 12½ feet. Here the plan of improvement as now adopted by the Government consists of two convergent jetties of riprap on mattress foundation, extending across the outer bar and requiring a length of over 10 miles, while their outer ends are to be 7,000 feet apart. The estimated cost is between $8,000,000 and $9,000,000, of which about $2,500,000 have been expended, with an increase of a possible 9 inches in depth near the end of the south jetty, which is the only portion built. The bar has advanced as rapidly as the jetty, and in the writer's opinion the plan and order of construction are incapable of producing the results predicted or desired for a deep-draught harbor entrance.

The entrance to the harbor of Charleston, S. C., was to have been improved by two converging submerged jetties extending from Sullivan island on the N. and Morris island on the S. to the outer bar. This work was to cost $3,000,000 and to give 21 feet of water in the channel. It was begun in 1878, and during the ten years following 265,749 cubic yards of stone and 481,740 sq. yards of mattress-work were put in place at a cost, including auxiliaries, of $1,464,032.99,

* See *Proceedings American Philosophical Society*, Philadelphia, and *Transactions American Society of Civil Engineers*.

with the result that even with the assistance of dredging there was no navigable channel between the jetties, the vessels still using the old south channel with its 12 feet depth. In 1889 the project was modified, and it was proposed to abandon the submerged feature and to raise the jetties to low water at a cost of $2,548,000 more, or, if necessary, to 3 feet above this level, for $3,502,000, making the total estimate $5,334,500. Up to June, 1891, the foundations were completed to the crest of the bar. They consisted of log mattresses loaded with stone. On June 30, 1892, the expenditures aggregated $2,185,814.36, with the result of a tortuous 12-foot channel between jetties not considered permanent, and a general advance of the outer curves of the bar. These results are stated in illustration of the general principles laid down in the early part of this article. Here there is a well-defined littoral drift to the southward, and an ample tidal prism to produce early and marked results by reaction.

At Sabine Pass, Texas, two parallel jetties increased the depth to 10 feet through soft mud at a cost of $1,319,848.48 up to June 30, 1892, with $1,728,856.50 more to complete. These jetties are about half a mile apart, too far to coact effectively, but the eastern one is now (1894) being extended most rapidly on a curve to the west, thus applying to some extent the reaction principle with beneficial results. The earlier design of 1883 provided for two parallel straight jetties over 4 miles long and 1,500 feet apart.

It sometimes happens that the creation of a harbor is needed where no natural element of one is found in the configuration of the shore. The most important examples are the harbor of Port Saïd at the north end of the Suez Canal and that where the North Sea Canal of Holland opens into the ocean. In both cases the coast and sea-bottom are of sand, and the shore lines rectilinear and wholly destitute of harbor qualities.

"Port Saïd, though affording sufficiently good anchorage for small vessels, can not be considered a harbor for vessels of large tonnage and great draught of water. It is formed by two breakwaters, inclosing an area of some 450 acres, with an average depth of only 13 or 14 feet of water, except in the ship-channel leading to the inner basins, where the depth is from 25 to 28 feet. The western breakwater, which extends for 6,940 feet at right angles to the shore, was begun in 1860, and finished in 1868. For a quarter of a mile from the mainland the breakwater is formed, on its inner side, of a bank of rubblestone, surmounted by a promenade, over which the spray breaks with a very moderate N. W. wind, and on the outer or sea-front, of concrete blocks; but beyond this point to its termination it is entirely constructed of large blocks of artificial stone, composed of one part of French hydraulic lime with two parts of sand, some of which were transferred to it from the eastern breakwater. This latter, also constructed of large masses of concrete, is of more recent construction; it extends about 6,020 feet, and

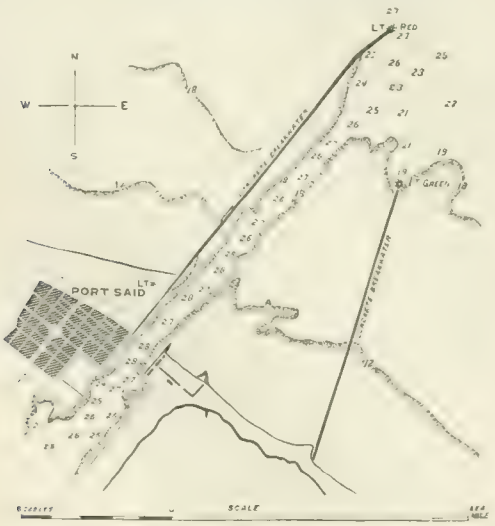


FIG. 2.

converges toward the western breakwater. These concrete blocks are made from sand and lime from Theil; two months of exposure to the air suffices to harden them, and their subsequent immersion in water adds to their hardness. Each block weighs 25 tons. Steam-cranes took them up and put them in their places. The joints between the artificial blocks are filled in with small pebbles, which, assisted by the action of the sea, form a compact and solid mass. Both structures are deficient in width, and from the rough way in which the blocks are deposited some amount of silt finds its way through the interstices, while from their slight elevation the sea, during fresh N. W. winds, washes over them, bringing with it a certain quantity of sand."

The canal furnishing to the port of Amsterdam direct communication with the North Sea has its sea-entrance and artificial harbor on a coast of sand-dunes, the trend of which is about N. by E. The axis of the harbor projected from the coast into the North Sea is nearly normal to the coast-line. The width of this entrance is 260 meters. The two piers are now extended to the depth of 8 meters below the level of low water, corresponding with about 9·50 meters below daily high water, and 8·50 meters below A. P. (i. e. the established Amsterdam level). The roots of these piers, at the foot of the downs on the beach, are 1,200 meters distant one from another. Their directions converge, so as to make an angle of about 77° with their base-line. At 1,200 meters from their origin the piers, distant 660 meters from one another, commence to converge more rapidly; so that, with an increment of length of 345 meters (1,545 in all), they terminate 260 meters apart at the harbor-mouth. To obtain the requisite depth the area between these piers has been dredged to an elliptic form for a width of 650 meters, and to a depth of 8·50 meters below A. P. at the entrance, 7·50 meters on the land side, the harbor area being 55 hectares (135 acres); while the total area inclosed by the piers is fully 100 hectares.

The method of construction adopted was to place on the sand a riprap foundation of small stone, and to lay regularly, from a huge derrick working from the built-up end of the pier itself, a wall of concrete blocks, as represented in the

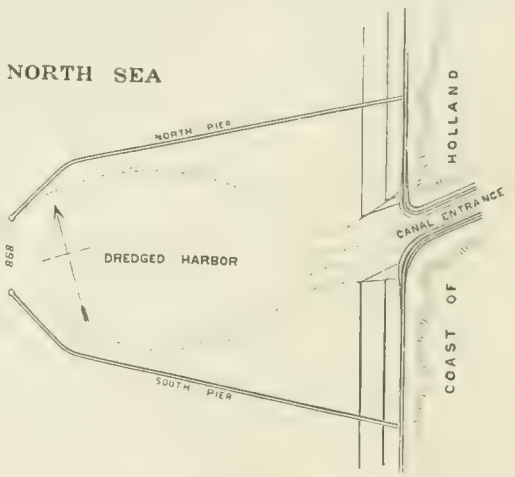


FIG. 3.

section (Fig. 4). For a more detailed account, see *Prof. Papers, Corps of Engineers*, No. 22.

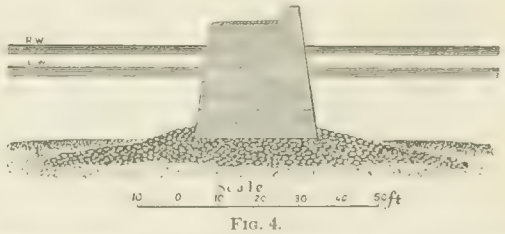


FIG. 4.

Outer Harbors.—In a few instances where it is necessary to effect a landing without lightering through the surf and there is no natural inlet, landing-piers have been built across the strand and through the breakers to deep water, thus affording both a quay for transportation of cars and a comparatively safe retreat for vessels. Probably the most typical instance of this kind to be found is that recently built at Ceará, on the northern coast of Brazil (Fig. 5), where an

open iron viaduct extends across the breakers for a distance of 750 meters, curving to the N. and connecting with a breakwater of concrete-in-mass 2,193 feet long, 26 ft. 3 in. wide on top, and about 30 feet high. The viaduct is com-

FIG. 5.—The pier and harbor at Ceará, Brazil.

posed of iron trestles built of four screw piles with the usual iron braces. There are twenty-five bays of 30 feet span. Thus the littoral currents are enabled to pass along the strand uninterruptedly, and the cove formed by the outer arm of monolithic work does not silt up. This same method was employed at Rosslare, in Ballygeary Bay, Ireland, where a pier designed by Mr. Rendel was built. The approach to the pier was formed by an embankment across the beach to low water, and no sooner had this work been executed than the sand began to accumulate on the southeastern side (or that of the flood tide). The railway was then carried straight out from the shore on an open viaduct of iron girders resting on concrete piers. Twelve of these were built of concrete deposited *in situ* within frames, each pier forming a single mass. A solid breakwater, composed of two concrete block walls, with rubble filling between, was carried out from the end of the viaduct. It was intended to curve the breakwater around until its outer arm was at right angles to the viaduct, and to continue to a depth of 19 feet below low water. Want of funds stopped the work after only 300 feet of the curved part of the breakwater was completed, and the harbor is not sufficiently sheltered. Had the viaduct been made solid a considerable advance of the foreshore would have occurred; as it was, however, the work has been perfectly successful as far as the accumulation of sand is concerned.

Landing-piers of iron are of frequent occurrence. One of the most extensive works of this kind is to be found at Lewes, Del., within the shelter of the breakwater, but it has never been used by the railways for which it was intended. The piers at Coney Island, N. Y., Long Branch, N. J., Atlantic City, etc., are well-known examples of such structures jutting into the breakers. From lack of sufficient protection the heads of some of these have been injured by wrecks beating against them and from storms. One of the most extensive outer harbor projects for the west Gulf coast is that known as Willett's harbor, the general plans of which are shown in Fig. 6. The viaduct is designed to extend out 4,500 feet from the shore to a depth of 27 feet, where the concrete and riprap breakwater will commence by a curve to the S., extending parallel to the shore in 30 feet depth for 3,000 feet or more, with landing-slips on the inside for the largest vessels. One of the most interesting works to evade the bar at the mouth of a river was executed in Holland for the navigable communication of Rotterdam with the sea. Naught but a map can exhibit the relations of that city to the remarkable reticulation of fluvial channels by which the waters of the Rhine, the Meuse, and the Scheldt mutually communicate and discharge themselves into the North Sea. The shortest and most natural route is to follow the Nieuwe Maas to its outlet between the Hook of Holland and the island of Voorne; and this channel, formerly much used, becoming deteriorated, ships of modern large dimensions have been compelled since 1874 to reach the Brouwershaven inlet by circuitous channels 60 or more miles in length. The direct communication, just alluded to, 15 miles in length, the Nieuwe Maas,* is deflected, near its mouth, from its course by the Hook of Holland, and discharges itself over extensive shoals, whereas the Brouwershaven inlet has ample depth of water. In former years the Voorne canal had been made in order to reach the Goeree inlet; but through various causes † had ceased to subserve fully its object.

The project finally adopted by the commission, and successfully executed, was to cut a new outlet to the Nieuwe Maas through the Hook of Holland, and to prolong it into deep-sea water by divergent piers (jetties). These two jet-

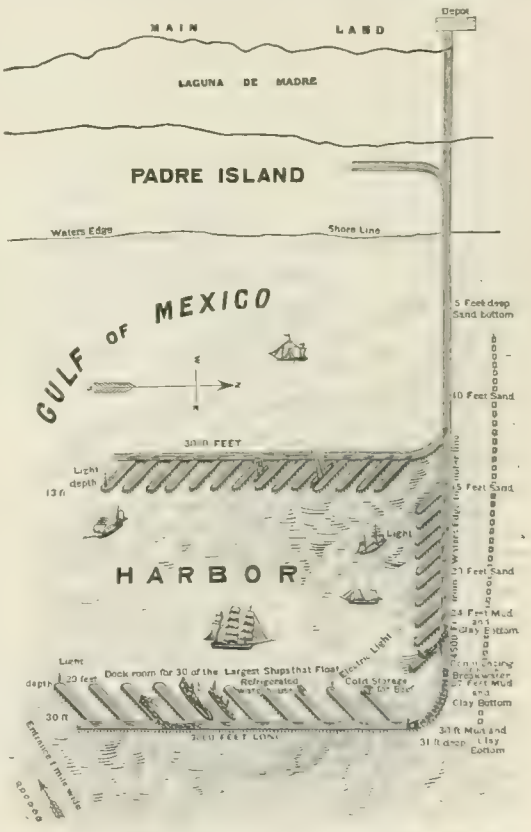


FIG. 6.—Proposed Willett's harbor on west coast of Gulf of Mexico.

ties in the North Sea constitute the proper river-mouth, consist of fascine-work with stone, and have a total length

* The main body of the Rhine river flows by Rotterdam, bearing this name, the ancient arm which, through the N[illegible] bears the name of "Rhine" having long since ceased [illegible]

† The locks were 294 by 46 feet; the draught [illegible] feet, and was considered adequate; but the Goeree [illegible] deficiency of depth on its bar and shoals.

of 2,800 meters, the northern pier reaching to 6·50 meters below mean low (8·20 meters below mean high) water, and the southern one so much shorter that a tide-catching form is given to the entrance. This latter arrangement, however, was found unsatisfactory, and the southern pier was lengthened by 1,200 meters in 1875 and 1876.

FIG. 7.

The engineer, Mr. P. Caland, was promoted to be inspector of the Waterstaat in recognition of his success. For an account of the work see *Prof. Papers, Corps of Engineers*, No. 22, where a description of its peculiar construction will be found.

These jetties were originally built 3,000 feet apart at the outer end and about 2,500 feet at the shore, but they were unable to maintain the requisite depth, so that another jetty was placed inside of the south jetty and about 700 feet therefrom, reducing the mean width to 2,300. The result was a channel with a minimum low-water depth of 63 decimeters, (21 feet) and having an average width between the 60-decimeter curve (19⅔ feet) of 400 feet. This channel, however, has to be maintained by constant dredging, and on the occasion of the writer's visit in 1889 there were a number of large ladder dredgers employed on different parts of the channel. The chart of 1886, issued by the Minister of Marine, shows that the groins have filled up with littoral drift, and the 25-decimeter contour extends to the heads of the jetties. The plan of the channel is curved in accordance with the practice of the North German and Holland engineers, the radius being about 22,000 feet, causing the channel to flex toward the concave or right bank.

A more celebrated instance of the improvement of a river-mouth by the use of parallel piers or jetties is that of the Sulina mouth of the Danube. The piers as designed were of riprap thrown in from a staging of piles, subsequently re-enforced and made permanent by covering with large blocks of concrete. As designed, the piers were 5,850 and

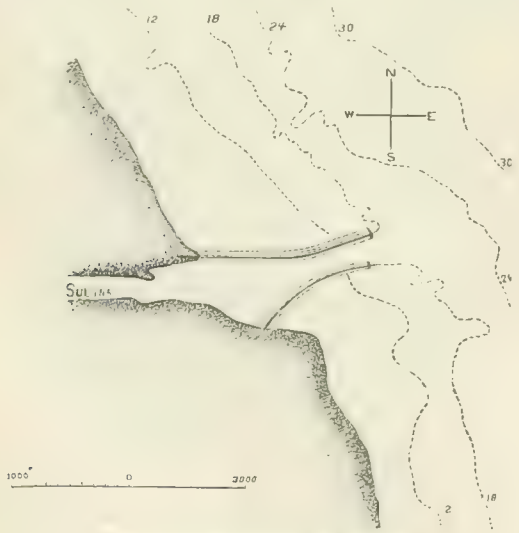


FIG. 8.—Sulina mouth of the Danube.

4,310 feet long, starting at points on shore 2,500 feet apart, and converging to parallelism about 600 feet apart. The results are thus stated by Sir Charles Hartley (*Minutes of Proceedings of Institution of Civil Engineers*, vol. xxxvi., pp. 208, 209): 1. That when the European commission of the Danube began its labors in 1856, the entrance to the Sulina branch was a wild, open seaboard stream, with wrecks, the hulls and masts of which, sticking out of submerged sand-banks, gave to mariners the only guide where the deepest channel was to be found. 2. That the depth of channel varied from 7 feet to 11 feet, and was rarely more than 9 feet. . . . 5. That on the completion of the provisional piers (in 1861) the depth on the bar increased to 17 feet, and Sulina, instead of being the worst harbor, at once took the highest rank among the best commercial harbors in the Black Sea. Finally, by prolonging the south pier, consolidating and rendering permanent the work at an expense equal to the first cost of the temporary structure, and by other improvements, an effective depth of 20 feet was attained in 1872, and has since been maintained.

The Danube bears a proportion by volume of sediment of $\frac{1}{1728}$, nearly the same as for the Mississippi. The case was cited (*Ex. Docs.* 113, H. R., p. 98, and No. 220, p. 112, 43d Congress, 1st Sess.), not as a proof, but as an example, that to the great river of the West, the Mississippi, instead of abandoning the mouths and resorting to canal—inadequate at best, and of doubtful success—a navigable open mouth might be given.

The harbor of Libau, Russia, opening on the Baltic, with no tide, has been cited as a case of successful jetty scour. Here two parallel jetties were constructed from 1856 to 1868. The north one was 2,723 feet long; the south, 3,346 feet, while they were but 350 feet apart, thus utilizing the full amount of reaction from currents. The channel was dredged to a depth of 20 feet, and the total cost of these improvements was $1,000,000. Two years later the depth at the mouth was but 14 feet. It was again dredged to 17,

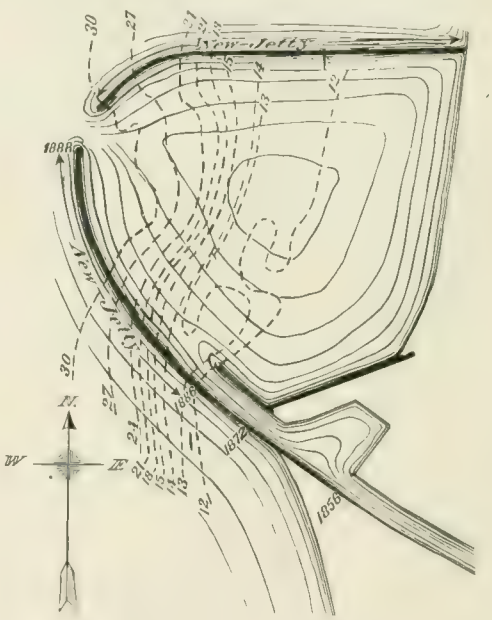


FIG. 9.—Harbor of Libau, Russia.

and by 1872 it had shoaled to only 13 feet. The jetties were extended in 1877, the south one 956 feet to intercept the littoral drift, the north one 81 feet, and the channel was again dredged to 21 feet depth. The cost to this date was $2,500,000, but the result was unsatisfactory, and in 1886 it was decided to construct an outer harbor, as at Boulogne, Madras, Kingstown, Tynemouth, and many other places, by inclosing a sufficient area between two curved moles or breakwaters each over a mile long and estimated to cost over $4,000,000. The work was begun Apr. 14, 1887, and is still progressing.

Many artificial harbors exist where a bight in the coast is utilized by building an arm across the exposed seaway, as at Dover, Newhaven, Colombo, Alexandria, Portland, Holyhead, Algiers, and many other places frequently described, but one of the latest and most important of the harbors of this class, because of its extent and position, is to be found at the Ponta Delgada, on the south side of the island of St. Michael, one of the Azores, where the spring tides rise

7½ feet. The Portuguese Government authorized the construction of a breakwater at this port in 1860 upon the design of Mr. J. S. Tucker, C. E., as revised by Sir John Rennie. Work was begun in 1861, but afterward enlarged by Portuguese engineers until now it covers a length of 1,255 yards. By Nov., 1886, it had advanced to a distance of 1,054 yards from shore to a depth of 12 fathoms. The wall along its summit was then 805 yards long, and sheltered a spacious quay for storage and cranes. At that date 3,407,037 tons of stone (basaltic rock in sizes up to 18 tons) had been deposited in the work, and it was estimated that 1,450,000 more tons would be required to finish it. This is nearly double the quantity in the Plymouth breakwater. The cost was $3,000,000 for the stone in place and $1,100,000 estimated to complete. It was under the supervision of Capt. David X. Cohen, director. The recent cost per ton of stone was only 44 cents.

Insular breakwaters may be used to form harbors. They may be either natural, as an isolated rock or island of sufficient extent to provide a lee, or they may be artificial mounds of riprap, of which many instances have already been cited. It should be observed, however, that where the exposure is such as to cause waves and currents to travel around the salients of the structure and meet in its rear, in course of a short time a bar will be formed which will extend ultimately to the shore, producing the numerous formations known as *presque isles*, so common on the Great Lakes and in Massachusetts Bay, as at Nahant, Marblehead, Nantasket, Lynn, etc., or at Richmond island, Maine. A similar result will be found in the shoal which has been caused by the Delaware breakwater, where a submerged embankment extends from shore to the northern end of the breakwater, having about 14 feet depth in the middle of the harbor and only 10 feet at the outer end. This has been produced by the defective location of both branches of the structure with reference to the currents, and a similar defect is repeated in the proposed design for the harbor of Lynn Haven inside of Cape Henry, Chesapeake Bay.* Here it is (1894) proposed to construct a riprap and concrete-in-mass structure rising only to extreme high water, 4,500 feet in length, at an estimated cost of $1,555,538, and extending in large part across the path of the currents. The effects produced by this plan doubtless will be similar to those of the Delaware breakwater, where fifty vessels were wrecked in eighteen months. Of projects, the most important is that for an additional structure on the shoal known as the Shears in Delaware Bay, northwest from the present harbor, where it is proposed that a national harbor of refuge for deep-draught vessels be established. To this end a survey has been requested, but no recent data as to physical conditions are available. The number of vessels anchored in the Delaware breakwater harbor has diminished over 50 per cent. in four years. In 1890 it was 2,250, exclusive of tugs and small coasting craft.

Space will not allow more ample description than has been given of artificial harbor construction. Of interesting works not described, reference may be made to the following: that of Oamaru, New Zealand, *Engineering*, Apr. 25, 1873; of Karachi, India, *Engineering*, June 6, 1873 (the Manora breakwater is described under BREAKWATER); Holyhead, *Engineering*, Sept. 26, 1873; Alexandria (new harbor), *Van Nostrands Eng. Mag.*, Feb., 1873. In *Engineering*, Mar., 1873, will be found a novel project for an "island harbor" at Boulogne, by Col. A. Clarke, Royal Engineers. See also Sir John Rennie on *Harbors*; Stevenson on *Harbors*; Vernon Harcourt on *Harbors and Docks*; *Transactions Institution of Civil Engineers*, etc. (London), and other references under BREAKWATER. L. M. HAUPT.

Harbor Springs: village; capital of Emmet co., Mich. (for location of county, see map of Michigan, ref. 3–I); on Lake Michigan and the Gr. Rapids and Ind. Railroad; about 30 miles S. W. of Cheboygan. It has one of the finest harbors on the Great Lakes, is a popular summer resort, and contains 5 churches, 5 graded public schools, Roman Catholic convent and school, several summer hotels, and 2 weekly newspapers. Pop. (1890) 1,052.

EDITOR OF "REPUBLICAN."

Harburg, haar'boorch [O. H. G. *hari*, army + Mod. Germ. *heer* + *burg*, fortified place]: a town of the Prussian province of Hanover; on the left bank of the southern branch of the Elbe, opposite Hamburg, which stands on the right bank of the northern branch at a distance of 4½ miles (see map of German Empire, ref. 2–E). The two points are connected with each other by a railway across both rivers. It has large tanneries and extensive manufactures of woolens and linens, and its transit trade with Hamburg is of importance. Pop. (1890) 35,090.

Har'court, Sir WILLIAM GEORGE GRANVILLE VENABLES VERNON, LL. D., Q. C., M. P., P. C.: politician; b. Oct. 14, 1827; graduated M. A. at Trinity College, Cambridge, with high distinction; admitted to the bar 1854; became Q. C. 1866; Professor of International Law at Cambridge 1869; knight bachelor 1873; Solicitor-General 1873–74; entered Parliament for Oxford 1868, Derby 1885 and 1892. Author of pamphlets and papers in *The Saturday Review* and London *Times*, signed "Historicus," etc. Upon Gladstone's return to power in 1880, Harcourt was appointed Secretary of State for the Home Department. He went out on the fall of his party in 1885, but during the brief period of Liberal government in 1886 he held the office of Chancellor of the Exchequer, and in 1892 he was appointed to the same office.

Har'dee, WILLIAM J.: Confederate soldier; b. in Savannah, Ga., in 1819; graduated at West Point 1838, and was appointed a second lieutenant of dragoons; first lieutenant 1839; captain 1844. He served with distinction in the Mexican war, and commandant of cadets at West Point 1856–61, when he resigned to become a brigadier-general in the Confederate army. For bravery at the battle of Shiloh he was promoted to be major-general, and placed in command of a division in Gen. Bragg's army. He was in the battles of Chaplin's Hills, Murfreesboro, and Chattanooga; promoted to lieutenant-general; engaged in siege and fall of Atlanta; commanded at Savannah, which place he evacuated Dec. 20, 1864, as he did Charleston Feb. 17, 1865, finally surrendering with Johnston's army at Durham Station, N. C., Apr. 26, 1865. Author of *Hardee's Tactics*, adopted for use in the U. S. army and for the militia. D. at Wytheville, Va., Nov. 6, 1873.

Hardenberg, FRIEDRICH, von: See NOVALIS.

Hardenberg, haar'den-bārch, KARL AUGUST, Prince von: b. at Essenroda, Hanover, May 31, 1750; studied law at Leipzig and Göttingen, and held various positions in the service of the King of Hanover, the Duke of Brunswick, and the Margrave of Anspach, until he became Prussian Minister of State in 1791. In this office his chief work was the negotiation of peace between Prussia and France in 1795. When war broke out between France and England he strove to maintain the neutrality of Prussia, but French aggressions in Anspach in 1805 drove him into an alliance with Russia against France. The victory of the latter power at Austerlitz discouraged Prussia from entering upon the war; Napoleon's policy triumphed; Prussia signed a convention with France, and Hardenberg was compelled to resign, but when war nevertheless broke out between Prussia and France, he was recalled to power, and was Minister of Foreign Affairs till 1807. He lived for some time in exile in Russia, but was recalled to Berlin, made chancellor in 1810, and carried out the plans of Stein for the reorganization of the Prussian state. Among his important measures of reform were the improvement of the military system, the opening of the civil service to all classes, the removal of feudal burdens, the abolition of serfdom, and the promotion of public education. At the same time he sought to foster the national feeling and rouse the patriots of Prussia to free her from her humiliating subjection. Few did more than he to promote the national movement which resulted in the War of Liberation and the downfall of Napoleon. He signed the Treaty of Paris and was made a prince. After this his policy lacked its former vigor and boldness. He betrayed reactionary tendencies and became displeasing to his former friends without winning the confidence of the reactionists. D. at Genoa, Nov. 26, 1822. See *Denkwürdigkeiten des Staats Kanzlers Fürsten von Hardenberg* (4 vols., 1877), containing his memoirs, and a biography by Leopold von Ranke. F. M. COLBY.

Har'derwyk, or **Harderwijk** [Dutch, liter., Mulletville; *harder*, mullet + *-wijk*: Eng. *-wick*, from Lat. *vicus*, village: οἶκος, house]: town of the Netherlands: in the province of Geldern, on the Zuyder Zee: 31 miles N. E. of Utrecht (see map of Holland and Belgium, ref. 5–G). It is much engaged in herring-fishing, but it was formerly a place of vastly greater importance than at present. In the thirteenth and fourteenth centuries it was a free city, surrounded with strong walls, maintaining close commercial relations with

* See *Ex. Doc.* No. 27, 52d Congress, H. R.

England, Denmark, Sweden, etc.; but, having been bereft of its privileges by Charles V., it gradually fell into decay. It was the seat of a university from 1648 till 1811. Pop. (1890) 7,333.

Hardicanute' (*Harthacanut*): King of England; a son of Canute by Emma, widow of Ethelred II.; chosen King of the West Saxons in 1035, while Harold, his reputed half-brother, ruled the rest of England. In 1036 he became King of Denmark, where he was already viceroy; was deposed as King of Wessex 1037, "because he was too long in Denmark"; made preparations for invading England, when he heard of Harold's death (1040); was unanimously chosen King of England at the Witenagemote. Hardicanute's reign was short, but stained with dreadful crimes. He had the dead body of Harold dug up and thrown into the Thames; he exacted a heavy *danegeld*, and burned Worcester to the ground because it refused to pay it. D. June 8, 1042.

Hardie, James Allen: soldier; b. in the city of New York, May 5, 1823; graduated from the U. S. Military Academy July 1, 1843, entering the army in the artillery service; served as assistant professor at West Point, and as company officer in garrison, frontier, and Indian service until 1861, being, during a portion of the time, aide-de-camp to Gen. Wool. Served during the civil war as aide-de-camp to Maj.-Gen. McClellan during his campaigns with the Army of the Potomac, before Richmond, in the Maryland campaign, etc.; on the staff of Maj.-Gen. Burnside in the Rappahannock campaign; judge-advocate-general of the Army of the Potomac, staff of Maj.-Gen. Hooker; brigadier-general of volunteers Nov. 29, 1862; appointed assistant adjutant-general (rank of major) Feb. 19, 1863; assigned to special duty in the War Department till 1866; assistant to Mr. Secretary Stanton until he vacated office; thereafter with Gens. Grant, Schofield, and Rawlins as acting Secretary of War; appointed inspector-general (rank of colonel) Mar. 24, 1864; brevet brigadier-general and brevet major-general U. S. army Mar. 13, 1865; in 1866 senior member of commission to inspect the ordnance and ordnance stores in forts and arsenals of the U. S., with reference to the disposition of munitions, the accumulation of the war; commissioner to audit the military claims of Kansas, Montana, Dakota, California, and Oregon. Author of various contributions to the press, and of numerous military reports. D. at Washington, D. C., Dec. 14, 1876.

Harding, Chester: portrait-painter; b. at Conway, Mass., Sept. 1, 1792; self-taught; was at first a turner; soldier in the war of 1812 and after his service a sign-painter in Pittsburg, Pa. Went to London in 1832 and had considerable success painting portraits and was patronized by the royal family. His memoirs, published in 1891, give interesting accounts of his adventures and his intercourse with public men. A *Portrait of Daniel Webster* belongs to the Bar Association, New York, and one of *John Randolph* is in the Corcoran Gallery, Washington. D. in Boston, Apr. 1, 1866. W. A. Coffin.

Harding, James Duffield: landscape-painter, teacher, and writer on art; b. at Deptford, England, in 1798. He received his first instruction in the latter from his father and from Prout; studied engraving for a time, but soon engaged in teaching landscape-painting. He practiced lithography with great success, and published a number of series of his lithographic sketches—*Lessons on Trees*, *Sketches at Home and Abroad*, *The Park and the Forest*—showing in the drawing of trees a remarkable power of distinguishing the character of one kind of foliage from another, but also a disposition to reduce all tree-drawing to a set of conventional symbols. He published also *Elementary Art* and *The Principles and Practice of Art*. He was a member of the Water-color Society, and painted mostly in water-colors, but produced many oil-paintings. D. at Barnes, England, Dec. 4, 1863.

Revised by Russell Sturgis.

Harding, or **Hardyng**, John: English chronicler; b. 1378; was originally an inmate of the house of Henry Percy ("Harry Hotspur"), but enlisted, after the death of Percy, under the banner of Sir Robert Umfraville, whom he accompanied in the battle of Agincourt 1415, and in the naval battle which the Duke of Bedford delivered the next year at the mouth of the Seine. In 1424 he went to Rome to seek for documents which should prove that the Kings of Scotland owed allegiance to the Kings of England. When he wrote his chronicle is doubtful. According to one manuscript, it seems originally to have ended with the death of Sir Robert in 1436; according to another, he seems later on to have recomposed the work. His *Chronicle of England unto the Reign of King Edward IV.* (in verse, and continued by Grafton to 1543) was edited by Sir Henry Ellis (1812). D. after 1465. Revised by H. A. Beers.

Harding, Stephen: b. at Sherborne, Dorsetshire, England, in the latter part of the eleventh century; made a pilgrimage to Rome; entered the monastery of St. Claude de Joux, at Moleme, near Dijon, France; afterward, with others, established the monastery of Citeaux, and succeeded Alberic in 1110 as abbot. The severity of the discipline he enforced was not far from ruining the whole institution, when, in 1113, St. Bernard, with thirty other young men, entered the monastery and gave the abbot their heartiest support in carrying out his reforms. In 1119 he drew up, in conjunction with St. Bernard, the so-called *Carta Caritatis*, the constitution of the Cistercian order, which was confirmed by Calixtus II. and Eugenius III. D. at Citeaux, Mar. 28, 1134.

Hardinge, Henry, Viscount: b. at Wrotham, Kent, England, Mar. 30, 1785; entered the army 1798; made lieutenant 1802, captain 1804; served in the Peninsula 1808–14; deputy quartermaster-general 1809–13; wounded at Vimeira, Vittoria, and Ligny, where he lost an arm while commanding a German brigade; entered Parliament for Durham 1820; Secretary of War 1828; Chief Secretary for Ireland 1830, 1834–35, and 1841–44; Governor-General of India 1844–48, and performed the duties of that office with ability; commander-in-chief 1852; field-marshal 1855. D. at Southport, Sept. 24, 1856. See the *Life* by his son (1891).

Hardness: (in minerals): See Mineralogy.

Hardouin, ärˊdooˊänˊ, Jean: learned Jesuit and classical scholar; b. at Quimper, Bretagne, France, in 1646; librarian and Professor of Dogmatic Theology at Paris. D. Sept. 3, 1729. His numerous works, though all distinguished by vast erudition and originality, are too often marred by an inordinate love of paradox. The most famous of these, which he defended with a great deal of ingenuity, was his contention that all the Latin classics, with the exception of Cicero's works, Pliny's *Natural History*, the *Georgics* of Vergil, and the *Satires* and *Epistles* of Horace, were the skillful forgeries of certain thirteenth-century monks, perpetrated under the general supervision of one Severus Archontius. See his *Prolegomena ad censuram veterum scriptorum* (1693). In his great theological work, *Conciliorum collectio regia maxima*, he endeavored to prove that none of the great Church councils before the Tridentinum were historical. He also edited *Themistius* (1684), thirteen speeches being here printed for the first time, and Pliny's *Natural History* (5 vols., 1685). Alfred Gudeman.

Hardwar', or (older spelling) **Hurdwar**: ancient town in the Northwestern Provinces, British India; situated in lat. 29° 57′ N. and lon. 78° 14′ E., at an elevation of 1,024 feet above the sea, on the spot where the Ganges bursts from the hill-country into the plain of Hindustan. During the latter part of March and the beginning of April this place is yearly visited by more than 100,000 pilgrims, who come to make their ablutions in the holy water and pay reverence to the foot-mark of Vishnu; every twelfth year is especially sacred, and at this time the number of pilgrims swells to 300,000. A large fair is also held here, to which the products of the neighboring countries are brought. Pop. 5,000.

Mark W. Harrington.

Hardwick, Charles: ecclesiastic; b. at Slingsby, Yorkshire, England, Sept. 22, 1821. Apparently of humble parentage, he made his way at the University of Cambridge by his talents and industry. In 1853 he was appointed Professor of Divinity in Queen's College, Birmingham, and in 1855 Lecturer on Divinity in King's College, Cambridge. He had been ordained deacon in 1846 and priest in 1847, and only a few months before his untimely death was made Archdeacon of Ely. His scholarship was both broad and accurate, and he was a versatile and rapid worker. He published other books, but his fame rests on these four: *History of the Articles of Religion* (Cambridge, 1851; 3d ed. 1876); *History of the Middle Age of the Church* (1853; 6th ed., by Stubbs, 1888); *History of the Reformation* (1856; 9th ed., by Stubbs, 1888); *Christ and Other Masters* (in 4 parts, 1855–58; 3d ed., by Francis Procter, 1874). He lost his life by a fall in climbing the Pyrenees, Aug. 19, 1859.

Revised by S. M. Jackson.

Hardwicke, Earls of: (1) Philip Yorke, b. at Dover, England, Dec. 1, 1690; was the son of a retail dealer, and after his elevation to the peerage he was often taunted with his low extraction. He studied law, obtained the patronage of Lord Chief Justice Macclesfield, and was admitted to the bar at the Middle Temple in 1715. In 1719 he was elected a member of the House of Commons for Lewes, Lord Macclesfield paying the expenses of the election, and, as his great patron in the same year became Lord High Chancellor, he was in the following year, 1720, made Solicitor-General. In 1724 he was appointed Attorney-General, and the very first case which occurred was the prosecution of Lord Macclesfield for corruption. In 1733 he was made lord chief justice and a peer of the realm, and in 1737 Lord High Chancellor. As a judge he enjoyed the highest authority; only three times appeals were taken, and each time his verdict was confirmed by the House of Lords. His judicial decisions show great acumen and great circumspection, and both of those qualities were much needed in a period when English law was in an almost chaotic condition. A collection of his verdicts is found in the *Reports* by Atkyns and Vesey, and in an independent volume published by West. D. in London, Mar. 6, 1764. (2) Philip, second earl, b. Dec. 9, 1720; was educated at Cambridge, where he took the doctorate of law, and in 1762 was made chancellor. He entered the House of Commons in 1741 as member for Ryegate, and for a short time in 1765 he held office in the administration of Lord Rockingham. But his feeble health made it difficult for him to take an active part in politics; he devoted most of his time to literature. He was one of the principal contributors to the *Athenian Letters; or, The Epistolary Correspondence of an Agent of the King of Persia residing at Athens during the Peloponnesian War.* Among his other works are *Walpoleana; or, A Few Anecdotes of Sir Robert Walpole* (1781); and *Miscellaneous State Papers from 1501 to 1726.* D. May 16, 1790. (3) Charles Philip, fifth earl, b. Apr. 23, 1836; succeeded to the peerage Sept. 17, 1873.

Hardy, ăär'dēē', Alexandre: dramatist; b. about 1570. Of his life little is known. By 1596 he was dramatic writer for wandering companies of actors, whom he followed about. After 1599 he was especially connected with the actors who made Paris and the Hôtel de Bourgogne more and more the chief scene of their representations, and who remained there after 1628, founding the first fixed and permanent French theater. He wrote and adapted for the stage a vast number of plays, according to his own claim over 600. Of these forty-one have been preserved in print, and the titles of thirteen others are known. These plays are often upon subjects taken from classical antiquity, but they show a great variety and confusion of forms, tragedy, tragi-comedy, pastoral and dramatic poem, and are marked by coarseness and violence or by an affected grace and sentiment. They were the main repertory of his day, but were abandoned and forgotten soon after his death (about 1631 or 1632). Hardy did not observe the rules that were beginning to produce the unity and elegance of the French classical drama, but he rendered a great service by endowing his plays with action, and producing pieces that were intended to be played rather than read, and by attracting to the theater the educated public that had abandoned the old popular drama as rude and barbarous. His works have been edited by Stengel—*Le Théâtre d'Alexandre Hardy* (5 vols., Marburg, 1883–84). A. G. Canfield.

Hardy, Arthur Sherburne, A. M., Ph. D.: author and mathematician; b. at Andover, Mass., Aug. 13, 1847. Educated at Phillips Academy, Andover, Amherst College, U. S. Military Academy, West Point, and École des Ponts et Chaussées, Paris. Graduated at West Point June 15, 1869, and promoted second lieutenant of Third Artillery; served at Military Academy as Assistant Instructor of Artillery Tactics July to Aug., 1869; in garrison in Florida and on leave of absence to Nov. 12, 1870, when he was honorably discharged at his own request; Professor of Mathematics and Civil Engineering, Iowa College, 1870–73; Professor of Civil Engineering, Chandler Scientific School, Dartmouth College, 1874–78; Professor of Mathematics, Dartmouth College, since 1878. Author of *Elements of Quaternions* (Boston, 1881); *Geometrical Interpretation of Imaginary Quantities* (translated from French; New York, 1881); *New Methods in Surveying* (1884); *Elements of Analytic Geometry*; *Elements of Calculus*; a poem, *Francesca of Rimini* (Philadelphia, 1878); the novels *But Yet a Woman* (Boston, 1883); *The Wind of Destiny* (1886); *Passe Rose* (1889); and *Life and Letters of Joseph H. Nesima.* He received the degree of A. M. from Iowa and Dartmouth Colleges, and that of Ph. D. from Amherst College. James Mercur.

Hardy, Arthur Sturgis: politician; b. at Mt. Pleasant, Ontario, Canada, Dec. 14, 1837, and educated at grammar school and at the Rockwood Academy. He was admitted to the bar in 1865; first returned to the Ontario Legislature for South Brant in 1873, and re-elected in 1875. He was appointed provincial secretary and registrar Mar., 1877, and re-elected by acclamation; and re-elected in 1879, 1883, 1886, and 1890. In Jan., 1889, he was appointed Commissioner of the Crown Lands, a portfolio which he now (1894) holds. Neil Macdonald.

Hardy, Robert Spence: author; b. at Preston, Lancashire, England, July 1, 1803; joined the Wesleyan Conference in 1825, and went as missionary to Ceylon, laboring there for twenty-three years, and then returning to England. *The British Government and the Idolatry of Ceylon* (London, 1841); *Eastern Monachism* (1850); *A Manual of Búddhism in its Modern Developments, translated from Singhalese MSS.* (1853); *Legends and Theories of the Búddhists compared with History and Science* (1867), were published by him. D. at Headingly, Yorkshire, Apr. 16, 1868. His writings have thrown much light upon Búddhism, and he was regarded as one of the best of modern Pali scholars.

Hardy, Thomas: novelist; b. in Dorsetshire, England, June 2, 1840. He was educated partly at King's College, London, and became an architect by profession, studying under Arthur Blomfield; subsequently he took up his residence near Dorchester in his native county. His novels, which are largely tales of rustic life in the West of England, are remarkable for ingenious plot, piquant situations, a knowledge of feminine character, and occasional tragic power of an unusual kind. Among them are *Under the Greenwood Tree* (1872); *A Pair of Blue Eyes* (1873); *Far from the Madding Crowd* (1874); *The Hand of Ethelberta* (1876); *The Return of the Native* (1878); and *Tess of the d'Urbervilles* (1890). In June, 1893, he published a drama, *The Three Wayfarers.* H. A. Beers.

Hardy's Colorado: See Colorado River.

Hare, George Emlen, D. D., LL. D.: clergyman; b. in Philadelphia, Sept. 4, 1808; graduated at Union College 1825; entered the Protestant Episcopal ministry; rector of St. John's, Carlisle, Pa., 1830–34; of Trinity church, Princeton, N. J., 1834–43; of St. Matthew's, Philadelphia, 1845–52. After serving as assistant Professor of Latin and Greek in the University of Pennsylvania for a time he became Professor of Biblical Learning in the Divinity School, Philadelphia, 1852–81; received the degree of D. D. from Columbia College 1843, and of LL. D. from the University of Pennsylvania 1873; Professor New Testament Literature 1881, and on his retirement from this chair professor emeritus until his death in Philadelphia, Feb. 15, 1892. Author of *Christ to Return* (Philadelphia, 1840); *Visions and Narratives of the Old Testament* (sermons, New York, 1889). Revised by W. S. Perry.

Hare, John Innes Clark, LL. D.: jurist; b in Philadelphia, Oct. 17, 1817; graduated at the University of Pennsylvania in 1834, and was admitted to the bar in 1841; became associate judge of the district court of Philadelphia 1851; presiding judge 1867; presiding judge of the court of common pleas of Philadelphia 1875. He is the author of *American Leading Cases* (2 vols., 1847), in conjunction with Horace B. Wallis; *The Law of Contracts* (8vo, Boston, 1887); *American Constitutional Law* (2 vols., 1889); and has ably edited and annotated several important reprints of English law-treatises. Revised by F. Sturges Allen.

Hare, Julius Charles, M. A.: author; b. at Valdagno, near Vicenza, Italy, Sept. 13, 1795; became a fellow at Trinity College, Cambridge, 1818; vicar of Hurstmonceux 1832; Archdeacon of Lewes 1840; a prebendary of Chichester 1851; chaplain to the Queen 1853. D. at Herstmonceux, Jan. 23, 1855. With his brother, A. W. Hare, he wrote *Guesses at Truth* (London, 1827–48); with Thirlwall translated Niebuhr's *History of Rome* (1828); author of *Mission of the Comforter* (1846); *Memoir of John Sterling* (1848); *Vindication of Luther* (1854), and other works.—His brother, Augustus William (b. at Rome, Nov. 17, 1792), became a fellow of New College, Oxford; rector of Alton-Barnes 1829. D. at Rome, Feb. 18, 1834. Joint author of *Guesses at Truth* (see above); author of *Sermons to a Country Congregation* (2 vols., 1837).—Their nephew, Augustus

John Cuthbert Hare, son of their eldest brother, Francis George (b. at Vicenza, Italy, Jan. 6, 1786), was born at Rome, Mar. 13, 1834. He was educated at Harrow and at University College, Oxford. He has published many works, among which may be named *Epitaphs for Country Churchyards* (1856); Murray's *Handbook for Berks, Bucks, and Oxfordshire* (1860); *A Winter at Mentone* (1861); Murray's *Handbook for Durham and Northumberland* (1863); *Walks in Rome* (1870), *Wanderings in Spain* (1872); *Memorials of a Quiet Life* (1872); *Days near Rome* (1874); *Cities of Northern and Central Italy* (1875); *Walks in London* (1877); *Life and Letters of Baroness Bunsen* (1879); *Cities of Southern Italy and Sicily* (1882); *Sketches of Holland and Scandinavia* (1882); *Venice* (1884); *Florence* (1884); *Studies in Russia* (1885); *Paris* and *Days near Paris* (1887); *Northeastern France, Southeastern France*, and *Southwestern France* (1890). Revised by W. S. Perry.

Hare, Robert, A. M., M. D.: chemist; b. in Philadelphia, Pa., Jan. 17, 1781; was the son of an English brewer, and early turned his attention to scientific experiments. In 1802 he invented the oxyhydrogen blow-pipe, which won for him the Rumford medal of the American Academy. In 1806 he received the degree of M. D. from Yale, *honoris causâ*, and from Harvard also in 1816, in which year he brought forward the calorimotor, a form of galvanic battery by which intense heat may be generated. In 1831 he made successful experiments in subaqueous blasting by means of the galvanic current. Among his other inventions are the gallows-screw and several improved processes in chemistry, toxicology, and pharmacy. In 1818 he was called to the chair of chemistry in William and Mary College, and he held the chemical professorship in the University of Pennsylvania from 1818 to 1847. Late in life he became a believer in Spiritualism. He published *Brief Views of the Policy and Resources of the United States* (1811); *Chemical Apparatus and Manipulations* (1836); *Spiritual Manifestations Scientifically Demonstrated* (1855), and other works, besides an immense number of scientific papers. He was a member of various learned societies. His excellent and ingenious apparatus he gave to the Smithsonian Institution, in which he felt a deep interest. Dr. Hare excelled as an instructor in his favorite sciences. D. in Philadelphia, May 15, 1858.

Harebell: See Bluebell.

Hare-lip: a congenital deformity of the human upper lip, characterized by a fissure (rarely median, like that normal in the hare or the cat), usually a little to one side, and more frequently on the left, but sometimes occurring on both sides at once. When simple and uncomplicated with cleft palate (a frequent accompaniment), a simple surgical operation will commonly cure it perfectly, and infancy is the proper time for operation; but the operation for cleft palate (staphyloraphy) usually should be deferred to a maturer age. The fissure itself normally exists in the fœtal state; by arrest of development it remains open after birth. When two fissures exist, it is not unusual to find the incisor segment (intermaxillary bone) of the upper jaw detached from, or rather ununited to, the jaw, and the deformity may amount to a double cleft palate.

The name is also applied to a catostomid fish, the *Quassilabia lacera*, the peculiar conformation of whose mouth suggests a hare-lip.

Harem [from Turk. *harem*, from Arab. *harām*, the forbidden, the shut off, hence the sacred; deriv. of *harama*, prohibit, forbid]: the female members and children of a Mussulman family; also, and more commonly, their apartment in the house. This is entirely distinct from the men's apartment, which is called selamlik (place of salutation). Into the harem no man can enter save the master, nor he till after giving warning of his approach, that any lady not of his household may have time to withdraw. There no one can pursue him. The entrance of a stranger, whether private individual or officer of the law, would be an extreme outrage and indignity. There the wife is absolute mistress. Whatever of comfort and elegance the house possesses is there, no matter how bare and unfurnished be the apartment of the men. When the master has more than one wife (something comparatively rare, though four wives are allowed each Mussulman) he must provide for each an apartment entirely distinct and complete. Edwin A. Grosvenor.

Hares [O. Eng. *hara*: O. H. Germ. *haso* > Mod. Germ. *hase* < Teuton. *hasan-*: Sanskr. *çaça* (for *çasa-*)]: properly those rodent mammals of the family *Leporidæ* which are in the main solitary in their habits, and which construct forms or nests upon the surface of the ground, but do not have burrows; for the social and burrowing *Leporidæ* are rabbits. According to this distinction, it is probable that there are no true rabbits in North America, except the descendants of those brought from Europe. With the exception of the calling hares (*Lagomys*, of which genus the U. S. have one species, the little chief hare, *L. princeps* of the Rocky Mountains), the hares and rabbits are all of the genus *Lepus*. Of more than forty known species, nearly half are North American. The more important are the common gray rabbit (*L. sylvaticus*), so extensively taken as food by traps, snares, and firearms; the great white hare (*L. americanus*); the jackass rabbits (*L. callotis* and *texanus*) of the far West; and the water-hares of the South (*L. palustris* and *aquaticus*), both good swimmers and inhabitants of swamps. The most common of the European hares is the *L. timidus*, so extensively coursed by greyhounds and pursued by harriers and beagles. This species is widely distributed, being found not only throughout the greater part of Europe, but in the northern portions of Asia and North America. At one time it was divided into several species, owing to the greater or less extent to which its pelage changed with the season. The Arctic hare, which in winter is snowy white, except the tips of the ears, which are black, is merely a variety of this animal, as is also the varying hare of Europe and Asia, which turns more or less white in winter.

Hares progress by a series of leaps, and are mostly very swift, flight being their chief means of eluding enemies, although their color, which harmonizes to a great extent with the dead leaves and branches of their "forms" or nests, is also protective. The hare is very skillful in throwing the hounds pursuing it off the scent. Sometimes, after running forward a considerable distance, it will return for a few hundred yards on the same track, and after making a great leap at right angles to its former course, will lie quietly hidden while the hounds run by. See also Leporide and Rabbit. Revised by F. A. Lucas.

Hargraves, Edmund Hammond: explorer; b. at Gosport, England, about 1815; went to sea at an early age, and for a time was settled in Australia; subsequently embarked for California (1849), and upon his arrival at the gold-fields was so impressed with the similarity of the country to that he had just left that on his return he entered upon explorations which resulted in the discovery of the valuable gold-fields of Australia. Disclosing his discovery to the Colonial Secretary at Sydney, he was subsequently appointed commissioner of crown lands, receiving also many valuable testimonials, among which was a grant of £10,000 by the authorities of New South Wales; in 1854 he returned to England, and published the following year an account of his discoveries, entitled *Australia and its Gold-fields*. D. Oct. 1, 1891.

Hargreaves, James: inventor of a carding-machine (1760) and of the spinning-jenny (1764, 1767); b. at Stanhill, near Blackburn, England; was an unlettered handspinner and weaver. He had tried in vain to spin several cotton threads at one and the same time, but failed. One day his little child overturned his spinning-wheel, and as he saw the spindle revolving vertically, he resolved to construct a machine with several vertical spindles. This proved a success, and was kept a secret; but his neighbors, seeing how much yarn he and his family produced, broke into the house and destroyed the machine. In 1778 he went to Nottingham and set up as a machine-spinner, but never had much success. He obtained a patent on his invention, but it was set aside by the courts, and he died a poor man, Apr., 1778.

Hargrove, Robert Kennon, D. D.: bishop of the Methodist Episcopal Church South; b. in Pickens co., Ala., Sept. 17, 1829; graduated at the University of Alabama 1852; was Adjunct Professor of Mathematics in the same institution 1853–57; member of Alabama conference 1857–67; of Kentucky conference 1867–68; of Tennessee conference 1868–82; elected bishop May, 1882; president of the board of trust, Vanderbilt University, since 1889. He is author of *Laws of the Methodist Episcopal Church South, as Interpreted by the College of Bishops*. Albert Osborn.

Haricot: See Bean.

Häring, Wilhelm: novelist; known under the pseudonym Wilibald Alexis; b. in Breslau, Prussia, June 29,

1798; studied at the Werder Gymnasium in Berlin; was a volunteer in the campaign of 1815; studied law at the Universities of Berlin and of Breslau; became *Kammergerichts-referendar* in Berlin, and engaged in several mercantile undertakings with little success. He soon gave up the practice of law and devoted himself to literature. His first works, *Die Treibjagd* (1820), *Die Schlacht bei Torgau* (1822), and *Der Schatz der Tempelherren* (1822), were unnoticed, but the three-volume romance *Walladmor* (1823–24), published as the work of Walter Scott, achieved popularity, and was translated into several languages. This was followed by an immense number of short stories and novels, of which only the historical romances have a permanent value. Among these are *Cabanis* (1832; 6th ed. 1880); *Der Roland von Berlin* (1840; 4th ed. 1881); *Der falsche Waldemar* (1842; 4th ed. 1880); *Die Hosen des Herrn von Bredow* (1846; 9th ed. 1881); *Ruhe ist die erste Bürgerpflicht* (1854; 4th ed. 1881); *Isegrimm* (1854; 4th ed. 1881); *Dorothe* (1856; 3d ed. 1879). In 1856 he received a blow on the head, causing partial paralysis, from which he never recovered. D. in Arnstadt, Dec. 16, 1871.

Harington, or **Harrington**, Sir JOHN: b. at Kelston, near Bath, England, 1561; son of John Harington (author of the excellent *Verses made on Isabella Markhame*) by an illegitimate daughter of Henry VIII. Queen Elizabeth stood sponsor at his christening, and he studied at Eton and Cambridge. He went in command of some horse to Ireland with Essex, who as Lord-Lieutenant knighted him on the field, to the great dissatisfaction of Elizabeth, who in 1596 excluded Harington from court on account of the publication of his *Metamorphosis of Ajax*, a poem. The queen had, however, a great liking for her godson, and soon recalled him. James I. made him a Knight of the Bath 1603. His other chief works are a translation of *Orlando Furioso* (in heroic verse, 1591); *Epigrams* (1615); *The Englishman's Doctor* (1609); *History of Polindor, etc.* (1651); *Briefe View of the State of the Church of England* (1653); *Nugæ Antiquæ* (with memoir, compiled by Henry Harington, 3 vols., 1769–79). D. 1612.

Hariri, AL, ăăl-hăă-ree'rĕĕ [Arab., the silk-mercer]: a name of Abu Mohammed al Kâsim: b. at Bussora in 1054. Author of *Makamat* (The Assemblies), an Arabian classic of the first importance, written in prose and verse; also of *Molhat-al-Irab*, a grammar, and *Durrat-al-Ghawwâs* (The Diver's Pearl), a treatise on the Arabic language, and other works. D. 1121. The best and completest version in English is that of Prof. Thomas Chenery, of Oxford (1867). Theodore Preston, of Cambridge (1850), translated twenty of the pieces. There is a spirited free translation into German by F. Rückert (1826).

Harivan'sa [Sanskr. *Harivaṅça*, the family of Hari or Krishna (Vishṇu); *hari-* + *vaṅça*, family, race]: a kind of epic written in Sanskrit, regarded as a supplement to the *Mahâbhârata*. Its critical character is not high. It treats of Vishnu in his avatar as Krishna, of cosmogony, and of ancient history.

Harkness, ALBERT, Ph. D., LL. D.: educator; b. at Mendon, Mass., Oct. 6, 1822; graduated at Brown University at the age of twenty; taught in the Providence High School 1843–53; studied in Germany 1853–55, and in the latter year became Professor of the Greek Language at Brown University. He is the author of many well-known text-books in Latin and Greek, including a Latin grammar, Greek and Latin readers, and school editions of various classic authors.

Harkness, WILLIAM, A. M., LL. D.: astronomer; b. at Ecclefechan, Dumfriesshire, Scotland, Dec. 17, 1837; graduated at Rochester University, New York, in 1858, and became Professor of Mathematics U. S. navy, Aug. 24, 1863, and was attached to the U. S. Naval Observatory. In 1866 he made a voyage round Cape Horn in the U. S. monitor Monadnoc to study the phenomena of magnetism on shipboard in the southern hemisphere. The results of this work were published in the *Smithsonian Contributions to Knowledge*. In 1871 he was made a member of the commission on the transit of Venus, and was in charge of U. S. expedition to observe the transit of 1874, at Hobart Town, Tasmania.

S. NEWCOMB.

Harlan, JOHN MARSHALL: jurist; b. in Boyle Co., Ky., June 1, 1833. He graduated at Centre College in 1850, and in the law department of Transylvania University in 1853; was an unsuccessful Whig candidate for Congress in 1859; raised the Tenth Kentucky Infantry for the Union army, and was commissioned its colonel in 1861; attorney-general of Kentucky in 1863–67; defeated for Governor in 1871 and 1875; member of the Louisiana investigating commission in 1877; appointed associate justice of the U. S. Supreme Court Nov. 29, 1877, and one of the arbitrators on the part of the U. S. before the Bering Sea tribunal May 31, 1892.

Harlan: town; capital of Shelby co., Ia. (for location of county, see map of Iowa, ref. 5–D); on the Nishuabatona river and the Chi., R. I. and Pacific Railway; 40 miles N. E. of Council Bluffs. It is in an agricultural region, and has a large flour-mill, plow-factory, iron-foundry, 2 steam brick-factories, creamery, and 3 weekly newspapers. Pop. (1880) 1,304; (1890) 1,765; (1895) 2,297.

EDITORS OF "REPUBLICAN."

Harland, MARION: pseudonym of Mrs. Mary Virginia Hawes Terhune. See TERHUNE.

Harlay, ăăr'lā', ACHILLE, de: statesman; b. in Paris, Mar. 7, 1536. Appointed first president of the Parliament, the highest judicial court in France, by Henry III. in 1582, he remained faithful to him during the civil war of the League, though he did not hesitate to remonstrate with the king on his prodigality, and to oppose the adoption of cruel measures against the Huguenots. His fidelity and courage are illustrated by his famous defiance to the Duke of Guise, who upon the expulsion of the court from Paris demanded that he should assemble the Parliament. "When the majesty of the prince is violated," said Harlay, "the magistrate no longer has authority." He was left untouched for some time, but afterward was thrown into the Bastile. After the death of Henry III. he was released on the payment of a ransom, and was maintained by Henry IV. at the head of the Parliament. He used his powers to counteract the manœuvers of the Ultramontanes, and caused the condemnation of the books of Bellarmin and Mariana. Author of *La Coutume d'Orléans*, 1583. D. in Paris, Oct. 21, 1616.

Harlay de Sancy, ăăr'lā'de-săăn'see', NICOLAS: b. in 1546; is principally known as having been the owner of the celebrated diamond, named after him the Sancy diamond, the largest in Europe, which belonged afterward to the crown of France. Harlay de Sancy was ambassador and superintendent of finances under Henry III. and Henry IV. He was a kind of freethinker, and he changed his creed so often that the famous Protestant writer d'Aubigné published a bitter satire under the name of *Catholic Confession of Sancy*. D. in 1629.

Har'leian Collection: a mass of MSS. collected by Robert Harley, Earl of Oxford (1661–1724), and by Edward, his son. In 1723 it was purchased by the British Government for £10,000, and the documents are now in the British Museum. There are some 8,000 MSS., many of them of very great value, and there were originally above 400,000 pamphlets. Volumes of *Harleian Miscellanies* have been from time to time published, being compilations from the collected documents. Harley's printed books were sold to a private person.

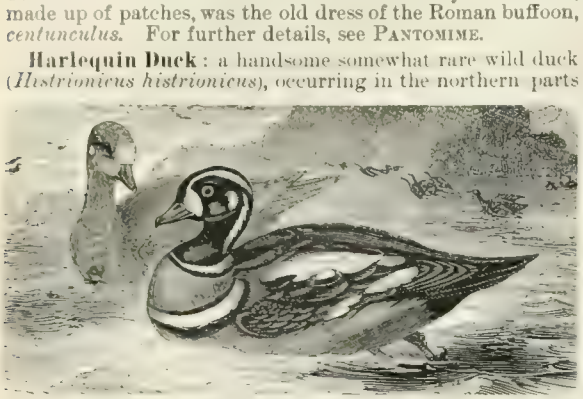
Harlem: a part of New York city above 106th Street, and between the East river and Eighth Avenue. It was once a distinct corporation. See NEW YORK.

Harlem River: the name given to the tidal channel or strait which with Spuyten Duyvil creek separates Manhattan Island, on which New York city is mainly situated, from the mainland, and connects the Hudson river with the channel called East river, which separates Manhattan from Long Island. It begins at Kingsbridge, where Tibbits brook flows into Spuyten Duyvil creek, and extends in a generally S. E. direction for 7 miles to Randall's island, near HELL GATE (*q. v.*). In June, 1895, this whole channel was opened as a ship-canal. Its depth at high water is 15 feet, and at low water 9 feet.

Harlequin [from O. Fr. *harlequin*, probably corruption of *helequin*, prob. of Teuton. origin, meaning troop of hell, i. e. hell's kin]: in mediæval and modern pantomime, the buffoon lover of Columbine, and her protector from the machinations of Pantaloon and the Clown. He wears tight-fitting, particolored garments covered with spangles, and often has the assistance of good fairies. The origin of the character may be traced back to the ancient *Atellanæ*. The buffoon Sannio, described by Cicero in his *De Oratore*, is the direct ancestor of "the two Zanni," Arlechino and Scapino, who flourished in the Italian *comedia del' arte*, the former being the servant of Pantalone, the old citizen of Venice; the latter, of *il dottore* from Bologna. When the

comedia dell' arte was transplanted to France, one of the Zanni (Scapino) was gradually dropped, while the other assumed the principal part of the play, remodeled in various shapes—the lover, the villain, the *deus ex machinâ*, but always witty, graceful, entertaining, and in possession of the sympathy of the audience. The traditional features in the costumes and in the business of the character are not easy to explain, though some of them are evidently very old. The mask some refer back to the Greek comedy. The dress, made up of patches, was the old dress of the Roman buffoon, *centunculus*. For further details, see PANTOMIME.

Harlequin Duck: a handsome somewhat rare wild duck (*Histrionicus histrionicus*), occurring in the northern parts



The harlequin duck.

of Europe, Asia, and North America, principally on the seacoast. Its general color is deep, leaden blue, but when adult the male bears a conspicuous white collar and various marks of white and reddish, the general pied appearance suggesting the popular name. F. A. LUCAS.

Harles, GOTTLIEB CHRISTOPH: a learned bibliographer and classical editor; b. at Culmbach, June 21, 1738; studied philology in the University of Erlangen; was made Professor of Greek and Hebrew in the gymnasium at Coburg 1765; Professor of Poetry and Eloquence 1770 in the University of Erlangen; in 1776 university librarian; and in 1777 founded the Philological Seminary. Edited with notes the *Plutus* of Aristophanes, Aristotle's *Poetics*, Cicero's *De Oratore* and *Verrine Orations*, Cornelius Nepos, Theocritus, Bion, and Moschus, and other classic authors. Wrote numerous works on Greek and Latin literary history and bibliography. His chief work was the new and enlarged edition of *Fabricii Bibliotheca Græca* (12 vols. 4to, Hamburg, 1790–1809). With the exception of the last mentioned his editions, which were mere compilations and devoid of originality of treatment, are now deservedly forgotten. D. Nov. 2, 1815. Revised by ALFRED GUDEMAN.

Har'less, GOTTLOB CHRISTOPH ADOLF, von, D. D.: author; b. at Nuremberg, Bavaria, Nov. 21, 1806; studied at Erlangen and Halle; held (1829–45) a theological professorship at Erlangen, and afterward one at Leipzig; and in 1852 became an ecclesiastical councilor to the Bavarian Government and president of the superior consistory of Munich. Author of a commentary on *Ephesians* (Erlangen, 1834; 2d ed. 1858); *Theological Encyclopædia* (Nuremberg, 1837); *Christian Ethics* (Stuttgart, 1842; 7th ed. 1875; Eng. trans. Edinburgh, 1868); *Jacob Böhme and the Alchemists* (Berlin, 1870); and other valuable works. D. in Munich, Sept. 5, 1879. Revised by S. M. JACKSON.

Harley, ROBERT: See OXFORD, EARL OF.

Harman, HENRY MARTYN, D. D., LL. D.: professor of languages; b. in Anne Arundel co., Md., Mar. 22, 1822; graduated at Dickinson College, Carlisle, Pa., 1848; Professor in Female College, Baltimore, 1853–55; one of the principals of the Classical Institute in Baltimore, 1858–68; Professor of Languages, West Virginia, 1868–69; Professor Ancient Languages in Dickinson College, 1870–79; in 1879 became Professor of Greek and Hebrew in same institution. Published *A Journey to Egypt and the Holy Land in 1869–70* (1872); *Introduction to the Study of the Holy Scriptures* (1878); contributor to *The Methodist Review* and *The Journal of the Society of Biblical Literature and Exegesis*.

Har'mar, JOSIAH: general in Revolutionary war; b. in Philadelphia in 1753; educated in the same city; in 1776 he was made captain First Pennsylvania Regiment, and lieutenant-colonel in 1777, which command he retained until the close of the Revolution, serving with Gen. Washington in his campaigns 1778–80; in the South with Gen. Greene 1781–82; brevet colonel First U. S. Regiment 1783; in 1784 was selected to bear the ratification of the definitive treaty to France, and in the following year was present as Indian agent at the treaty at Fort Mackintosh; appointed (Aug., 1784) lieutenant-colonel of infantry under the Confederation; brevet brigadier-general by resolution of Congress 1787, and general-in-chief of the army Sept. 29, 1789, which post he held until 1792, when he resigned. Adjutant-general of Pennsylvania 1793–99. D. in Philadelphia, Aug. 20, 1813.

Harmat'tan: a dry, parching east wind which prevails on the Guinea coast of Africa in the winter months. It usually brings a reddish dust with it. Its times of greatest frequency at Christiansborg, on the Gold Coast, are Nov. 1, Dec. 5, Jan. 10, Feb. 2, Mar. 1, and the direction shows a diurnal swing from N. E. to S. E. The temperature during the prevalence of the wind is cooler in the morning and evening, hotter at midday. The atmospheric pressure is slightly increased, while the humidity is decreased on the average by 25 or 30 per cent. M. W. H.

Harmo'dius: a beautiful youth of Athens, who was warmly attached to a citizen named Aristogiton, his remote kinsman, both belonging to the Gephyræi. It appears that Hipparchus, brother of the tyrant Hippias, desired to sever the relationship which existed between the friends, and to attach Harmodius to himself, and, failing, put repeated insults upon the two friends in the person of the sister of Harmodius. Accordingly, they determined to put to death not only Hipparchus, but his brother the tyrant. On the feast of the great Panathenæa (514 B. C.) Hipparchus was assaulted and slain, but Harmodius was at once killed by the guards. Aristogiton, put to the torture, in a spirit of revenge named the chief friends of Hippias as his accomplices, and they were accordingly put to death. After the expulsion of Hippias (510 B. C.), Harmodius and Aristogiton came to be highly honored as martyrs for the cause of liberty. The statues from the chisel of Antenor which were erected in their honor were carried away to Susa by Xerxes, but were afterward restored to Athens by Alexander. In the meantime, however, a new group of the tyrant-slayers had been executed by Critios and Nesiotes. The original was imitated on coins and by their help two statues in the Naples Museum have been recognized as copies of the Harmodius and Aristogiton of Critios and Nesiotes. Harmodius and Aristogiton were praised in drinking songs, one of which by Callistratus has been preserved in the works of Athenæus, and speaks of them as the men who "slew the tyrant and gave to Athens equal laws." The families of the tyrant-slayers were exempted from taxation and all public burdens, and it was forbidden by law to give to slaves the names of Harmodius and Aristogiton. See Grote, *History of Greece* (New York, 1865), and others; Collignon, *Histoire de la sculpture grecque* (Paris, 1892); Overbeck, *Geschichte der griechischen Plastik* (Leipzig, 1893); Mitchell, *History of Ancient Sculpture* (New York, 1888). Revised by J. R. S. STERRETT.

Harmo'nia (in Gr. Ἁρμονία): a nymph of the spot on which Thebes was founded, a daughter of Ares and Aphrodite, and sister of the dragon which Cadmus slew. She herself was the prize that awaited Cadmus in case he should prove successful in his contest with the dragon. (See CADMUS.) Their marriage took place on the spot which afterward became the Cadmea of Thebes. All the gods came to the marriage, each bringing a gift, while Apollo, the Muses, and the Graces made the marriage music. Chief among the gifts were a mantle presented by Athene, and a necklace made by Hephæstus, the gift of Aphrodite. Some maintained that the necklace had been given by Zeus to Europa on their wedding night in Crete, and that Cadmus, having received it from Europa, gave it to his bride, a story which was self-contradictory, since Cadmus never saw Europa after her rape by Zeus. Both the necklace and the mantle proved a curse to all who owned them. (See POLYNICES). According to another story Cadmus met and married Harmonia in Samothrace, where she was called a daughter of Zeus and Electra, one of the daughters of Atlas. After the celebration of their marriage in Samothrace, they went to Bœotia and founded Thebes. According to another story, Harmonia was a native of Arcadia, and was kidnapped by Cadmus while she was visiting Samothrace. Still another story has it that Cadmus, a cook of the King of Phœnicia, ran off with Harmonia, the king's fluteplayer. Originally Harmonia was a goddess whose functions were similar to those of Aphrodite Pandemos in her better and nobler side.

Hence, as her name indicates, she was the goddess who presided over civic unity and fraternity, and corresponded to the Roman Concordia. J. R. S. STERRETT.

Harmon'ica [liter., femin. of Lat. *harmo'nicus*, musical, harmonical = Gr. *ἁρμονικός*, deriv. of *ἁρμονία*, harmony. See HARMONY]: a musical instrument improved by Franklin (but known long before his time), consisting of a series of revolving glass cups, which upon being pressed by the tip of the finger or a suitable bow give forth musical tones of a peculiarly fine quality, and consequently also called a *glasschord*. Though much admired, the instrument soon passed out of notice. Various harmonicas have been since brought forward. The "chemical harmonica" is a long, straight, open tube of glass, one end of which is held over a flaming jet of hydrogen. A musical sound is given out, varying in pitch and other qualities with the proportions of the tube. The phenomenon is caused by a series of minute explosions produced by the burning gas, which communicate a vibration to the tube.

Harmonic Motion [so called because expressible as a simple harmonic function of the time. See HARMONIC RATIO]: in mechanics, the projection on any diameter of a point moving uniformly in a circle. If a planet or satellite, moving uniformly in a circular orbit about its primary, be viewed from a very distant position in the plane of its orbit, it will appear to move backward and forward in a straight line with a simple harmonic motion—e. g. the satellites of Jupiter seen from the earth. Such motion as that described is approximately that of the simplest species of *vibrations* of a sounding body, a tuning-fork or piano wire; it is also that of the various media in which waves of sound, light, heat, etc., are propagated, and it enters extensively into the theories of these phenomena, as well as into those of astronomy and mechanics. The *amplitude* is the range on one side or the other of the middle point of the course. The *argument* is the circular arc described by the projected point, and measured from any arbitrary fixed point. It is proportional of course to the time measured from period of passage through that arbitrary point. The distance of a point moving with simple harmonic motion from the middle of its course is a *simple harmonic function of the time*, the *argument* of which has just been defined. The *period* of such motion is the time of a complete course to and fro. The *phase* at any instant is the fraction of the whole period elapsed since the moving point passed through its middle position in a positive direction. The *epoch* is the time from the era of reckoning to the reaching of greatest elongation, in the direction reckoned as positive, from its mean position or middle of the course. For *Harmonic Analysis* ("spherical"), see Laplace's *Coefficients*.

Harmonic Ratio [*harmonic*, liter., pertaining to music or harmony, hence applied to the ratio, series, or proportion subsisting between lengths of stretched strings which vibrate in unison]: in mathematics, an anharmonic ratio equal to minus unity. If a pencil of four right lines meeting in a point, *O*, be intersected by a fifth right line in the four points *A*, *P*, *P*, *B*, then the ratio $\frac{A\ P.\ P\ B}{A\ P.\ P.\ B}$ is constant, no matter how the intersecting line be drawn. This ratio is called the *anharmonic ratio* of the pencil; and if it be *minus unity*, it is a *harmonic ratio* and the pencil is a *harmonic pencil*. In this case the angle *A O B* will be divided internally and externally into parts of which the sines are in the same ratio: and the line *P P* will be harmonically divided by the points *A* and *B*—one *on* it and the other on its prolongation, and *A B* is a harmonic mean between *P B* and *P B*. If *B* is at an infinite distance—that is, if the intersecting line be parallel to *A B* (and the pencil *harmonic*)—*P P* is bisected at the point *A*. The division of a musical string into lengths denoted by the reciprocals of the numerical series 1, 2, 3, 4, 5, 6, etc., produces a great many of the essential sounds of our musical system. Hence such a progression, or more generally that of reciprocals of any series in arithmetical progression, is called *harmonic*. If from four points taken on a conic section a pencil be drawn to any variable fifth point of the curve, the anharmonic ratio of the pencil thus formed will be constant.
Revised by S. NEWCOMB.

Harmonics [from Gr. *τὰ ἁρμονικά*, neut. plur. of *ἁρμονικός*, harmonic, pertaining to harmony; deriv. of *ἁρμονία*, harmony. See HARMONY]: in music, certain secondary or accessory sounds which are given out by sonorous bodies, besides the principal sound, and different from it, but bearing also to such sound a determinate harmonic relation. It is probable that no musical sound is absolutely pure and simple, but that every well-defined sound is the generator or root of several other sounds, which are more or less audible to our ears. A single string, or monochord, produces not only its own proper sound, but also its octave, twelfth, fifteenth, seventeenth, nineteenth, etc., or the sounds belonging to one-half, one-third, one-fourth, one-fifth, one-sixth, etc., of its length. These secondary sounds, in combination with the principal one, are found to be the elements of the perfect *major triad*—i. e. the root or fundamental tone—with its third and fifth, or their octaves and double octaves. A musical ear readily detects several of these in the sound of a large church-bell (the larger the better), and these harmonics are more or less perfect in proportion as the bell is regularly formed, well cast, free from cracks or flaws, and of uniform density. Sounding bodies not only give out primary tones and accompanying harmonics from their own substance, but also, under certain conditions, induce similar sounds in other bodies within reach of their vibrations. A string vibrating at a certain rate—e. g. 120 times in a second—will by "sympathy" cause equivalent vibrations in another contiguous string of the same length, thickness, and tension, and will also excite the more rapid vibrations of strings tuned to sound its octaves, thirds, and fifths; the vibrations or undulations on which sound depends meeting, coalescing, or touching each other at certain regular distances, longer or shorter, and thus producing the harmonic intervals just named. A long-continued note on an open string of a violin will thus cause vibrations in the corresponding string of another violin hanging against the wall. A tuning-fork forcibly struck, and set on the sounding-board of a piano, will occasion all the strings in harmonic relation with it to vibrate in sympathy. The jarring of window-sashes, the jingling of glass vessels, and the rattling of loose articles of furniture, when musical notes *of a certain pitch* (and not otherwise) are sounded, are facts easily explainable on the same principle. Telegraph wires also, during a brisk wind, often give out harmonic tones, though the proper sound of the wire is inaudible. These derived or sympathetic vibrations are, in very large strings, sensible to the touch, and may even be visible to the eye (especially when aided by a magnifying-glass), though the sounds produced are too faint to be appreciated by the ear when the experiment is confined to a single string. But when *several* strings are struck simultaneously, the sympathetic vibrations of a large number of other strings contiguous to them become distinctly audible to any ear by the manifest access of power thus given to the original sound. When a full chord, for example, is forcibly struck on a piano, with *the dampers raised* by using the loud pedal, the quantity of sound produced is much greater than otherwise, because the strings being now all free, every octave, fifth, and major third, with their octaves and double octaves, throughout the whole instrument, respond by sympathy to the notes actually struck, and the general effect is quite sensible to the ear. Composers of piano music often avail themselves of this fact when they wish to give to certain chords the highest degree of force, richness, and brilliance. In the following example the chords at *a* and *b* are precisely the same, but the latter will far exceed the former in power, because the use of the pedal on each note sets the strings free to contribute their harmonics, and thus to intensify the notes under the fingers:

In the large pipes of an organ (chiefly the stopped diapason and bourdon) the harmonic or accessory sounds are often disagreeably perceptible, sometimes causing an indistinctness or uncertainty as to the real tonal pitch of the pipe. In such cases the organist hears distinctly the harmonic fifth or twelfth, while the proper sound of the pipe is barely appreciable. A pipe may also, by an over-pressure of wind, be made to sound one or other of its harmonics *instead* of, or in union with, its own proper tone, as in the quintaton stop of German organs, where the pipes

are so "overblown" as to yield a piercing quality of tone many degrees higher than that proper to their length or capacity.

Under harmonics, or those below the natural sound, are frequently heard from large bells, making a booming or deep humming sound. It has also been found that two pipes of moderate size, under certain relations of length and diameter, if sounded simultaneously, will generate a third sound far deeper than their own, and this foreign sound will so predominate as to substitute itself for the proper sounds of the two pipes. Advantage of this curious fact has been taken by modern organ-builders in obtaining from two pipes—e. g. one of them 8 feet long, and the other only about 5—a derived or harmonic tone equivalent to that of a pipe 16 feet in length, thereby economizing both space and expense. It is obvious that an organ of moderate size may thus be made to produce tones similar in depth to those for which pipes of the largest class are commonly required. See Grove's *Dictionary of Music and Musicians.* Revised by DUDLEY BUCK.

Harmonic Stops: in a large organ, certain stops consisting of two, three, four, or more ranks of pipes, tuned in octaves, double octaves, and double or triple thirds and fifths above the natural pitch of the keys. Among these are the cornet, sesquialtera, mixture, and furniture; but, comprehensively, the term may also include those stops having only a single rank of pipes, which are tuned in thirds, fifths, and their octaves above the pitch represented on the keyboard. These latter are known as "mutation stops," among which are the quint, twelfth, tierce, larigot, and several others. The use of these stops is not only to add power to the "foundation stops" of the instrument—i. e. those which give the primary or *true* sound and its octaves—but also to produce clearness, variety, and greater or less degrees of brilliance, according to the character and requirements of the music under performance. Hence these stops are found in largest number on the keyboard or "manual" designated as the "great organ," though several of them have place also on the "choir organ," the "swell," and the "pedal organ."

Much of the sound produced by such stops must, in the nature of things, be utterly discordant and contradictory to the harmony under performance by the organist. Taking the diapasons as the standard (because tuned to the true and natural pitch), it is easy to understand that no ill effects of this kind would ensue by connecting with them another stop (e. g. the principal), sounding simply an octave higher, or still another (the fifteenth), sounding a *double* octave above each note on the keyboard. The effect would be only an increase of force and brilliancy, as in the addition of female to male voices; but when we add to the diapason such a stop as the twelfth, which makes a *perfect fifth* (in the octave above) to *every note* under the organist's fingers, we perceive that contradictory elements are introduced, and more or less discord must inevitably be the result. To a person not familiar with the organ it seems incredible that a stop whose pipes are tuned a fifth or double fifth above the proper pitch should be admissible, inasmuch as such a stop must necessarily deliver in the key of the *dominant* that which the organist plays in the *tonic* or proper key.

The natural conclusion from this would be that an organ provided with mutation and compound stops must be the most discordant of all instruments; and yet it is a known fact that these very stops contribute largely to the richness, majesty, and roundness of pure organ-tones. Experience proves that in their absence the diapasons, with mere duplicates in unison, octaves, and double octaves (as the principal, fifteenth, twenty-second, etc.), yield but a thin, meager, and disagreeably harsh quality of tone—a tone unsatisfactory to the ear for want of an infusion of some other element to give it substance and body. The explanation of the enriching effect of the twelfth, tierce, sesquialtera, and similar stops, though seemingly difficult, is not so in reality, as it is nothing more than the carrying out of the laws of *harmonics*, by applying them to each individual note on the keyboard of the organ. (See HARMONICS.) As a sounding body naturally gives forth not only its own proper tone, but also several accessory sounds (as the 8th, 12th, 15th, 17th, etc.), so the organ-builder seeks to strengthen the diapasons and other foundation stops by adding to them certain other stops or ranks of pipes, which are tuned (not as duplicates, but) in *imitation of the harmonic or secondary sounds* which are already faintly produced by the standard or fundamental stops. Each note of a complete organ therefore carries and exhibits all these harmonic elements in their perfection, and the ordinary ear recognizes *not the several constituents* of the sound, but *the whole blended together* in unity, as if produced by a single pipe. Hence it is that in playing a scale movement on the full organ the consecutive fifths and major thirds of the mutation and compound stops are not offensively apparent; and even in full chords the clashing of contradictory harmonics with their primaries is overborne and neutralized by the greater power of the stops sounding the root-tones, with octaves and double octaves superadded, and coming in *the same region with* the harmonics. Bad effects can ensue only when harmonic stops are drawn *without* those stops which are their foundation or correctives, as when we use the sesquialtera or cornet *without* the diapasons, principal, and fifteenth, at the least, as the basis from which they spring and the source of their meaning. See Grove's *Dictionary of Music*, etc. Revised by DUDLEY BUCK.

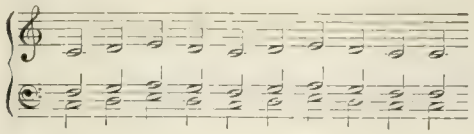
Harmonists: the followers of George Rapp (1770–1847), a German, of Würtemberg, who, believing that he was divinely called to restore Christianity to its primitive purity, organized a community in which goods were held in common. Disturbed by the authorities, they removed in 1803 to the U. S.; settled in 1805 at Harmony, Butler co., Pa., and removed in 1815 to New Harmony, Ind., which in 1824 they sold to Robert Owen. They then removed to Economy, Pa., 17 miles N. W. of Pittsburg. They own 3,500 acres of land, and have important manufactures. They do not marry. They interpret the Scriptures literally, believe that the millennium is near at hand, and that all mankind will ultimately be saved. They observe Christmas, Good Friday, Easter, and Pentecost. They are decreasing in numbers, having, according to the census of 1890, about 250 members.

Harmony [M. Eng. *harmonie*, from O. Fr. *harmonie* < Lat. *harmonia* = Gr. ἁρμονία, harmony; liter., a chording or joining together; deriv. of ἁρμόζειν, to join or fit together]: in music the union of two or more such melodies, or the combination of several tones in one *simultaneous* utterance in accordance with certain regulating principles, in distinction from melody which consists of a varied *succession* of single or simple tones. Harmony, as now understood and practiced, is a science of comparatively modern times, having risen from its rudest form to its present perfection within the last three or four centuries. There is no evidence that the ancients had any acquaintance with the laws indicating the relations of combined musical sounds, or any conception of the rich and beautiful effects resulting from those combinations under scientific and æsthetic treatment. The speculations of Greek writers concerning the origin, relations, and proportions of intervals, and their theory of the diatonic, chromatic, and enharmonic genera, contributed nothing of consequence to the development of harmony, and possibly as little to the improvement of melody. It is capable of proof that this science made little advance till the invention of the more perfect classes of instruments, such as the keyed organ and the precursors of the harpsichord and piano. When these instruments came into existence it became possible, for the first time, to reduce to experiment and proof all kinds of musical combinations, and to deduce from actual test some fundamental rules on which chords might be classified, and their progressions determined in an orderly and scientific manner.

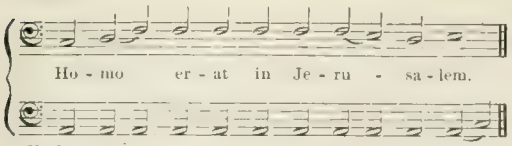
Even as late as the eleventh century the music of the Church—chiefly Gregorian plain-song—was but a simple melody, more or less inflected, without any accompanying harmony, except such as might be supplied by a rude and arbitrary use of occasional octaves, fifths, and fourths. It is questionable, indeed, whether even the term "melody," as now understood, can with justice be applied to those successions of notes which seem so bald and unmeaning, but which, nevertheless, constituted what our forefathers regarded as "music," and extolled as consonant with their own ideas of perfection. Of the music of that age Dr. Burney gives some curious relics. "Guido," he remarks, "speaks of *diaphonia*, which means *discant*, or, as he calls it, '*organum*.' This consisted in singing a part *under* the plain-song or chant. Some used only *fourths* for this purpose, but it was allowable to double either the plain-song or the 'organum' by octaves *ad libitum*." The following examples are quoted from Guido by Dr. Burney. For greater convenience they are given in modern notation; and the reader will be able to judge of the condition of musical sci-

ence and sensibility at a time when so hideous a succession of fourths, fifths, and octaves could be tolerated in divine service or anywhere else:

Ex. 1.



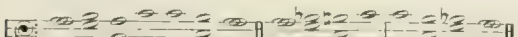
Ex. 2.



In all the examples extant of that age the same wretched poverty of thought appears. The writers of music were groping in the dark, without rule, and without any apparent inward feeling to indicate the direction which such rule should take. Some ideas they had about simple intervals, but none concerning their use and relations. Fourths, fifths, and sixths succeed each other without order or reason; and it is remarkable that the fourth seems to have been a rather favorite interval. What further advances the musicians of that period made it is not easy to determine, but it is inconceivable that either Guido or his fellow laborers ever produced anything harmonious.

The first attempts at harmony seem to have been in the line of *extemporizing* a secondary part to any well-known melody, by running under it a parallel train of notes in fourths, fifths, or octaves (as is often done by ignorant people at the present day). For the sake of variety, as in the last example, the accompanying part would sometimes form a kind of ground-bass, *not* following the movement of the melody, and ending with a clumsily formed cadence. This two-part of "double singing," as it was called, was common in the twelfth century, and even earlier. The constant hearing of the ecclesiastical chant rendered that chant familiar to the people, and its scales and inflections had a general influence over the style even of the secular songs. By a kind of natural instinct, some diversity would be sought by those who were weary of a dry uniformity of song either in the church or the field, and with very little effort one singer might invent a free and artless understrain to enliven or improve upon the song of his companion and neighbor. This part-singing was also much favored and promoted in and after the twelfth century by the facility which the organs then coming into use afforded for sounding two or more notes at once. The ear was thus in some degree trained to perceive the effect of perfect and imperfect intervals, and very gradually some rules were arrived at to regulate their succession. Some evidences of such improvement are discernible at this era, as will appear from the following harmonies of Marchetto da Padova:

Ex. 3.

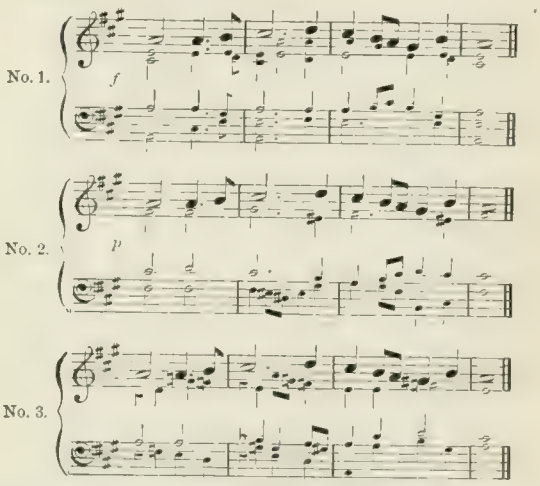


The organs of that age, however, though important as *suggestive* of harmony, were of small dimensions and of clumsy construction, containing but an octave or two of pipes, sufficiently harsh and noisy to be heard at a great distance, and played by keys requiring the force of the hand rather than the mere pressure of the fingers. But by the end of the fourteenth century these instruments had reached a far higher degree of perfection, having regular keyboards, numerous stops, and a compass of several octaves with the semitones. In consequence of this a new stimulus was given to the study of harmonious combinations and progressions, but still the advance in this direction continued to be slow and uncertain. Even as late as the middle of the fourteenth century, according to the statement of Dr. Burney, "the rules in use were of the rudest kind, and the ordinary ear in church service was not offended, probably, by any number of fifths and octaves in succession." From this to the time when Palestrina flourished (b. 1529; d. 1594) was a period when counterpoint was first successfully developed, its true principles discovered, carefully applied, and cast into a scientific form. The works of that renowned writer, though deficient in melody and the elegance and refined sentiment of modern music, abound with proofs of a profound acquaintance with counterpoint, even in its most subtle and intricate departments, and of wonderful skill in the most elaborate kinds of composition. Of the steps by which this great advance was reached, through a period of two centuries before Palestrina—an advance comparatively sudden, after more than 4,000 years of almost total darkness on the subject of musical science—there is no full and accurate account. But it is certain that within that time the leading principles of harmony had been discovered and applied with singular unanimity; compositions showing an exact knowledge of counterpoint had been produced; and already the nature and structure of *fugue* and *canon* had become familiar to musical writers.

The masters of the sixteenth and seventeenth centuries appear to little advantage as originators or students of *melody*, but their devotion to *harmony*, even in the most abstruse forms of canon, fugue, imitation, musical enigmas, etc., was all-absorbing and almost marvelous in its results. Their successors, however, with less pedantry and more regard for the beautiful and imaginative, advanced the art by adding to their studies the cultivation of this further department of melody.

Harmony has a certain controlling power over melody—i. e. the sentiment or mental effect of a given melody is largely dependent on the harmony affixed to it. A change of the harmony, either within the same key or by digression into another key or mode, may alter and even reverse the whole drift and spirit of a melody. Thus, without the variation of a single note the character of a given melody may be alternately joyful, sad, or otherwise, according to the relations impressed upon it by diversified and skillful harmony. The following example will be sufficient to show how an air may be affected in sentiment by changes in the quality of its accompaniment:

Ex. 4.



Very plain and even unmeaning melodies may also be impressed with a new beauty by the sole effect of a pleasing accompaniment. In the following example this is illustrated, the refined harmony at *b* giving the melody a far higher interest than it could have under the common treatment, as shown at *a*:

Ex. 5.—*a*

b Mendelssohn.

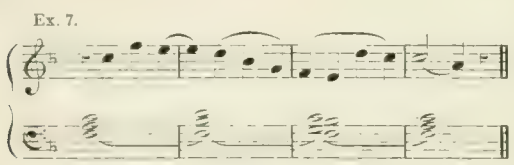
Hence it is that, as a general rule, the mind of a composer naturally associates some definite harmony with his conception of a new melody. Whether conscious of it or not, certain harmonious forms and progressions, key-relations, modulations, and even particularities of counterpoint are in the background of his thoughts, and quietly determine the spirit and significance of the melodic strain. And for this reason it becomes impossible to have a just conception of the sentiment intended to be expressed by a given melody till the very harmony with which it was invested by the composer is seen or heard.

There is one aspect also in which *melody* may be viewed as holding a similar directive influence over *harmony*, or at least the power of conferring beauty on masses of chords which would otherwise be void of color and expression. A series of chords, quite regular in progression, may easily be written in which the ear detects nothing attractive or descriptive of any peculiar line of thought and feeling—such, for instance, as the following:

Ex. 6

But let a distinctly marked and flowing melody be added, and these naked chords will acquire a meaning and connection which the ear recognizes at once, though due entirely to the suggestions of the melody. See this illustrated in Ex. 7:

Ex. 7.



This office of melody, as an element capable of throwing an air of ideal beauty over a train of dull and apparently aimless harmonies, is often lost sight of by young composers. The charm of chromatic and involved masses of chords obscures their sense of design, outline, rhythm, and breadth and symmetry of structure. And for this reason their early compositions are often overlaid and deformed with crude attempts at what they regard as scientific harmony, a superfluity of dissonant combinations and extravagant transitions into remote keys. Harmony may thus be abused till it becomes unmeaning and tiresome, like color thrown at random on canvas, with an absence of all distinctly marked objects and graceful forms.

The systematic treatment of harmony as a science has not been attempted in the present article, as the sole design has been to give such a general and historical view of the subject as might prepare the way for a full discussion of the subject under the head of Music (*q. v.*).

Revised by Dudley Buck.

Harmony, David B.: rear-admiral; b. at Easton, Pa., Sept. 3, 1832; entered the U. S. navy as a midshipman Apr. 7, 1847; served on board the Iroquois at the passage of Forts Jackson and St. Philip and capture of New Orleans, and in many severe engagements with the batteries at Vicksburg and Grand Gulf; was executive officer of the ironclad Nahant in the first attack upon Fort Sumter Apr. 7, 1863, and in the engagement with the ram Atlanta June 17, 1863; in command of the Asiatic station June, 1891; retired June, 1893.

Harmony of the Gospels: an arrangement of the four separate narratives of the life of our Lord which presents at one view all their facts and teachings. The earliest efforts to accomplish this appear to have been of the nature of a *diatessaron*, or a continuous narrative embracing all that is contained in the four Gospels, rather than of a "harmony," strictly so called. Tatian (about A. D. 170) prepared such a work, and after being long lost the commentary by Ephraem Syrus upon it was published by Georgius Moesinger in Venice, 1876, and in 1888, in Rome, Augustinus Ciasca published the Arabic translation of this harmony. In the earlier part of the third century Ammonius of Alexandria prepared a harmony, traces of which remain in the so-called *Ammonian Sections*, combined with the *Canons* of Eusebius. These are of great importance, having been placed in the margin of nearly all manuscripts of the Gospels since the middle of the fourth century. They are simply tables of reference by which may be found any passage in one Gospel either parallel or similar to a passage in one or more of the others. Each Gospel is divided into sections; the sections of St. Matthew being arranged in a column in the order of their numbers, the numbers of the sections corresponding to this in the other Gospels are placed opposite. Thus the first table, or *canon*, is formed of parallel passages in the four Gospels. There are ten such canons, containing the parallel passages in three Gospels, in two, and those found only in one. In the margins of manuscripts the number of the section is written above, and that of the canon by which the similar passages may be found, below in the form of a fraction. Since Eusebius every age has abounded in harmonies constructed on a variety of principles.

On the most cursory examination of the Gospels it is plain that the same events are not related in them all in the same order. Some of them, at least, must have arranged the details of the narrative on some other principle than that of chronological sequence. It is generally agreed that St. John, who gives minute notes of time, has carefully observed the chronological order of the history; but comparatively few facts are common to this Gospel and the others. Assuming in regard to these points the order of St. John, how shall the remaining events be grouped around them? St. Luke, in his introduction (i. 3), expresses his purpose to write "in order." Does this mean in chronological order? Some harmonists, and among them Tischendorf, have so understood it; but on examining the index of his *Synopsis Evangelica* it is plain that he has found himself obliged to disturb the order of St. Luke quite as much as is ordinarily done. It seems more probable that St. Luke's "in order" is equivalent to "systematically." He is remarkable for relating each event and discourse in careful connection with the circumstances under which it occurred; but it would be impossible to observe the order of St. Luke without violating that of all the other Evangelists and, at the same time, what would seem to be the most probable succession of events. The same things may be said with even more force of the first Gospel; indeed, it is soon evident to the student that exact chronological order was no part of the purpose of St. Matthew. St. Mark remains; and on comparing the points common to him and to St. John it will be found that they exactly agree. On further arranging events in what seemed on the whole the most probable sequence, several harmonists (notably Robinson; see his *Introduction*) have found that they had hit upon the order of St. Mark. There has come, therefore, to be a general disposition to adopt the order of St. John as more fully carried out by St. Mark. On this plan the order of two of the Gospels is preserved intact, which can not be accomplished in any other way.

Another debated question, which somewhat affects the structure of a harmony, is the length of our Lord's public ministry. Three theories have been proposed, severally known as the *Bi-paschal*, the *Tri-paschal*, and the *Quadri-paschal* schemes, according as they suppose that ministry to have included two, three, or four Passovers, and thus to have continued in addition to the first half year, one, two, or three years. Until the time of Eusebius opinions on this point were very vague and various, and do not seem to have really been definitely formed at all. He investigated the subject carefully, and decided in favor of the quadri-paschal scheme; and this view was adopted on his authority for many ages without much further investigation. In modern times much research has been devoted to the point with varying results. The bi-paschal scheme has been generally abandoned, but in Germany the tri-paschal has found great favor, having been adopted by such men as Wieseler and Tischendorf. In Great Britain also it has some eminent advocates, as well as in the U. S.; but the balance of opinion in both countries is decidedly in favor of the quadri-paschal. A weighty argument for this has been found in the reading of the *Codex Sinaiticus* in John v. 1, which renders it in the highest degree probable that the feast there mentioned must have been a Passover, and there are three other Passovers distinctly mentioned. Independently of that reading, however, and before it was known, the argument of Robinson to show that it was really the Passover has never been satisfactorily met.

When all doubtful questions have been determined, there will still remain a certain number of passages whose chronological position can not be fixed with certainty, because they contain no notes of time. These, however, are comparatively few and of secondary importance. On comparing the harmonies published in Germany, Great Britain, and the U. S. within the last fifty years, it will be found there is a gen-

eral and striking agreement in the order of all the main points of the Gospel history, even among those who differ in regard to the whole length of our Lord's ministry. There is more difference of opinion as to whether miracles of a similar character, yet narrated with certain circumstantial differences in the different Gospels, should be considered as the same or as actually different. The tendency of the earlier harmonists was to consider such events different when the circumstances were at all differently narrated, as, e. g., when the healing was of one demoniac or two, when the blind was cured as Jesus was entering into or departing from Jericho; later harmonists make more allowance for individual differences of narration, and in such cases identify the events, whether the data can be found (as they generally can) to explain these differences or not.

There is still greater difference in regard to the longer discourses of our Lord as given in the first Evangelist, such as the Sermon on the Mount and the charge to the Twelve (ch. x.), parts of which are given by the other synoptic Evangelists at other times and under different circumstances. Were these repetitions, or are the discourses as given in St. Matthew groupings together of several discourses uttered at different times? In most cases the other Evangelists give parts of the discourses in the same connection with St. Matthew, and other parts in connection with events or circumstances, especially the Perean journey of our Lord, of which St. Matthew makes no mention.

The uses of a harmony are very obvious. It enables the critical scholar to compare readily the language of the several writers in the narration of the same things; it gives to the exegetical student the fullest material for the interpretation of our Lord's acts and words; and to every Christian it affords a ready and convenient method of seeing at once all that is recorded of each scene and event and discourse.

The harmony in common use is by Edward Robinson (Boston and New York, 1845–46, both in Greek and in English; rev. ed. by M. B. Riddle, 1885 and 1886 respectively); on a somewhat new plan is that by J. A. Broadus (New York, 1893). The *Diatessarons* or attempts at interweaving the four Gospels into a continuous narrative are numerous. The most successful are by F. Gardiner (Andover, 1871); G. W. Moon (London, 1877; rep. New York); J. P. Cadman (Chicago, 1885); A. T. Pierson (New York, 1890). Tatian's *Diatessaron* has been edited in English by S. Hemphill (Dublin, 1888), and by J. H. Hill (Edinburgh, 1894).

Revised by S. M. Jackson.

Harmony of the Spheres: a kind of music which the ancients imagined was produced by the motions of the heavenly bodies. This sound, said they, we do not hear, because we have always heard it, and can not contrast it with absolute silence, of which we know nothing. Others thought the sound too powerful for our hearing, or that our senses are too gross to perceive it.

Harms, Klaus: Lutheran pastor; b. at Fahrstedt, Holstein, May 25, 1778; worked in the mill of his father till his nineteenth year. He studied theology at the University of Kiel 1799–1802; was tutor in the family of a pastor at Propsteierhagen, near Kiel, 1802–06; and was appointed assistant pastor at Lunden in 1806 and pastor in Kiel 1816. On the religious life, not only of Germany, but also of the Scandinavian countries, he exercised a powerful and most beneficial influence. Like Luther, he knew the wants of the people, and spoke their language. His preaching defied all homiletical rules, but reached the heart. In 1817, on the occasion of the third centennial of the Reformation, he published *Ninety-five Theses*, in which he attacked rationalism as sharply as Luther had attacked popery. They startled Germany like a thunderbolt, and provoked controversy on all sides between the orthodox and rationalistic. Most of them are translated in *The Lutheran Church Review* for July, 1889. His other works consist of several collections of sermons, a *Pastoraltheologie* (1830; 3d ed. 1878), an autobiography, etc. An excellent edition of his autobiography, with the theses was published as volume seven of the *Bibliothek Theologischer Klassiker* (Gotha, 1888). There are also biographies by C. Lüdemann (Kiel, 1878) and C. C. G. Behrmann (Kiel, 1878); cf. *Das Gedächtnissfeier für Claus Harms* (Kiel, 1878); H. F. Neelsen, *Claus Harms als Seelsorger und Freund* (Kiel, 1878). D. at Kiel, Feb. 1, 1855.

Revised by H. E. Jacobs.

Harms, Ludwig (*Georg Ludwig Dettev Theodor*): preacher; b. at Walsrode, on Lüneburg Heath, Hanover, May 5, 1808; the son of a Lutheran minister; educated at Göttingen 1827–30, and in 1844 became assistant pastor to his father at Hermannsburg, and succeeded him in 1849. His powerful evangelical preaching led to a great awakening in the parish, where rationalism had previously prevailed. The almost dead and poverty-stricken parish became from 1849 a missionary center, with a missionary college, a missionary journal, a printing establishment, and missions in Africa, New Zealand, and Australia, sustained by contributions for which he made no direct appeals. At his death at Hermannsburg, Nov. 14, 1865, the direction of the work passed into the hands of his brother Theodore (b. 1819; d. 1885), who was succeeded by his son, Rev. Egmont Harms. An excellent account of Harms's work is found in Stevenson's *Praying and Working* (London, 1862; rep. New York, 1892). A number of volumes of his sermons have been published. See *Life* by his brother Theodore (Hermannsburg, 1867; 4th ed. 1874), and a volume of his correspondence (1879).

Revised by H. E. Jacobs.

Harnack, Adolf: theologian; son of a distinguished Lutheran theologian and professor, Theodosius Harnack (d. 1889); b. at Dorpat, Russia, May 7, 1851; there he studied 1869–72; went to Leipzig in 1874 as tutor; became in 1876 professor extraordinary; ordinary professor at Giessen 1879; at Marburg 1886; at Berlin 1889. In critical knowledge of the sources of early Church history he has no superior. With Gebhardt and Zahn he put forth, 1876–78, an edition of the Apostolic Fathers, *Patrum apostolicorum opera* (Leipzig, 3 parts), and in 1882 began, with Gebhardt, to issue *Texte und Untersuchungen zur Geschichte der altchristlichen Literatur*, of which the ninth volume appeared in 1893, and to this series he contributed many important articles. He has separately published *Zur Quellenkritik der Geschichte des Gnostizismus* (1873); *De Apellis gnosi monarchica* (1874); *Die Zeit des Ignatius und die Chronologie der antiochenischen Bischöfe bis Tyrannus* (1878); *Das Mönchthum, seine Ideale und seine Geschichte* (Giessen, 1881; 3d ed. 1886); *Martin Luther in seiner Bedeutung für die Geschichte der Wissenschaft und der Bildung* (1883; 2d ed. 1886); *Lehrbuch der Dogmengeschichte* (Freiburg im Breisgau, 1886–90, 3 vols.; 2d ed. 1888–90); *Die Apostellehre und die jüdischen beiden Wege* (Leipzig, 1886); *Grundriss der Dogmengeschichte* (Freiburg im Breisgau, 1889; 2d ed. 1893; Eng. trans. by E. K. Mitchell; *Outlines of the History of Dogma*, New York, 1893); *Augustins Confessionen, Vortrag* (Giessen, 1888); *Rede auf August Neander gehalten zur Feier seines hundertjährigen Geburtstage am 17. Jan., 1889, in der Aula der Berliner Universität* (Berlin, 1889); *Das neue Testament um das Jahr 200. Thdr. Zahns Geschichte des neutestamentlichen Kanons [1 Bd., 1 Hälfte] geprüft* (Freiburg im Breisgau, 1889); *Das apostolische Glaubensbekenntniss, ein geschichtlicher Bericht neben ein Nachwort* (Berlin, 1892; 26th ed. 1893); *Antwort auf die Streitschrift D. Cremers zum Kampf um das Apostolicum* (Leipzig, 1892); *Geschichte der altchristlichen Literatur bis Eusebius*, 1. *Theil* (1893). Samuel Macauley Jackson.

Harnett, Cornelius: statesman; b. probably in North Carolina, Apr. 30, 1723; became owner of a large estate near Wilmington, and was early interested in the cause of liberty. He was (1770–71) an active member of the provincial assembly; in 1775 president of the provincial council, and afterward acting governor; in 1776 a member of the provincial Congress at Halifax, in which he used his active influence in favor of national independence, and was one of a committee to draft a State constitution and bill of rights, in which he procured the insertion of the clause declaring for religious freedom. In 1777–80 he was in Congress, and signed the Articles of Confederation. Harnett was taken prisoner when the British took possession of the Cape Fear region, and died in captivity at Wilmington, N. C., Apr. 20, 1781.

Har'ney, William Selby: soldier; b. in Louisiana in 1798; appointed second lieutenant of infantry U. S. army Feb., 1818; in 1833 appointed paymaster with rank of major, and in 1836 was transferred to the Second Dragoons as lieutenant-colonel, taking an active part in the Florida war against the Indians; brevet colonel Dec., 1840, for gallant conduct; appointed colonel 1846; served with distinction in the war with Mexico (brevet brigadier-general), and in 1858 was promoted to be brigadier-general. While in command on the Pacific coast he took possession of the then neutral territory of San Juan island, Puget's Sound, which was, however, soon evacuated by the U. S. In the early

days of the civil war he commanded in Missouri, but for an unauthorized truce with Gen. Price was soon relieved, and in 1863 retired from active service. In 1865 he was brevetted major-general. D. May 9, 1889.

Ha'ro, or **San Juan Archipelago**: a group of islands belonging to the U. S.; E. of the southern end of Vancouver island, and between Haro and Rosario Straits, N. of Puget Sound.

Har'old I. (surnamed HAREFOOT, from his swiftness): King of England; the reputed son of Canute by Ælgifa of Northampton, who was either wife or concubine of the king; but whether Harold was really their offspring is doubtful. In 1035 Harold was chosen as Canute's successor by the Danish party, and began to reign N. of the Thames; but Hardicanute (*Harthacanut*) the late king's recognized heir, was preferred by the English party. Before this time it is believed that Harold had ruled Denmark for Canute. Hardicanute was chosen King of Wessex, and Emma, his mother, was his regent, he being then absent in Denmark. Harold soon rid the kingdom of the Anglo-Saxon princes (Æthelings), and in 1037 he was chosen King of all England. He banished Queen Emma, and died at Oxford, Mar. 17, 1040. The history of his reign is obscure.

Harold II.: King of England; the last sovereign of the Anglo-Saxon race; second son of Godwin, the great earl of the West Saxons, by Gytha, a Danish lady, and consequently not of the royal line of England; assisted his father in his quarrels with Edward the Confessor, with whom he became reconciled 1052; with Tostig, his brother, conquered Wales 1063; was shipwrecked at the mouth of the Somme, Normandy, made prisoner, and compelled to swear to give support to Duke William's claim to the English crown 1065; caused himself to be proclaimed king, and was crowned Jan. 10, 1066; defeated and slew Harold Hardrada, who supported the claims of Tostig, Harold's brother, at the battle of Stamford Bridge, Sept. 25, 1066; fought William the Conqueror at the bloody battle of Hastings, and was killed there Oct. 14, 1066.

Har'old (or **Har'ald**) **I. Haar'fager** [Haarfager is O. Norse; fair-haired; *hār*: Germ. *haar*: Eng. *hair* + *fagr*: O. H. G. *fagar*: Eng. *fair*]: first King of Norway in the historic period. According to the story he loved Gyda, a jarl's daughter, who refused to marry him until he had conquered all Norway; and accordingly in 865 he took a vow never to comb or cut his hair till all the jarls submitted to his sway. His great sea-fight at Hafursfiord (885) released him from his vow. He died at Trondjem in 933, and was succeeded by Eric I.

Har'old (or **Har'ald**) **III. Hardra'da** [*Hardrada* is from O. Norse *harð*: O. H. G. *hart*: Eng. *hard* + *rāð*: O. H. G. *rāt*: O. Eng. *rēd*, counsel]: King of Norway; b. about 1016; became a kind of knight-errant in the East; served in the Byzantine armies 1038–40, and was distinguished by his exploits in Sicily and at Jerusalem; became sole King of Norway on the death of Magnus the Good, his nephew, 1047; invaded England 1066 to avenge the supposed wrongs of Tostig, brother to Harold II. of England; gained the battle of Fulford (Sept. 20), but was defeated and killed in the battle of Stamford Bridge, Sept. 25, 1066.

Haroun' al Rasch'id [Arab.; Aaron the just]: Caliph of Bagdad, the fifth of the Abbasides; a son of the Caliph Mohammed Mahdi by a slave-woman; b. at Rei about 765 A. D. (148 A. H.); invaded the Greek empire 781; encamped opposite Constantinople, and compelled the Empress Irene to pay yearly 70,000 dinars in gold; succeeded Mousa al Hadi, his brother, in 786; raised the caliphate to its greatest pitch of splendor, chiefly by the aid of Zahya and Jaafer the Barmecides, whom he treacherously murdered (803); sent an embassy with presents to Charlemagne (probably in 801); was frequently and with almost uniform success engaged in fierce wars with the Byzantines; made Bagdad a center of learning, commerce, and industry. D. in Khorassan, Apr. 2, 809. See Palmer, *The Caliph Haroun Alraschid* (1881).

Revised by J. R. JEWETT.

Harp [M. Eng. *harpe* < O. Eng. *hearpe*: O. H. Germ. *harpha* (> Mod. Germ. *harfe*): Goth. *harpō*, whence Low Lat. *harpa* > Fr. *harpe*]: a musical instrument highly esteemed by the ancients, and used by Egyptians, Hebrews, Greeks, and in Celtic nations, particularly in Wales and Ireland, as well as among the Teutonic nations of antiquity, while the Romans preferred the lyre. The word is of Teutonic origin; Icelandic *harpa*. It occurs for the first time in the works of Fortunatus, a Latin writer of the seventh century, who speaks of the harp as a barbarous instrument. It was known to the Egyptians in the earliest times, though there is nothing which indicates that they were its inventors. The Egyptian harp had no front pillars. It was bow-formed and strung with catgut. The pedestal was often profusely decorated. The Assyrian harp resembled the Egyptian; it was bow-formed and had no front pillar. But it had the sound-body uppermost, and the lower portion was simply a bar to which the strings were tied and by means of which the tuning was effected. Of the shape of the Hebrew harp nothing is definitely known; indeed, it is probable that the Hebrew word which is generally translated "harp" really means "psaltery," a horizontal stringed instrument. The oldest specimen of the true Irish harp, with its curved front pillar and graceful sweep of neck, is that belonging to Trinity College, Dublin; it dates from the fourteenth century. A cast of this harp is in the South Kensington Museum, England, and has been accurately described in the catalogue by Engel. Another of great age, belonging to a family in Perthshire, Scotland, and called the *Clarsach Lumanach*, or "Lamont's Clarschoe," had about thirty strings tuned singly, with the scale sometimes doubled like lutes. In modern times the power and the sweetness of the harp have been much improved, especially by Sébastien Érard. Generally the harp is of a somewhat triangular outline, and has strings of wire or catgut. See Hipkins, *Musical Instruments* (1889).

Har'palus: treasurer of Alexander the Great. In 324 B. C. he took flight with a large amount of embezzled treasure, which the Athenians, to whom he fled for refuge, forced him to deposit in the Parthenon in trust for Alexander. The discrepancy between the sum as stated by Harpalus and the sum actually deposited led to investigation, and the name of Demosthenes headed the list of the nine who were charged with having received bribes. Harpalus meantime had escaped from the prison in which he had been confined and went with some troops to Crete, where he was murdered.

B. L. GILDERSLEEVE.

Harpe, JEAN FRANÇOIS, de la: See LA HARPE.

Harper: a town on Cape Palmas, Liberia (see map of Africa, ref. 5–B). Pop. with suburbs (1891) 8,550.

Harper, JAMES: publisher; b. in Newtown, Long Island, N. Y., Apr. 13, 1795. He was the son of a farmer, and removed with his brother JOHN (b. Jan. 22, 1797; d. Apr. 22, 1875) to New York city, where the brothers learned the printer's trade, founded the firm of J. & J. Harper, printed for a time for booksellers, and, establishing themselves as printers and publishers, brought out their first publication, an edition of *Locke on the Human Understanding*, in 1818. Their brothers, JOSEPH WESLEY (b. Dec. 25, 1801; d. Feb. 14, 1870) and FLETCHER (b. Jan. 31, 1806; d. May 29, 1872), learned the business with them, and were admitted to the firm, the name of which was changed to Harper & Brothers about 1833. The extensive plant of the firm on Cliff and Pearl Streets was destroyed by fire in 1853, and the present establishment, covering nearly half an acre, occupies the site of the former one. James Harper died in New York city, Mar. 27, 1869.

Harper, WILLIAM RAINEY, Ph. D., D. D.: educator and author; b. at New Concord, O., July 26, 1856; A. B., Muskingum College, 1870; Ph. D., Yale University, 1875; principal of Masonic College, Macon, Tenn., 1875–76; tutor in preparatory department, Denison University, 1876–79; principal of same 1879–80; Professor of Hebrew and the Cognate Languages, Baptist Union Theological Seminary, Morgan Park, Ill., 1879–86; principal of the Chautauqua College of Liberal Arts 1885–91; elected principal of the Chautauqua System 1891; Professor of the Semitic Languages, Yale University, 1886–91; Woolsey Professor of Biblical Literature, Yale University, 1889–91; D. D., Colby University, 1891; editor of the *Old and New Testament Student* and of *Hebraica*; first president of the University of Chicago and head Professor of the Semitic Languages and Literatures in that institution. He has been the chief exponent of the inductive system of language study, and has edited numerous text-books on that principle. His name appears as joint author of *Harper's Elements of Hebrew*; *Hebrew Method and Manual*; *Elements of Hebrew Syntax*; *Hebrew Vocabularies*; *Harper and Weidner's New Testament Greek Method*; *Inductive Latin Method*; *Inductive Greek Method*; *Inductive Latin Primer*; *Cæsar's Gallic Wars*; *Vergil's Æneid*.

C. H. THURBER.

Harper's Ferry: railway junction in Jefferson co., W. Va. (for location of county, see map of West Virginia, ref. 6–N); picturesquely situated at the confluence of the Potomac and Shenandoah rivers, and in the basin formed by the steep heights known as Maryland, Loudoun, and Bolivar Heights, which tower high above the village. The scenery at this point, where the combined streams break through the Blue Ridge, is grand and beautiful. An unusual historic interest also attaches to this locality. In Oct., 1859, the place was entered by John Brown and his followers, and the U. S. arsenal and national armory seized and held for upward of twenty-four hours. During the civil strife it was among the first to feel the ravages of war. In Apr., 1861, the small party of regulars guarding the public buildings evacuated the place before an approaching body of insurgents, and the town was occupied and held by the Confederates, who in turn evacuated it the following June after destroying the arsenal and armory, and the bridge across the Potomac. Again in Sept., 1862, during Lee's invasion of Maryland, the place was invested by the Confederates, and after a futile defense, the heights not having been fortified, was surrendered by Col. Miles, who was himself shot dead while bearing the white flag betokening surrender; 12,000 prisoners, 47 guns, and upward of 13,000 small-arms, besides a large quantity of stores, thus fell into the hands of the Confederates. The place was reoccupied by Gen. McClellan after the battle of Antietam. When, in the summer of 1864, Early invaded Maryland the garrison of Harper's Ferry evacuated the town and occupied Maryland Heights, holding them against the Confederate advance and covering Harper's Ferry with their guns so thoroughly that although Early entered the town with his skirmishers on July 5, capturing and destroying a large amount of property, he was not able to occupy it in force or use it for a depôt of supplies, and therefore withdrew and crossed the river at Shepardstown. The Chesapeake and Ohio Canal passes by on the Maryland shore. Harper's Ferry is the seat of the normal school called Storer College. Pop. (1890) 958. Revised by JAMES MERCUR.

Harpies [plur. of *harpy* < M. Eng. *harpie*, from O. Fr. *harpye* < Lat. *harpyia* = Gr. ἅρπυια, plur. ἅρπυιαι, harpies, liter., snatchers, deriv. of ἁρπάζειν, snatch]: in Greek mythology, the daughters of Thaumas (the personification of the wonders of the sea), son of Pontus (the Great Deep) and Electra, daughter of Ocean. Originally there were but two: Aello (Storm or Tornado) and Ocypete (Hurricane or Cyclone). In Homer their number is not limited to two. From being the demons of the storm they became by a natural transition the demons of Death, that comes, as it were, on the wings of the storm and snatches men away in sudden and unaccountable fashion. In this character they appear on the Harpy Monument in Lycia. Because of their swiftness they have something of the nature of the horse, and one of the Harpies, Podarge (Lightfoot, or Quickfoot), became by Zephyr, the quick west wind, the mother of Zanthus and Balius, the immortal horses of Achilles, and of Phlogeus and Harpagus, the horses of Castor and Pollux. In Hesiod and in archaic art they appear in human form with wings, indicative of swiftness. Later on they have the body, legs, and claws of a bird, but the head, arms, hands, and breasts of a woman. In vase-paintings belonging to the Argonautic cycle Zetes and Calais, sons of the North Wind, free Phineus from the tortures inflicted upon him by the Harpies, the demons of the Storm. In the nature of the case one or the other must die, and the Harpies are either killed or made to bind themselves to vex Phineus no more. According to Vergil, they dwell in the Strophades islands in the Ionian Sea, S. of Zante (now Strofadia and Strivali). Vergil makes them guardians of the door of the house of Hades. See Roscher, *Ausführliches Lexicon*, etc., under *Harpyia*; Mitchell, *History of Ancient Sculpture* (New York, 1888); Collignon, *Histoire de la Sculpture Grecque* (Paris, 1892); and Overbeck, *Geschichte der Griechischen Plastik* (Leipzig, 1893). J. R. S. STERRETT.

Harpignies, har'pēēn'yee', HENRI: landscape-painter; b. at Valenciennes, France, July 28, 1819; pupil of Achard; medals, Salons, 1866, 1868, and 1869; second-class medal, Paris Exposition, 1878; officer Legion of Honor 1883; one of the best painters of the French school; his pictures are finely composed and superbly drawn; his water-colors are excellent. Among his works are *Evenings on the Campagna* (1866); *Oaks of Châtaurenard*, and *Valley of Aumonce* (1875), in the Luxembourg Gallery, Paris; and *Moonrise*, in the Metropolitan Museum, New York. W. A. C.

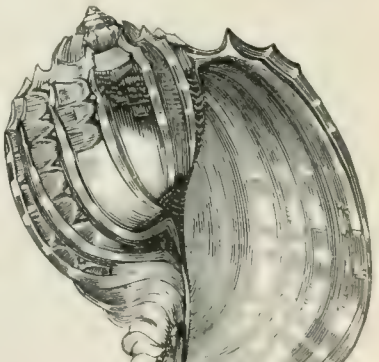
Harpoc'rates [Gr. Ἁρποκράτης; Egyptian, *Har-pe-chruti*, Horus the child]: the Younger Horus, a divinity of the ancient Egyptians, son of Osiris and Isis; worshiped in later times in Greece and Rome as the god of silence, but not so esteemed by the Egyptians. His sculptures show him as a child placing his finger upon his lips—an infantile act which the Greeks incorrectly thought to be expressive of a command to preserve silence. The Romans honored him as the sender of prophetic dreams. He was begotten when Osiris was dying or even after he was dead; he was therefore always weak and puny. Accordingly he is interpreted as the weak winter sun, and he also seems to have symbolized originally the feeble vegetal life of the winter months. He is therefore the counterpart of Priapus.
Revised by J. R. S. STERRETT.

Harpocra'tion (in Gr. Ἁρποκρατίων), with the Roman surname VALERIUS: a Greek rhetorician and lexicographer who flourished at Alexandria, but of whose life no particulars are preserved. Even the period when he flourished is uncertain. An important work for the explanation of legal and political terms is ascribed to him, entitled λεξικὸν τῶν δέκα ῥητόρων, containing in somewhat irregular alphabetical order an explanation of expressions peculiar to Athenian courts of law and of proper names in the ten chief Attic orators. Suidas and the *Etymologicon Magnum* have borrowed much from him. The best editions are that of Bekker (Berlin, 1833) and that of G. Dindorf (Oxford, 1855).
Revised by J. R. S. STERRETT.

Harpoot, or **Kharpoot** (Arm. *Kharpert*): town; in Kurdistan, in the vilayet of Mamuret-ul-Aziz; near the Euphrates (see map of Turkey, ref. 5–H). It occupies a commanding situation on a plateau at the foot of mountains. A large trade is carried on in cotton, cereals, opium, silk, olive oil, wine, and cattle. It is the headquarters of Roman Catholic and Protestant missions to the Armenians, is the seat of Euphrates College, and has many churches and mosques. American mission property valued at over $60,000 was destroyed here by the mob during the Armenian troubles in 1895. The Government officials and the wealthier classes reside in the suburb of Mezereh. Pop. (1889) 35,000. E. A. G.

Harp-seal: popular name of a species of hair-seal (*Phoca* (*Pagophilus*) *grœnlandicus*), so called from the markings on its back. It inhabits the coasts of Greenland, Labrador, and Newfoundland; is also found in the north of Europe and of Asia, and is of great commercial importance. It is the most extensively caught of all the seals sought in the Newfoundland fisheries, many steamers as well as sailing vessels being employed in its pursuit. It yields great quantities of excellent oil, and its skin is also valuable. See SEAL-FISHERIES.

Harp-shell: popular name of a genus (*Harpa*) of gasteropod mollusks, of the whelk family, natives of the Atlantic, Indian, and Pacific Oceans. There are several species, of which *H. ventricosa* is best known. It is caught as food at the Mauritius, and the shells are highly valued.


The harp-shell.

Harp'sichord [with inserted *s*, from O. Fr. *harpe-chorde*; *harpe*, harp + *chorde*, chord]: the precursor of the modern piano. In form it resembles the grand piano, but is smaller, and is strung with steel and brass wires, two to each note, which are struck by *jacks* furnished with quill plectrums. Stops, swells, and double rows of keys were sometimes employed to affect the power of the wires. When skillfully played upon, the instrument gave forth a feeble but not unpleasing tone, which was susceptible of delicate modulations. The harpsichord was in common use in the twelfth and thirteenth centuries; it was introduced into England in the seventeenth, but was superseded by the piano. Revised by DUDLEY BUCK.

Harpy: See HARPIES.

Harpy-eagle: a large and powerful eagle (*Thrasaëtus harpyia*) of tropical America, of very rare occurrence in the southern parts of the U. S. It is dark gray above, barred with black, wings dark, head and under parts, except a dark band across the breast, white. The head is crested. The harpy is over 3½ feet long, the beak is strong, feet and the talons enormous. Judged by its build, this eagle is the most powerful of the birds of prey. It is said to feed on sloths, young peccaries, and other mammals. F. A. LUCAS.

Harpy-eagle.

Harrier [deriv. of *harry*, ravage; cf. Germ. *verheeren*, lay waste]: a general name for the hawks of the genus *Circus*. Of some fifteen species, only one (*Circus hudsonicus*), the marsh-hawk, is a native of the U. S. Like the goshawks, the harriers fly along the ground in search of prey. In this genus feathers radiate from the eyes, giving the bird a rather owl-like appearance. Many of the species are European.

Harrigan, EDWARD: actor and playwright; b. in New York city, Oct. 26, 1845; was educated in the common schools. In 1859 he removed to San Francisco, where he worked three years in a ship-yard. He first appeared professionally as a comic singer at the Olympic theater, San Francisco, in 1867. After some years of experience as a variety actor, he formed a partnership with Tony Hart in 1871 in New York. Harrigan wrote a number of sketches, in which he himself appeared. On Aug. 7, 1876, Harrigan and Hart opened their first Theater Comique in New York, and it was at this house that they brought out (1879–1881) *The Mulligan Guard* series of plays. Between Aug., 1881, and Jan., 1885, they produced in other theaters in New York a number of plays, including *Squatter Sovereignty*, *Cordelia's Aspirations*, *Investigation*, and *McAllister Legacy*. In May, 1885, Harrigan and Hart dissolved partnership. Harrigan has written and produced on an average two new plays yearly. All his dramas are pictures of the lower life in New York, and while they are strong in character are weak in plot and construction. B. B. VALLENTINE.

Harrington, JAMES: author; b. at Upton, North Hants, England, Jan., 1611; was educated at Trinity College, Oxford; served in the Low Countries, and became groom of the bedchamber to Charles I., to whom he was faithful, though an enthusiastic republican. His chief work, *Oceana* (1656), a description of an ideal republic, was dedicated to Cromwell, although it contained severe reflections upon him. It made a great sensation when it first appeared. While it was in press Cromwell's suspicions were roused, and the book was forbidden to appear. The author, however, succeeded in obtaining permission to publish it through the daughter of Cromwell. Several persons wrote against it, among whom was Baxter. In 1659 the author published a kind of abridgment of it under the title *The Art of Lawgiving*, and at the same time he founded the Rota Club, where he lectured in order to propagate his ideas. The club was closed, however, after a few months. Soon after Charles II.'s restoration Harrington was confined in the Tower as a traitor, and became insane during his imprisonment. His minor works are mostly upon the theory of government, but among them is a translation of four books of the *Æneid* into English verse. A collected edition of his works was published by Toland in 1700; another and more complete by Birch appeared in 1737; and there is still a third, from 1747. His political works were translated into French by Henry (3 vols., 1789). There is also a French translation of *Oceana* (Paris, 1795). D. at Westminster, Sept. 11, 1677. Revised by H. A. BEERS.

Harrington, MARK WALROD, A. M.: astronomer and meteorologist; b. at Sycamore, Ill., Aug. 18, 1848; educated at Evanston, Ill., and University of Michigan, graduating at the latter in 1868; began teaching there the same year; 1870–71 in Alaska in the employ of the U. S. Coast and Geodetic Survey, taking part in a reconnoissance of the Shumagin islands; studied in Leipzig 1876–77; in the latter year was Professor of Astronomy in the Chinese Foreign Office Cadet School in Peking for one year; resigned on account of ill-health and returned to the U. S.; appointed Professor of Astronomy and director of the observatory at the University of Michigan 1879–91; in 1884 founded *The American Meteorological Journal*, of which he was managing editor until 1892; in 1891 he was appointed chief of the U. S. Weather Bureau at Washington on the transfer of the meteorological work from the War Department to the Department of Agriculture; in 1891 was made vice-president of the International Meteorological Conference at Munich; associate editor *Johnson's Universal Cyclopædia*, in charge of the department of geography, meteorology, and climatology; president of Washington State University 1895–

Harrington, Sir JOHN: See HARINGTON.

Har'riott, THOMAS: mathematician and astronomer; b. at Oxford, England, 1560; studied at St. Mary's Hall, Oxford; graduated B. A. 1579; went with his patron, Raleigh, to Virginia 1584–85; published a *Briefe and True Report of the New Found Land of Virginia* (1588; republished in Hakluyt's 3d vol.); became a pensioner of the Earl of Northumberland; made very important algebraical improvements; greatly simplified the theory of equations, and was the first to conceive the possibility of putting all the terms of the equation into the same side. He was also an able observer of the phenomena of physics. D. in London, July 2, 1621. The posthumous *Artis analyticæ Praxis nova ad æquationes resolvendas* (1631) is his most important work.

Harris, DAVID BULLOCK: Confederate general; b. at Frederick's Hall, Louisa co., Va., Sept. 28, 1814; graduated at the U. S. Military Academy at West Point in 1833, and entered the army as a brevet second lieutenant of the First Artillery; served a year with that regiment in the field; and was assigned to duty as Assistant Professor of Engineering at West Point; resigned from the army in 1835. For several years thereafter he was employed as a civil engineer on important works, such as the James river and Kanawha Canal; subsequently was an exporter of tobacco to Europe and of flour to South America. In Apr., 1861, he entered the Confederate army as a captain of engineers of the Virginia forces; first reconnoitered the line of Bull Run, and determined its defensive and strategic value; and when the position of Manassas Junction was occupied in force late in May, 1861, laid out and constructed the works for its defense. In the battle of Bull Run, attached specially to the staff of Gen. Philip St. George Cocke, Capt. Harris was conspicuous for courage and skill at several critical moments in the disposition of the Confederate troops, notably in their encounter with Sherman's brigade. He accompanied Beauregard early in 1862 to the West, and there planned and constructed the works at Island 10 and Fort Pillow on the Mississippi river, and subsequently the river-defenses at Vicksburg. In 1862 Capt. Harris was charged with the direction of the engineer operations of the defense of Charleston, S. C. In 1864 (meanwhile promoted to the grade of colonel of engineers and second in rank in his corps) he went back with Gen. Beauregard to Virginia, and was employed on the defenses of Petersburg. Soon after he returned to Charleston and was commissioned brigadier-general. D. of yellow fever near that city, Oct. 10, 1864.

Harris, GEORGE: jurist: b. in England in 1809; educated at Cambridge; entered the navy as a midshipman, but left it on account of ill-health; studied law, was admitted to the bar in 1843, and went the Midland circuit. After being the acting judge of the Birmingham county court for two years, under the direction of the Lord Chancellor, he was appointed one of the registrars of the court of bankruptcy in 1862, and held that position till 1869. He wrote *The Life of Lord Chancellor Hardwicke* (1847), having for that purpose obtained access to the manuscripts at Windsor Castle; also *Civilization considered as a Science*, *The True Theory of Representation in a State*, *The Theory of the Arts* (translated into French), and *Philosophical Treatise on the Nature and Constitution of Man* (1876). D. Nov. 15, 1890.

Harris, HOWELL: the chief founder of Calvinistic Methodism, the most prevalent form of dissent in Wales; b. at Trevecca, county of Brecon, Wales, in 1713; studied at Oxford, and on returning to Wales took the field as an evangelist and open-air preacher, founding societies and awakening the whole principality by his zealous labors. Though, like Wesley and Whitefield, a Churchman, he received little or no sympathy from the clergy, but the two great evangelists heartily recognized him. In a few years he had formed no less than 300 societies. Wesley and Whitefield frequently traversed the principality in his company, preaching daily.

Wesley describes Harris as a "powerful orator." Harris raised and commanded a regiment, mostly of his own people, during the French war, when the invasion of England was expected. For about three years he preached in his camps and in the market-places whenever his troops moved. D. at Trevecca, July 21, 1773. See his *Autobiography* (1791).

Revised by J. F. Hurst.

Harris, Isham Green: statesman; b. near Tullahoma, Tenn., Feb. 10, 1818; was a shop-boy in Paris, Tenn., in 1832; after mercantile success, was admitted to the bar in 1841; elected to the State Legislature in 1847; member of the U. S. Congress 1849–53. He then removed to Memphis and resumed the practice of law; was a presidential elector for the State at large in 1856; elected Governor of Tennessee in 1857, and re-elected in 1859 and 1861; served as volunteer aide on the staff of the commander of the Confederate Army of the West. After spending eighteen months in Mexico and a year in Great Britain, he returned to his profession at Memphis in 1867; U. S. Senator 1877–89, and was re-elected for the term ending in 1895; unanimously elected president *pro tem.* of the Senate in 1893.

Harris, Joel Chandler: journalist and author; b. at Eatonton, Ga., Dec. 9, 1848. He learned the trade of a printer, and was connected with various newspapers in his native State. Since 1876 he has held an editorial position on the Atlanta *Constitution*. To that paper he contributed his very successful studies in the folk-lore of the American Negro, published collectively in 1880 as *Uncle Remus: his Songs and his Sayings*. This was followed by *Mingo and other Sketches* (1883); *Nights with Uncle Remus* (1884); and other volumes.

H. A. Beers.

Harris, Robert: Canadian artist; b. in Carnarvonshire, Wales, Sept. 18, 1849; educated at Prince of Wales College, Charlottetown, Prince Edward Island. He practiced land-surveying as a young man; by working from nature acquired skill enough to do some illustrating and to paint portraits of prominent men. In 1877 he went to Europe; studied art in London and Paris, and exhibited paintings in the Paris Salon, Royal Academy, London, and elsewhere in England. In 1883 he painted for the Government of Canada *Fathers of Confederation*, a large picture now in the library of the Parliament House, Ottawa. Subsequently he settled in Montreal; has painted a number of subjects dealing with life in Canada, and is chiefly occupied as a portrait-painter. Among his best-known paintings is *Meeting of School Trustees*, purchased by the Government of Canada for the Canadian National Gallery. He was elected president of the Royal Canadian Academy, but declined to serve.

Neil Macdonald.

Harris, Samuel: the "apostle of Virginia," so called; b. in Hanover co., Va., Jan. 12, 1724; became a colonel of militia in Pittsylvania County, and held important public offices. In 1769 he was ordained a Baptist minister, having for years zealously preached in the Baptist churches with great power; gave a large share of his property to charitable causes, and underwent much persecution from the then Established Church of Virginia. In 1774 he was ordained an "apostle" by the General Association of Separate Baptists. Date of death uncertain, probably 1794.

Harris, Samuel, D. D., LL. D.: theologian; b. in East Machias, Me., June 14, 1814; graduated at Bowdoin College in 1833, and at Andover Theological Seminary in 1838; taught at Limerick, Me., 1833–34, and at East Machias 1834–35 and 1838–41. He was pastor of the Congregational church in Conway, Mass., 1841–51, and of the South Congregational church in Conway, Mass., 1851–55. From 1855 to 1867 he was Professor of Systematic Theology in the Theological Seminary in Bangor, Me.; president of Bowdoin College 1867–71; and in 1871 took the chair of Systematic Theology in the theological department of Yale College. He has published *Zaccheus, or the Scriptural Plan of Benevolence* (Boston, 1844); *Christ's Prayer for the Death of His Redeemed* (1862); *The Kingdom of Christ on Earth* (Andover, 1874); *The Philosophical Basis of Theism* (New York, 1883); *The Self-revelation of God* (1887).

Revised by S. M. Jackson.

Harris, Thaddeus Mason, D. D.: a Unitarian divine; b. at Charlestown (now Boston), Mass., July 17, 1768; graduated at Harvard in 1787; was appointed private secretary to Gen. Washington, but sickness prevented his acceptance. In 1790 he delivered the Phi Beta Kappa address at Cambridge, where he studied divinity; was librarian of Harvard University 1791–93; pastor of the First church, Dorchester, 1793–1839, where he died Apr. 3, 1842. He was the author of many works, among which are *The Minor Encyclopædia* (4 vols., 1803); *Journal of a Tour into the Northwest Territory* (1803); *Natural History of the Bible* (1820); and *Memoirs of Oglethorpe* (1841).

Harris, Thaddeus William, M. D.: a son of Dr. T. M. Harris (1768–1842); b. at Dorchester, Mass., Nov. 12, 1795; graduated at Harvard in 1815, and studied medicine, which he practiced at Milton, Mass. He was (1831–56) librarian of Harvard College, and for a time was instructor in Botany and Natural History, and won especial distinction as an entomologist, being one of the pioneers of that science in North America. D. at Cambridge, Mass., Jan. 16, 1856. His most important works are a *Systematic Catalogue of the Insects of Massachusetts*, and a valuable treatise *On Insects Injurious to Vegetation* (1841; enlarged eds. 1842, 1852, 1862). He also published many scientific and antiquarian papers.

Harris, Thomas Lake: reformer; b. at Fenny Stratford, England, May 15, 1823; in 1827 was taken to the U. S. by his parents, who settled at Utica, N. Y. He early attained some distinction as a writer, and became a minister of the Universalist faith in New York city and elsewhere. From 1850 to 1855 he labored as a lecturer upon Spiritualism, in which he became an earnest believer. He preached in Great Britain 1858–61, winning many followers to his system, which combines the Swedenborgian theology and the Platonic philosophy with some of the doctrines of Fourier. His followers, the Brotherhood of the New Life, are found in Great Britain, the U. S., India, and Japan. Their chief establishment, co-operative, but not communistic, was at Wassaic, Dutchess co., N. Y., from 1861 to 1867, when it was removed to Brocton, Chautauqua co., N. Y. The Scriptures and the marriage relation are esteemed sacred by them; proselytism is repudiated; and self-renunciation is regarded as one of the supreme duties of man. Mr. Harris is the author of numerous poetical and prose works explaining his mystical philosophy, one of which is *God's Breath in Man* (1891).

Harris, William Logan, D. D., LL. D.: bishop; b. near Mansfield, O., Nov. 4, 1817; joined the Michigan conference in 1837, and after ten years as an itinerant preacher was for three years principal of the Baldwin Institute; he subsequently served from 1851–60, as professor in the Ohio Wesleyan University. In 1860 he was elected assistant secretary to the missionary society of the Methodist Episcopal Church. At the General Conference of his church in 1872 he was elected bishop. He was energetically devoted to his denomination in her greatest enterprises, and was especially eminent in her anti-slavery struggle. He published in 1879, with W. J. Henry, a work on *Ecclesiastical Law*. D. in New York city, Sept. 2, 1887.

Harris, William Torrey, A. M., LL. D.: educator; b. at Killingly, Conn., Sept. 10, 1835; entered Yale College in 1854; became a teacher in St. Louis, Mo., 1857; became superintendent of public schools there 1867; was in 1866 one of the founders of the Philosophical Society at St. Louis; founded *The Journal of Speculative Philosophy* 1867, which he has since edited, and in which he has published many translations and original articles upon philosophical questions. It was the first journal of the kind in the English language. His school reports were widely sought for and read both in the U. S. and Europe. Has written on philosophical and sociological subjects for *The Forum*, *The Atlantic Monthly*, *The North American Review*. In 1890 he published *The Logic of Hegel*; in 1891 *The Spiritual Sense of Dante's Divina Commedia*. He was elected president of the Boston Schoolmasters' Club in Oct., 1884, and became U. S. Commissioner of Education in 1889.

Harrisburg: town; capital of Saline co., Ill. (for location of county, see map of Illinois, ref. 11–F); on the Cleve., Chi., Cin. and St. L. Railway; 70 miles N. E. of Cairo. It is in an agricultural and fruit-growing region, and has valuable deposits of salt, coal, and iron in its vicinity, and 2 banks and 4 weekly newspapers. Pop. (1880) 934; (1890) 1,723.

Harrisburg: city (site settled by John Harris about 1726, known as Harris's Ferry in 1755, laid out as the town of Louisbourg in 1785, incorporated as the borough of Harrisburg in 1791, made the State capital in 1812, and chartered as a city in 1860); capital of Dauphin County and of the State of Pennsylvania (for location of county, see map

of Pennsylvania, ref. 5-G); on the Susquehanna river, the Pennsylvania Canal, and the Penn., the N. Cent., the Phila. and Read., and the Cumberland Valley Railways; 106 miles W. by N. of Philadelphia, 121 miles N. of Washington, D. C. The river is here spanned by four bridges, each over a mile in length—two for railways and two for carriages. The State Capitol buildings are located in the midst of a beautiful park of more than 15 acres on a gentle rise of ground. The Capitol proper, burned down Feb. 2, 1897, had large porticoes on the east and west fronts, and a spacious rotunda

State Capitol, Harrisburg, Pa.

surmounted by a dome. A monument erected to the memory of the soldiers who fell in the Mexican war adorns the Capitol park. Besides the Harrisburg Academy and two seminaries, there were in 1892 2 high schools, 28 grammar schools, 83 primary schools, and a teachers' training-school. The various religious denominations had a total of 50 churches. There were 26 building, loan, and savings institutions; 3 national banks with aggregate capital of $685,000, and 2 State banks with aggregate capital of $600,000; and 1 quarterly, 1 monthly, 11 weekly, 1 semi-weekly, and 4 daily periodicals. The charitable institutions comprised a Home for the Friendless, Children's Industrial Home, State Lunatic Asylum, and 7 hospitals. The city has a system of water-works which cost $750,000, gas and electric-light plants, and electric street railways. In 1887 the board of trade compiled statistics of the local manufactures, which showed number of establishments, 403; aggregate capital, $8,511,340; persons employed, 10,402; amount of wages paid during the year, $4,049,418; and value of products, $17,187,910. The principal industries were the manufacture of iron and steel, steam railway cars, foundry and machine-shop products, boots and shoes, clothing, malt liquors, carriages and wagons, silk goods, coffins, marbleized slate, hydraulic cement pipe, flour, brooms, nails, steel barrows, worked wood, brick and tile, galvanized iron cornices, etc. The city ranks seventh in population in the State, and is the see of a Roman Catholic bishop. Pop. (1880) 30,762; (1890) 39,385. BUSINESS MANAGER OF "STAR-INDEPENDENT."

Harrison: town; capital of Boone co., Ark. (for location of county, see map of Arkansas, ref. 1-C); in Crooked Creek valley; 40 miles S. E. of Eureka Springs, 90 miles S. of Springfield, Mo. It is the center of one of the largest and richest mineral belts in the U. S.; contains a U. S. land-office and three newspapers; and is engaged in farming, milling, and manufacturing. Pop. (1880) 582; (1890) 1,438; (1893) estimated, 1,800. EDITOR OF "BOONE BANNER."

Harrison: village; Hamilton co., O. (for location of county, see map of Ohio, ref. 7-C); on the Cleve., Cin., Chi. and St. L. Railway; 25 miles W. N. W. of Cincinnati. It is in an agricultural region, and contains flour-mills, creameries, distilleries, canning-factory, woolen-mill, and corn-drill, furniture, and carriage factories. Pop. (1880) 1,850; (1890) 1,690.

Harrison, BENJAMIN: a signer of the Declaration of Independence; b. about 1740 at Berkeley, Charles co., Va.; was educated at William and Mary College. He took an early and prominent part in public affairs, and in 1764 was Speaker of the House of Burgesses, and again 1777–82. He was a member of the General Congress from 1774–77, and Governor of Virginia 1782–85. He was the brother of Gen. Charles Harrison, a Revolutionary officer, and father of President William Henry Harrison. D. in Apr., 1791.

Harrison, BENJAMIN: twenty-third President of the U. S.; b. in North Bend, O., Aug. 20, 1833; son of John Scott Harrison, and grandson of William Henry Harrison, the ninth President of the U. S. His great-grandfather, Benjamin Harrison, was a signer of the Declaration of Independence. After attending school he was sent to Farmer's College, at College Hill, near Cincinnati, where he remained two years, and afterward entered Miami University, Oxford, O., where he made a good record as a student and graduated at the age of eighteen. In 1853 he married Miss Caroline L. Scott (b. Oct. 1, 1832; d. Oct. 25, 1892), daughter of the Rev. Dr. John W. Scott, principal of a seminary for young ladies at Oxford. He studied law in Cincinnati, in the office of Storer & Gwynne, and removed in 1854 to Indianapolis, Ind., where he made his home and practiced law. In Oct., 1860, he was elected by the people reporter of the decisions of the Supreme Court of the State. He was commissioned second lieutenant of Indiana Volunteers in 1862, recruited Company A, Seventieth Indiana Volunteer Infantry, and on the reorganization of the regiment was commissioned colonel. He brought his regiment to a high degree of efficiency, and with it participated in the campaign waged by Sherman in 1864 against Johnston. He served with special distinction at the battle of Peach Tree Creek; had charge of the brigade at the battle of Nashville; was breveted brigadier-general Feb., 1865. His military record was in a high degree honorable. He was re-elected reporter of the Supreme Court Oct., 1864, while in the field, and after being mustered out he served in this capacity for four years. In 1876 he was the Republican candidate for Governor of Indiana, but failed of an election. He was appointed a member of the Mississippi river commission in 1879, and the following year was chairman of the Indiana delegates to the Republican national convention at Chicago which nominated Mr. Garfield for the presidency. In the following winter he was elected to the U. S. Senate, and after his election was offered a portfolio in Mr. Garfield's cabinet, which he declined, and took his seat in the Senate Mar. 4, 1881. During six years he rendered valuable service in the Senate, and became known as the advocate of protective duties, civil service reform, and the restoration of the U. S. navy. He was a delegate to the national convention in 1884, where his name was mentioned in connection with the presidency. At the expiration of his term in the Senate he received the votes of the Republican minority in the Indiana Legislature for re-election. He was nominated for the presidency in the national convention of 1888 on the protective tariff platform, and elected after an exciting campaign in which the tariff question was the controlling issue. He received 233 electoral votes, against 168 electoral votes cast for Mr. Cleveland, while the popular vote stood 5,439,853 for Mr. Harrison and 5,540,329 for Mr. Cleveland. Among the notable events of his administration were the passage of the McKinley Bill, the suppression of the Louisiana lottery, the enforcement of the reciprocity policy, the extension of the new navy, the promotion of civil service reform, the arrangement of the international monetary conference, the organization of the Bering Sea arbitration, the difficulty with Chili, and the settlement of the Samoan question. In 1892 he was renominated by the Republican party, being again opposed by Mr. Cleveland, who had been renominated by the Democratic party. In the following election the Democratic party was successful, Mr. Cleveland receiving 276 electoral votes against 145 electoral votes cast for Mr. Harrison. The popular vote stood 5,553,142 for Mr. Cleveland and 5,186,951 for Mr. Harrison. Mr. Harrison was appointed at the close of his term lecturer in International Law in Leland Stanford Junior University, Palo Alto, Cal. C. H. THURBER.

Harrison, FREDERIC: author; b. in London, Oct. 18, 1831; educated at Oxford; graduated in 1853; called to the bar in 1858; was a member of the commission upon trades-unions 1867–69; secretary to the royal commission for the digest of the law 1869–70; and from 1877 to 1889 was Professor of Jurisprudence and International Law at Lincoln's Inn Hall. In philosophy he is a follower of Comte, and was one of the founders of the Positive school in England in 1870. In politics he is a Liberal and a Home Ruler. His

principal works are *The Meaning of History* (1862); *Order and Progress* (1875); an English translation of the second volume of Comte's *Politique Positive*; *The Choice of Books, and Other Literary Pieces* (1886); and *Oliver Cromwell* (1888).

Harrison, JOHN: inventor; b. at Faulby, Yorkshire, England, 1693; was bred a carpenter; produced a new escapement for clocks and watches and a compensation (gridiron) pendulum 1725; went to London 1735; invented the nautical chronometer 1736, and perfected it in 1759; received in consequence (1767) a prize of £20,000 offered in 1714 for the invention of means by which mariners could tell their longitude within 30 miles. He made various improvements in clocks and watches. D. in London, Mar., 1776.

Harrison, SUSAN F.: Canadian author; b. in Toronto, Ontario, Feb. 24, 1860. She was for a time literary editor of the Toronto *Week*; has been a teacher of music and literature, published various musical compositions of merit, and has been a successful contributor to periodicals. Among other works she has published are the following: *Crowded Out, and other Sketches* (Ottawa, 1889); an anthology entitled *French and English Native Writers* (Toronto, 1889); *Pine Rose and Fleur-de-Lis* (Toronto, 1891).

NEIL MACDONALD.

Harrison, THOMAS ALEXANDER: figure, marine, and landscape painter; b. in Philadelphia, Pa., Jan. 17, 1853; pupil of Gérôme, Paris; member Société Nationale des Beaux-Arts, Paris; Royal Institute, London; and Society of American Artists (1885); honorable mention, Paris Salon, 1885; first-class medal, Paris Exposition, 1889; Legion of Honor and Officer of Public Instruction 1889; medal, Munich Exposition, 1890; represented in the state collection, France. *Le Crépuscule*, a marine view under an effect of moonrise, attracted great attention when exhibited at the Salon, and received a prize of $2,500 at the American Art Association, New York (not a professional society), in 1887. It is now in the Museum of Fine Arts, St. Louis, Mo. *The Amateurs*, a picture of children fishing, is in the Art Institute, Chicago, Ill. *In Arcady*, a realistic study of nude figures in a landscape, is a canvas remarkable for harmony in the color scheme and truth to nature. *Castles in Spain* is in the collection of J. G. Johnson, Philadelphia. Studio in Paris.

WILLIAM A. COFFIN.

Harrison, WILLIAM HENRY: ninth President of the U. S.; b. Feb. 9, 1773, at Berkeley, in Charles co., Va.; studied at Hampden-Sidney College with a view to entering the profession of medicine. In 1791 he became an ensign in the army, and in 1792 a lieutenant on Wayne's staff. In 1797 he was made captain and commandant of Fort Washington, now Cincinnati, O. On the conclusion of peace with the Indians, he resigned his commission in 1798, and was immediately appointed secretary of the Northwest Territory. This position he resigned in 1799 in order to take a seat as delegate in Congress. He was (1801–13) Governor of Indiana Territory and superintendent of Indian affairs, and as such concluded thirteen important treaties and gained the battle of Tippecanoe, Nov. 7, 1811. In 1812 he was made major-general of Kentucky militia and brigadier-general in the army, with the command of the northwest frontier. In 1813 he was made major-general, and as such won much renown by the defense of Fort Meigs and the battle of the Thames, Oct. 5, 1813. In 1814 he left the army, and was employed in Indian affairs by the Government. He was a member of Congress from Ohio 1816–19; State Senator 1819–21; U. S. Senator 1825–28; presidential elector 1821 and 1825; U. S. minister to Colombia 1828–29; after which he retired to his farm at North Bend, Hamilton co., O., 16 miles below Cincinnati, where for twelve years he was clerk of the county court. In 1839 he was nominated for the presidency by the Whigs at Harrisburg, Pa., Mr. Van Buren being the Democratic candidate, and Gen. Harrison received 234 electoral votes against 60 for his opponent. Mass meetings and processions were introduced for the first time in a presidential campaign, and the watchwords "log cabin" and "hard cider" (referring to statements of his political adversaries as to the general's habitation and his favorite drink) were effectively used by the Whigs, and aroused a wonderful popular enthusiasm. President Harrison died April 4, 1841, thirty-one days after his inauguration. He published in 1838 a small work on the Indians of the Ohio valley. See his *Life* by Dawson (1824), by Hall (1836), by Hildreth (1839), by Burr (1840), by Isaac R. Jackson and others.

Revised by C. K. ADAMS.

Harrison, WILLIAM POPE, D. D., LL. D.: author and minister; b. at Savannah, Ga., Sept. 3, 1830; educated at Emory College, Oxford, Ga.; after serving as a pastor, he was in 1870 elected, by the General Conference of the Methodist Episcopal Church South, editor of *The New Monthly Magazine*; in 1882 book editor; in 1886 and 1890 editor of *The Quarterly Review*; served four years as chaplain of the House of Representatives, Washington; was a member of five general conferences of his Church; secretary of the General Conference 1890; was a member of the platform committee of the Œcumenical Conference at Washington 1891, and a member of the London Œcumenical Conference in 1881. He has published *Theophilus Walton, or the Magnets of Truth*, a controversial work (1858); *Lights and Shadows of Forty Years* (1883); *The Living Christ* (1884); *The High Churchman Disarmed, a Defense of our Fathers* (1886); *Methodist Union* (1892); *The Gospel among the Slaves* (1893).

Harrisonburg: city; capital of Rockingham co., Va. (for location of county, see map of Virginia, ref. 5–F); on the Balt. and O. Railroad; 25 miles N. of Staunton, 125 miles N. W. of Richmond. It is in the beautiful Shenandoah valley, is engaged in farming, and has 8 churches, 1 private and 2 public schools, a tan-yard, and 4 weekly newspapers. Pop. (1880) 2,831; (1890) 2,792.

EDITOR OF "SPIRIT OF THE VALLEY."

Harrisonville: town; capital of Cass co., Mo. (for location of county, see map of Missouri, ref. 4–D); on the Kan. C., Ft. S. and Mem., the Kan. C., Osceola and So., and the Mo. Pac. Railways; 45 miles S. S. E. of Kansas City. It has 8 churches, 2 public schools, high school with large general library, electric-light plant, 4 weekly newspapers, machine-shops and foundry, and steam flour-mill. It is in an agricultural and coal region. Pop. (1880) 1,113; (1890) 1,645; (1893) estimated 2,250.

EDITOR OF "CASS COUNTY DEMOCRAT."

Harrodsburg: town; capital of Mercer co., Ky. (for location of county, see map of Kentucky, ref. 3–H); on the Louisville S. Railroad; 30 miles S. of Frankfort. It contains an academy, high school, 2 flour-mills, grain-elevator, distillery, 2 planing-mills, ice-factory, electric-light plant, water and sewage systems, and 2 weekly newspapers. It is in an agricultural region, and has numerous mineral springs. Pop. (1880) 2,202; (1890) 3,230. EDITOR OF "DEMOCRAT."

Har'rogate, or **Har'rowgate**: watering-place of Yorkshire, England; 20 miles W. of York (see map of England, ref. 6–I). Its sulphurous and chalybeate springs are much frequented during summer, and have very beneficial effects in diseases of the skin, scrofula, dyspepsia, and gout. Pop. (1891) 13,917.

Har'row, or **Harrow-on-the-Hill**: town and parish of Middlesex, England; on the London-Birmingham Railway, 12 miles N. W. of London; chiefly famous for its school, founded in 1571 by John Lyon, a yeoman, as a free school for poor boys (see map of England, ref. 12–J). It is one of the most exclusive of English classical schools. It has about 600 students. Pop. of parish (1891) 5,725.

Harrowby, Hon. DUDLEY FRANCIS STUART RYDER, Earl of: politician; b. at Brighton, England, Jan. 16, 1831; educated at Harrow School and Christ Church, Oxford; entered Parliament as Viscount Sandon in 1856; was vice-president of the council of education 1874–78; introduced Education Act 1876; president of the Board of Trade under Lord Beaconsfield 1878–80; Lord Privy Seal in Salisbury's government 1885–86; member of the royal commission on education 1886–89. C. H. T.

Hart: See STAG.

Hart, ALBERT BUSHNELL: professor of history; b. at Clarksville, Pa., July 1, 1854; A. B., Harvard, 1880; Ph. D., Freiburg, 1883; has held positions of fellow, instructor, and Assistant Professor of History in Harvard University. Author of *Coercive Powers of the United States Government* (1885); *Topical Outline of the Courses in Constitutional and Political History of the United States* (1884–90); *Introduction to the Study of Federal Government* (1890); *Epoch Maps Illustrating American History* (1890); *Formation of the Union* (1892). C. H. T.

Hart, HENRY MARTYN, S. T. D. (Trinity College, Dublin): clerical writer; b. at Otley, Yorkshire, England, Mar. 3, 1838; educated in England; principal of Wriothesley House School, Blackheath, Kent, 1862–79, and incumbent of St. Germain's

church, Blackheath; became dean of St. John's Cathedral, Denver, Col., in 1879. He was editor of *The World of the Sea*, and contributed mineralogical and geological articles to *The Popular Educator*; published *Elementary Chemistry* (1870); *The Children's Service-book, with Music and Sermons* (1875); *The Book of Family Prayer* (1876); *The Preacher's Legacy* (1879); *Purgatory* (1885); *Notes on the Jewish Sacrifices* (1889); *Service-book and Hymnal for Evening Service and Sunday-schools* (1891).

Hart, James McDougal: landscape-painter; b. at Kilmarnock, Scotland, May 10, 1828. He was taken to the U. S. when three years of age; studied painting with his brother, William Hart, and later in Düsseldorf under Schirmer. National Academician 1859; third-class medal, Paris Exposition, 1889. Among his works are *Drove at the Ford* (1874), in the Corcoran Gallery, Washington; *Adirondacks* (1859), in the collection of W. T. Walters, Baltimore. Studio in New York. W. A. C.

Hart, Joel T.: sculptor; b. in Clarke co., Ky., in 1810; bred a mason. While working in 1830 at Lexington, Ky., as a stone-cutter he began modeling in clay, and soon won reputation. His statue of Henry Clay, which he began in 1846, owing to a shipwreck and other causes of delay was not set up for many years; it is in Richmond, Va. The *Angelina, Woman Triumphant* (in the court-house at Louisville, Ky.), and *Il Penseroso* are among his best works. He made many portrait-busts, and invented a mechanical contrivance for modeling heads from life. D. at Florence, Italy, Mar. 2, 1877. Revised by Russell Sturgis.

Hart, Samuel, M. A., D. D.: scholar; b. at Saybrook, Conn., June 4, 1845; educated at Trinity College, Hartford; since 1868 tutor, adjunct tutor, and professor in that institution; registrar of diocese of Connecticut since 1874; custodian of Standard Prayer-book since 1886; secretary of American Philological Association 1873–78; president of same 1891–92; secretary of the House of Bishops 1892; elected Bishop of Vermont 1893, but declined the appointment; published editions of *Juvenal* (1873); of *Persius* (1875); and of Bishop Seabury's *Communion Office* (1874; second ed. 1876); *Historical Address at Quadri-millennial of Saybrook, Conn.* (1885); and of *Guilford, Conn.* (1889); *Historical Sermons de Bishop Seabury* (1883–86).

Hart, William: landscape and cattle painter; b. at Paisley, Scotland, Mar. 31, 1823; self-taught; removed to the U. S. in boyhood; studied in Scotland three years 1849–52; National Academician 1858; member American Water-color Society, and president 1870–73. D. at Mt. Vernon, N. Y., June 17, 1894. W. A. C.

Harte, Francis Bret: novelist; b. at Albany, N. Y., Aug. 25, 1839. In 1856 he went to California, dug gold, taught school, engaged in the express business, set type in the office of *The Golden Era*, became editor of *The Californian*, a literary weekly, and was appointed secretary of the U. S. branch mint in San Francisco in 1864. Some of the poems which he published in San Francisco papers during the following years—*The Society upon the Stanislaw, The Pliocene Skull, John Burns of Gettysburg*, etc.—attracted great attention, and in 1868 he started *The Overland Monthly*. The two sketches which he contributed to this paper, *The Luck of Roaring Camp* and *The Outcasts of Poker Flat*, made quite a sensation, and with the publication in 1870 of his poem, *The Heathen Chinee*, his popularity culminated. In 1871 he removed to New York city; was appointed U. S. consul at Crefeld, Germany, in 1878, and at Glasgow in 1880, where he served till 1885. He afterward resided in London. Among his books are *Condensed Novels* (1867); *Poems* (1870); *Echoes of the Foot Hills* (1874); *Tales of the Argonauts* (1875); *On the Frontier* (1884); *Maruja* and *By Shore and Sedge* (1885); *A Phyllis of the Sierras* (1887); *A Waif of the Plains* (1890); *A Protégée of Jack Hamlin's* (1894). Revised by H. A. Beers.

Harte-beeste, haart'beest, or **Caama**, kaa'ma [*harte-beeste* is South African Dutch; *harte* for European Dutch *hert, hart* + *beeste*, animal]: *Alcelaphus caama*, a large antelope of South Africa, which is extremely swift, and is hunted for its flesh, which resembles beef. The harte-beestes go in great herds. They are often domesticated. The bastaard harte-beeste, or sassaby (*Antilope lunata*), also lives in South Africa, toward the tropic.

Har'tel, Wilhelm, von: philologist; b. in Hof, Moravia, May 29, 1839; studied in Vienna; privat docent 1866; professor extraordinary 1869; ordinarius 1872; member of the Vienna Academy 1875; of the Berlin Academy 1893; raised to the peerage in 1882. His principal works are *Homerische Studien, Studien über das attische Staatsrecht, Demosthenische Studien.* Editor of Eutropius, Cyprian, and Ennodius for the *Corpus Script. Ecclesiast.* He founded the *Wiener Studien* in 1877. Alfred Gudeman.

Har'tenstein, Gustav: philosophical writer; b. at Plauen, Germany, Mar. 18, 1808; became in 1834 extraordinary and in 1836 regular Professor of Philosophy at Leipzig; is of Herbart's school of thought, and has done much to make his master's teachings understood. Among his works are *Probleme und Grundlehren der allgemeinen Metaphysik* (1836); *Die Grundbegriffe der ethischen Wissenschaften* (1844); *Historisch-philosophische Abhandlungen* (1870). He also edited Herbart's and Kant's complete works.
Revised by W. T. Harris.

Hartford: city and port of entry; an important railway and commercial center; capital of Connecticut and county-seat of Hartford County; on the west bank of the Connecticut river, 50 miles from its mouth and at the head of navigation, except for small boats; lat. 41° 45′ 59″ N., lon. 72° 40′ 45″ W. (see map of Connecticut, ref. 8–H). It is on the line of the New York, New Haven and Hartford and the New York and New England Railroads; 111 miles from New York and 124 miles from Boston. It is the eastern terminus of the Philadelphia, Reading and New England Railroad (Poughkeepsie bridge route), and the northern terminus of the Valley Division of the New York, New Haven and Hartford Railroad, extending to Long Island Sound at Saybrook, about 45 miles.

Hartford covers an area of about 17 sq. miles, and lies on terraces and low hills, from the highest parts of which fine views of the Connecticut river valley are obtained. It is laid out with much regularity. Main Street, the chief thoroughfare, on which are situated some of the largest stores and insurance buildings, extends N. and S., and other important streets are parallel with it or cross it at right angles. Asylum Hill, which is almost exclusively a residence section, is crossed by Asylum and Farmington Avenues, running E. and W. and uniting to form Asylum Street, the seat of an extensive and varied business. The city is intersected by Park river, a narrow stream which empties into the Connecticut and is crossed by numerous bridges, one of which, supporting a soldiers' memorial arch, forms an approach to the new State-house. Aside from the

New State Capitol, Hartford, Conn.

relics preserved in the Historical Society rooms and in the new State-house, the old State-house, now the city-hall, built in 1794–96, the graveyard in the rear of the Center or First (Congregational) church, and a few mansions antedating the Revolutionary war, comprise the most interesting antiquities of the city. Many of the banks, insurance buildings, and business blocks, and some of the churches, are large and handsome structures, as are the buildings of Trinity College. Bushnell Park, named in honor of its projector, Horace Bushnell, D. D., is a tract of land drained by Park river, is beautifully laid out, and with the adjoining grounds of the new State-house comprises 46 acres. Charter Oak Park, containing fair-grounds and a trotting-park, lies on the outskirts of the city.

The prominent business interests are insurance and manu-

factures. There are 7 fire-insurance companies (including a steam-boiler company), having a capital of $10,250,000. Their gross assets in Jan., 1893, were $33,624,339.43; the surplus exceeded $9,592,132.63. There are 7 life-insurance companies (including accident), with capital of $2,900,000, assets amounting to $130,077,634.49, and a surplus exceeding $22,000,000. Hartford has 9 national banks (aggregate capital, $5,975,000; deposits, $9,096,094.59), 4 trust companies (capital, $850,000; deposits, $2,957,991.60), 4 State banks (capital, $1,190,000; deposits, over $2,800,000), and 4 savings-banks, one of them the largest in New England, with aggregate deposits of $21,763,227.45. The manufactured articles include firearms, steam-boilers, steam-engines, car-wheels, machinery, nails, screws, pins, bicycles, carriages, furniture, sewing-machines, pumps, hosiery and knit goods, subscription-books, and envelopes. Some of its factories have a worldwide reputation. Many factories in other towns, such as those producing edge tools, carpets, and silks, are controlled by Hartford corporations. The number of manufactories in 1890 was 513; capital employed, $14,126,282; hands employed, 9,021; value of products, $17,164,318. Hartford is a central market for Connecticut leaf tobacco. In 1887 it was made a port of entry, superseding Middletown. The city has a paid fire department and an electric fire-alarm telegraph system. Water is supplied from large storage reservoirs on the slope of Talcott Mountain, W. of the city. There is telephone connection with the leading towns of the State and with other States.

The educational institutions are Trinity College, Hartford Theological Seminary (Congregational), Hartford High School, with which is incorporated Hopkins Grammar School, endowed in 1657, Collins Street Classical School, Woodside Seminary for Young Ladies, 2 nunneries, Roman Catholic parochial schools, and a complete system of public schools. The Hartford Public (free circulating), Trinity College, the State, Theological Seminary, Watkinson Reference, and Historical Society libraries have large and important collections. There are 4 daily papers, 2 Sunday papers, and many other publications. Among public institutions are the American Asylum for the Deaf and Dumb, the oldest asylum of the kind in the U. S., a hospital, the Old People's Home, the Watkinson Juvenile Asylum, the Young Men's Christian Association, the Women's Christian Association, the City Mission Society, and the Union for Home Work. A Retreat for the Insane is situated in the south part of the city. St. Joseph's Cathedral is the seat of the Roman Catholic bishop of the diocese of Hartford.

Hartford was settled in 1635 by emigrants from Newtown (now Cambridge, Mass.), re-enforced in 1636 by a company constituting the Puritan church at Newtown, led by its pastor, Rev. Thomas Hooker. In 1637 the settlement, which had been called Newtown, was renamed after Hertford, England, the birthplace of Rev. Samuel Stone, the teacher of the church. A classical school was opened in 1638; in 1639 the planters of Hartford, Windsor, and Wethersfield adopted at Hartford a written constitution, the first framed in America. In 1654 the general court of Connecticut dispossessed some Dutch traders who since 1633 had held a fort at the mouth of Park river. In 1687 Sir Edmund Andros, Governor-General of New England, made at Hartford an unsuccessful attempt to seize the charter granted to Connecticut in 1662. (See CHARTER OAK.) Hartford was the sole capital of the colony of Connecticut until 1701. From that year until 1873 New Haven was one of the capitals. In 1873 a constitutional amendment was adopted making Hartford the sole capital again. A handsome new State-house, built at a cost of about $2,500,000 and completed in 1880, was erected on ground purchased from Trinity College. The old State-house, in which in 1814–15 the HARTFORD CONVENTION (*q. v.*) held its sessions, stands in State-house Square in the heart of the city. Pop. (1890) 53,230; (1893) 62,000, estimated. See *Memorial History of Hartford County, Connecticut* (2 vols., Boston, 1886). Revised by WILLIAM A. GRAHAM.

Hartford: village; Van Buren co., Mich. (for location of county, see map of Michigan, ref. 8–H); on the Chi. and W. Mich. and the Tol. and S. Haven Railways; 17 miles N. E. of Benton Harbor; 19 miles N. E. of St. Joseph. It is in an agricultural region and the richest part of the famous Michigan fruit belt, and contains 5 churches, union school, flour and saw mills, brick and tile works, and 2 weekly newspapers. Pop. (1880) 838; (1890) 1,044; (1894) 1,005.

EDITOR OF "DAY SPRING."

Hartford City: town; capital of Blackford co., Ind. (for location of county, see map of Indiana, ref. 5–G); on the Ft. W., Cin. and Louisv. Railroad and the Penn. lines; 40 miles S. of Fort Wayne, 75 miles N. E. of Indianapolis. It is in the center of the natural gas belt, and manufactures window-glass, straw boards, paper, wood pulp, machinery, flour, and hubs and spokes. Pop. (1880) 1,470; (1890) 2,287; (1893) 4,235.

EDITOR OF "TELEGRAM."

Hartford Convention: a political convention held at Hartford, Conn., between Dec. 15, 1814, and Jan. 5, 1815, for the purpose of considering the interests of the New England States in relation to the war with Great Britain. It consisted of twelve delegates from Massachusetts, seven from Connecticut, three from Rhode Island, two from New Hampshire, and one from Vermont. The president was George Cabot, of Massachusetts, and the secretary Theodore Dwight, of Connecticut. The convention sat in secret session for three weeks, and then issued a report to the Legislatures of the States represented.

The purpose of the convention will be made clear by a brief review of the antecedent political condition. The Democratic, or, as it was then called, the Republican or Anti-Federalist party, came into power in 1800, and very soon had a strong majority not only in the South but also in the West. The course of the Government, including Congress, was directed, it was thought, very largely to the development of agricultural interests at the expense of the interest of manufactures and commerce. This policy aroused not a little hostility and bitterness on the part of New England, the stronghold of the Federalists. In 1812 the Republicans succeeded in carrying, as a strict party measure, a bill declaring war against Great Britain for the purpose of enforcing an abandonment of the right of search and the right of impressment. To this war the Federalists of New England were unanimously and strenuously opposed, for reasons which were set forth in an address to the people. They denounced the projected invasion of Canada in most vigorous terms, as "cruel, wanton, senseless, and wicked." When summoned to supply their quota of militia, the Governors of Massachusetts and Connecticut denied the power of the President to make such a draft, "except to execute the laws, suppress insurrections, or repel invasions." That this declaration was approved by the people was indicated by the fact that immediately afterward they chose an overwhelming majority of Federal members of the Legislature. In every step that was taken the New England Federalists insisted upon the strictest and most limited construction of the Federal Government's constitutional powers. In 1813 the Legislature of Massachusetts declared the war "impolitic and unjust," and refused to vote thanks for naval victories, for the reason that "in a war like the present, waged without justifiable cause, and prosecuted in a manner indicating that conquest and ambition are its real motives, it is not becoming a moral and religious people to express any approbation of military and naval exploits not immediately connected with the defense of our seacoast and soil." The Federalists of New England presented a united front of opposition to all the measures of the war. Meantime the Federal Government, urged on by the desperation of the Republican leaders, deemed itself driven to attempt to raise men by conscription and impressment. A proposition was presented in Congress to enforce a draft, and to enlist minors without the consent of their parents. While these provisions were under consideration the defense of the New England coast was neglected; the commerce and fisheries of New England were open to destruction; and New England practically had no voice in the conduct of affairs. In Feb., 1814, a committee of the Legislature of Massachusetts declared: "We believe that this war, so fertile in calamities, and so threatening in its consequences, has been waged with the worst possible views, and carried on in the worst possible manner, forming a union of wickedness and weakness which defies, for a parallel, the annals of the world." In view of such expressions it is not singular that New England had no influence in the conduct of the war. The administration believed there was evidence of a disloyal intention, and even went so far as to send agents to search for evidence of a secret plot to separate that portion of the country from the Union and place it as a grand duchy under an English prince. The condition seemed to be so threatening that the President, at the request of Congress, appointed Jan. 12, 1815, as a national day of fasting and prayer.

It was when public affairs were in this condition that the convention met Dec. 15, 1814. After three weeks of deliberation it issued its report. It denied "any present intention to dissolve the Union," but admitted that "if a dissolution should become necessary by reason of the multiplied abuses of bad administration, it should, if possible, be the work of peaceable times and deliberate consent." It proposed that Congress should pay into the State treasuries their portion of the taxes raised in the States, and that it should intrust the States with their own defense. It laid down the general principle that "it is as much the duty of the State authorities to watch over the rights *reserved* as of the U. S. to exercise the powers that are *delegated*." It recommended constitutional amendments to deprive the Southern States of the representation of three-fifths of their slaves; that two-thirds of both houses of Congress should be necessary for the admission of new States; that the votes of two-thirds of both houses should be necessary to declare an embargo or a war; that naturalized citizens should not be eligible to Congress; and that the President should not be eligible for re-election. The Legislatures of Massachusetts and Connecticut adopted these recommendations, and sent delegates to Washington to urge them upon the administration and Congress; but before the delegates arrived the defeat of the British by Gen. Jackson at New Orleans had aroused a public enthusiasm which would listen to no complaints or memorials. No attention whatever was paid to the recommendations, but they are of great historic interest and importance, as showing that the disruption of the Union under certain possible contingencies was contemplated in New England as well as in other parts of the country. It was the taunt of Senator Hayne, of South Carolina, in regard to the Hartford convention and the part of Nathan Dane in it, that called forth one of the most eloquent and famous passages of Daniel Webster's celebrated reply.

AUTHORITIES.—Dwight's *History of the Hartford Convention*; Ingersoll, *History of the Second War with Great Britain*; Adams, *Documents Relating to New England Federalism*; Holmes, *Annals*; Goodrich, *Recollections*; Quincy, *Life of Quincy*; Benton, *Debates of Congress*.

C. K. ADAMS.

Hartig, haar'tich, GEORG LUDWIG: writer on forestry; b. at Gladenbach, near Marburg, in Hesse, Germany, Sept. 2, 1764; studied in the University of Giessen, and became successively inspector of forests to the Prince of Solms-Braunfels in 1786, to the Prince of Orange-Nassau in 1797, to the King of Würtemberg in 1806, and to the King of Prussia in 1811. As early as 1787 he founded a school for instruction in forestry at Hungen in the Wetterau, and he afterward carried his school along with him from place to place, until he finally succeeded in 1812 in having the institution connected with the University of Berlin. Among his numerous books on forestry, the principal are *Lehrbuch für Jäger, Lehrbuch für Förster, Kubiktabellen für geschnittene, beschlagene, und runde Hölzer, Lexikon für Jäger und Jägdfreunde*, etc., which have often been republished. D. in Berlin, Feb. 2, 1836.

Hartington: village (founded 1883); capital of Cedar co., Neb. (for location of county, see map of Nebraska, ref. 8–G); on the Chi., St. P., Minn. and Omaha Railway; 22 miles S. by E. of Yankton, S. D. It is in an agricultural and stock-raising region, is engaged in milling and brick-making, and has 2 banks and 2 weekly newspapers. Pop. (1890) 834.

EDITOR OF "HERALD."

Hartington, Marquis of, SPENCER COMPTON CAVENDISH, LL. D., P. C., now Duke of Devonshire: statesman; b. July 23, 1833; graduated at Trinity College, Cambridge, in 1854; was connected with the special mission of Earl Granville to Russia in 1856; in 1857 became a member for North Lancashire in the House of Commons; was appointed a lord of the admiralty in Mar., 1863, and in April of same year became Under Secretary of State for War; in Feb., 1866, became Secretary of State for War; retired in July of same year; lost his seat for North Lancashire in Dec., 1868; in 1869 was returned for New Radnor, having first become Postmaster-General in Mr. Gladstone's cabinet; held that office till Jan., 1871, and then became Chief Secretary for Ireland; retired in Feb., 1874, with his party; succeeded Mr. Gladstone as the leader of the Liberal party in the House of Commons; received the freedom of the city of Glasgow, Nov. 5, 1877, and became lord rector of the University of Edinburgh, Jan. 31, 1879; in Apr., 1880, he became M. P. for Northeast Lancashire; Secretary of State for India from May, 1880, to Dec. 16, 1882, when he became Secretary of State for War; resigned June, 1885. He refused to join Gladstone's Home Rule cabinet in 1886, and became a leader of the Liberal Unionists, giving Lord Salisbury's government his support, though refusing to become a member of the cabinet. On the death of his father, the Duke of Devonshire, Dec. 21, 1891, he succeeded to his title and estates. He married the Dowager Duchess of Manchester Aug. 16, 1892.

Hartlaub, haart'lowp, CARL JOHANN GUSTAV, M. D.: ornithologist; b. at Bremen, Germany, Nov. 8, 1815; educated at the universities of Bonn, Berlin, and Göttingen. Dr. Hartlaub is a member of various scientific societies and is one of the few honorary members of the American Ornithologists' Union. He has devoted much attention to the question of the geographical distribution of birds. His most important publications have treated of the birds of Africa, Madagascar, and Polynesia. Among them are *System der Ornithologie Westafrikas* (Bremen, 1857); *Beitrag zur Fauna Zentral-Polynesiens*; *Die Vögel Ostafrikas* (Leipzig, 1870; this in conjunction with Dr. Friedrich H. Finsch; *Die Vögel Madagascars und der benachbarten Inselgruppen*; *Ein Beitrag zur Zoologie der Æthiopischen Region* (Halle, 1877.)

F. A. LUCAS.

Hartlepool: a municipal borough of England, constituting with the municipal borough of West Hartlepool a parliamentary borough; in the county of Durham; 18 miles E. S. E. of Durham. It is situated on a peninsula projecting into the North Sea, and has a good harbor (see map of England, ref. 4–I), which communicates with the port of West Hartlepool. It was for years a well-frequented bathing-place, but is now chiefly engaged in the coal-trade. Pop. (1891) 21,521. Fishing, the building of iron ships, the manufacture of cement and of marine engines, are important industries. Hartlepool contains a hospital and an ancient parish church. WEST HARTLEPOOL, which adjoins Hartlepool, was founded in 1847, and became a municipal borough in 1889. It contains extensive docks and ship-building yards, and manufactures cement, marine engines, and wood-pulp. It has a large trade with Germany, Holland, and Russia, and exports coal, grain, timber, agricultural products and other articles of commerce. It has a school of art, a mechanics' institute, an athenæum, custom-house, market-house, and other public buildings. Pop. (1891) 42,492.

Hartley, Sir CHARLES AUGUSTUS, F. R. S. E., K. C. M. G.: civil engineer; constructor of improvement of the Sulina mouth of the Danube; b. at Heworth, Durham, England, in 1825. In 1845, after a practical course of instruction in mining and railway engineering at Bishop Auckland and Leeds, he was district engineer on the Scottish Central Railway until 1848; next resident engineer at Sutton harbor, Plymouth. On the completion of the harbor in 1855, he accepted a commission as captain of Turkish engineers, and served through the Crimean war, receiving the Turkish war medal. In 1856 Mr. Hartley was chosen engineer to the European commission on the Danube, on the recommendation of Lieut.-Gen. Sir John Stokes and Gen. Sir John Burgoyne. He inspected the Suez Canal works and reported on them to his Government. He was knighted in 1862. In 1867 he received against twenty competitors the Russian competition prize for plans for enlarging the harbor of Odessa. In 1874 he recommended the improvement of the south pass of the Mississippi; was a member of Mr. Ead's advisory board, and was consulted by him up to the completion and success of the jetties. He was consulted as to the Cattewater breakwater at Plymouth, England; made plans for enlarging the harbor of Kustendjie, Roumania, and harbor at Bourgas; in 1884–85 became a member of the international technical commission for the improvement of the Suez Canal. Author of *The Delta of the Danube, Public Works of the United States and Canada*, and *Inland Navigation in Europe*. He has received the orders of Medjidie and the Star of Roumania, and the Stephenson prize, Telford medal, Watt medal, Telford premium, and Manby premium of the Institution of Civil Engineers.

WILLIAM R. HUTTON.

Hartley, DAVID, M. D.: philosopher; b. at Armley, Yorkshire, Aug. 30, 1705; became a fellow of Jesus College, Cambridge, where he graduated M. A. in 1729; was educated for the Church, but on account of conscientious scruples chose the profession of medicine. He practiced at Newark, Bury St. Edmunds, London, and Bath. He was a man of simple and benevolent character and virtuous life; wrote some medical works, but is chiefly remembered for his

Observations on Man (1749), which gave him a brilliant though transient fame. He was a firm necessitarian, and was perhaps the first philosopher who attempted to explain psychological phenomena by reasoning based mainly upon physiological data. He nevertheless repelled the charge of materialism. He made some valuable observations, especially upon the theory of the association of ideas, anticipating later theories. D. at Bath, Aug. 25, 1757.

Hart'mann, Karl Robert Eduard, von: philosopher; b. in Berlin, Germany, Feb. 23, 1842. He was educated at the School of Artillery, and became an officer in 1861; but in 1862 he accidentally hurt his foot, and an incurable disease which set in has since that time confined him almost without interruption to his bed, where he occupies himself with literary and philosophical studies. In 1868 he published *Ueber die dialektische Methode*; in 1869 *Schellings positive Philosophie*; in 1871 *Das Ding-an-sich und seine Beschaffenheit*; but his principal work is his *Philosophie des Unbewussten* (1869). His idea is to connect the results of the abstract philosophy with those of the concrete inductions of natural science. The point in which these two lines of research meet each other and prove each other is the unconscious. The unconscious in nature has a will—not a merely blind, irrational will (*Schopenhauer*), but one which can determine itself to prototypal ideas; and an idea—not a merely logical idea (*Hegel*), but one which can reach reality by will. In the mind this will and this idea become conscious by means of brain and nerves, but the unconscious is still at work in the instincts, in love, in the formation of language, etc., and in the unconscious the "first principles" are to be found. The execution of this idea is very ingenious, and has attracted great attention in Germany, in spite of the sad coloring of pessimism which pervades it. Among his works are *Die Selbstzersetzung des Christenthums und die Religion der Zukunft* (1874); *Kritische Grundlegung des transcendentalen Realismus* (1875); *Philosophische Fragen der Gegenwart* (1885); *Spiritismus* (1885); *Moderne Probleme* (1885).

Hartmann, Jacob, Baron von: soldier; b. a French citizen in the Bavarian palatinate, Feb. 4, 1795; received his education in the military institutions of Bonn and St.-Cyr, and entered Dec. 1, 1811, as a lieutenant, the First Regiment of the grand duchy of Berg. He fought 1813–15 under French colors in the Twenty-seventh Regiment of the line. At Waterloo he saved the eagle of the regiment, and was made a knight of the Legion of Honor. After the peace of Paris (1815) he left the French service and entered the Tenth Bavarian Regiment of infantry. In the topographical department and by travels in foreign countries he extended his knowledge, and was attached to the staff in 1824. In 1842 he was appointed adjutant to the Crown Prince Maximilian, in 1848 adjutant to the king, and in 1849 major-general. In this position he exerted himself for the improvement of the Bavarian army, its organization, and its fighting capacity, but he encountered great difficulties from the political situation of the kingdom. In 1854 he visited France, especially Paris, and carefully studied the French military system. His investigations of this subject, together with a study of the Italian war of 1859, were embodied in a military work which he published in 1860. In 1861 he became lieutenant-general and commander of the fourth division of infantry, and as such took part in the war of 1866. In 1869 he became a general of infantry, and led the second Bavarian Army-corps against France in 1870 and 1871. He took part with great distinction in the encounter at Weissenburg, contributed considerably to the victory in the battle of Wörth by his energetic advance on the French left wing and line of retreat, took the fortress of Marsal, fought at Sedan, and kept, during the siege of Paris, the plateau of Chatillon occupied. D. at Würzburg, Feb. 22, 1873.

Hartmann, Julius, von: soldier; b. Mar. 2, 1817, at Hanover, where he received his education at the military school. In 1834 he entered the Tenth Prussian Regiment of Hussars, and in 1848 he was attached to the staff. He was often employed in diplomatic missions on account of his elegant education and address; thus he was sent in 1850 to Schleswig-Holstein, and later to Austria and Saxony, to represent Prussian interests. After various occupations in the ministry of war and in the staff, he was made a major-general in 1865, and commander of Coblentz. In 1866 he commanded a division of cavalry, and took part in the encounters of Zwithau, Tobitschau, and Rokeinitz. In 1867 he was given the difficult task of reorganizing the Bavarian army in harmony with the army organization of Prussia, a task which he performed with great success. In the Franco-German war he received the command of the first division of cavalry, and fought at Courcelles and Gravelotte. Jan. 6, 1871, he was appointed commander of a larger detachment, comprising all arms, with which he operated in the region between the Loire and the Loir, and took Tours Jan. 13. After the war he became governor of Strassburg, a position of great political importance, and in 1874 was made a general of cavalry. D. Apr. 30, 1878.

Hartmann, Moritz: novelist and poet; b. of Jewish stock at Duschnik, in Bohemia, Oct. 15, 1821; was educated at Prague and Vienna; left the empire on account of his political liberalism 1844; published *Kelch und Schwert* (1845), a volume of poems expressing radical opinions both on Church and state, followed by *Neuere Gedichte* (1847). He was in the Frankfort Parliament of 1848; went to Vienna with Blum and Fröbel, and escaped thence with some difficulty; lived for a time in the East, and then in Paris; began in 1860 to lecture on German history and letters in the Academy at Geneva; went to Stuttgart 1863, to Vienna 1868. He wrote also *Reimchronik des Pfaffen Maricius* (1849), a brilliant political satire, and the novels *Der Krieg um den Wald* (1850); *Der Gefangene von Chillon* (1863); *Die letzen Tage eines Königs* (1866); *Nach der Natur* (1866); *Die Diamanten der Baronin* (1868); and others. Among his works are *Schatten* (1851); *Tagebuch aus der Provence und Languedoc* (1853); *Briefe aus Irland*; and the idyllic poem *Adam und Eva* (1851). D. in Vienna, May 13, 1872.

Revised by Julius Goebel.

Hartmann von Aue: mediæval German poet; the date of his birth is unknown. He was a feudal dependent of the Herr von Aue in Swabia. He took part in a crusade, either that of Frederick I. (1189–91), or, more probably, that of Henry VI. (1197–98). He is mentioned by Gottfried von Strassburg as living in the first decade of the thirteenth century; by Heinrich von Türlin as dead, about 1220. He calls himself a scholar, i. e. able to read and write; and he was one of the most eminent of the German poets of the second half of the twelfth century, who, through the study and imitation of the poets of Northern France, brought about a revival of poetry in Germany. He tried his hand both at songs (*Minnelieder*) and at narrative poems; but his reputation rests mainly upon the latter. His contemporaries had a remarkably high opinion of his powers. Thus Gottfried (*Tristan*, 117, 30, *seq.*) says of his style:

> Wie lûter und wie reine
> sîn kristallînin wortelîn
> beidin sint und iemer müezen sîn!

The works of Hartmann which have come down to us are, besides the *Lieder*, the following: (1) Two *Büchlein*, as the poet modestly called them, one a monologue on love (*Minne*), the other a dialogue between heart and body on love's pains and harms. (2) A version, based upon a French original, of the curious legend about Pope Gregory the Great, which makes him, the son of a brother and sister, marry unwittingly, like Œdipus, his own mother, and finally, after years of repentance, becomes pope. (Cf. Fr. Lippold, *Ueber die Quellen des Gregorius von Hartmann von Aue*, Leipzig, 1869; *La Vie du pape Grégoire le Grand*, ed. Luzarche, Tours, 1857.) (3) The pious and sentimental legends, apparently connected with the house of Aue, called *Der arme Heinrich*—perhaps the most famous of Hartmann's poems, giving the story of a pure maiden who was ready to sacrifice her life in order to relieve her lord of leprosy, but who of course finally happily married him. Longfellow has used this tale for the framework of his *Golden Legend*. (4) The romance of *Erek* (written about 1190), a free version, with many additions, of the French romance of the same name by Chrestien de Troyes (*q. v.*). (5) The romance of *Iwein* (written soon after 1200), also based upon a poem by Chrestien, *Le chevalier au lion*. Editions of Hartmann are: F. Bech, in *Deutsche Classiker des Mittelalters* (3 vols., Leipzig, 1871–73); Henrici (2 vols., 1891–93); the *Gregorius* (ed. Paul, Halle, 1873); *Der arme Heinrich* and the *Büchlein* (ed. Haupt, Leipzig, 1881, and Paul, Halle, 1883); *Erek* (ed. Haupt, Leipzig, 1871); *Iwein* (ed. Benecke und Lachmann, Berlin, 1877). See also Fr. Saran, *Hartmann von Aue als Lyriker* (Halle, 1889); L. Schmid, *Des Minnesängers Hartmann von Aue Stand, Heimat, und [illegible]* (Erlangen, 1874).

A. R. Marsh.

Har'tranft, John Frederic: soldier; b. in New Hanover township, Montgomery co., Pa., Dec. 16, 1830; graduated at Union College, New York, 1853; admitted to the bar of Pennsylvania 1859. At the outbreak of the civil war he raised the Fourth Pennsylvania; served as its commander during the three months' term, and as volunteer aide to Gen. Franklin in the first battle of Bull Run. Commissioned colonel Fifty-first Pennsylvania volunteers Nov. 16, 1861, and with it accompanied the Burnside expedition, leading it in the attack on Roanoke island Feb. 7 and in the battle near Newbern, N. C., Mar. 13, 1862; was engaged in the second battle of Bull Run and Chantilly, and in the Maryland campaign at South Mountain and Antietam. In June, 1863, he commanded a brigade before Vicksburg, and subsequently accompanied Gen. Sherman in his advance to Jackson, Miss. In the Richmond campaign of 1864 he commanded a brigade in the battles of the Wilderness and Spottsylvania; was commissioned brigadier-general May 12, 1864, and engaged in all the army movements to and before Petersburg, and was brevetted major-general for conspicuous gallantry in recapturing Fort Steadman, Mar. 25, 1865. In Oct., 1865, he was elected auditor-general of Pennsylvania, and re-elected in 1868. He was Governor of that Commonwealth 1873–76, and collector of the port of Philadelphia in 1880. D. at Norristown, Pa., Oct. 17, 1889.

Hartshorn: See Ammonia.

Hartshorne, Edward, A. M., M. D.: son of Dr. Joseph Hartshorne (*q. v.*); b. in Philadelphia, May 14, 1818; graduated at Princeton, A. B. in 1837, A. M. in 1840, and M. D. at the University of Pennsylvania in 1840; was elected assistant physician to the new hospital for the insane of the Pennsylvania Hospital on its opening, Jan. 1, 1841; was elected resident surgeon to the Pennsylvania Hospital in Apr., 1841, and after two years' service there was elected physician to the Eastern State Penitentiary of Pennsylvania. He published two reports (1843 and 1844) in favor of the innocuous sanitary influence of the "separate system of prison discipline" when properly administered, which attracted much attention in Europe and the U. S. as the first evidence of the kind derived from practical experience upon the spot. He began general practice in Philadelphia in 1848; was soon elected one of the attending surgeons of Wills' (eye) Hospital, and subsequently one of the attending surgeons of the Pennsylvania Hospital; served throughout the civil war as consulting surgeon and in other professional capacities in the U. S. army medical service, chiefly in Philadelphia U. S. army hospitals; also as active member and secretary of the executive committee of the U. S. Sanitary Commission in Philadelphia. He served as secretary to the first prison discipline convention in Philadelphia (1847), and to the first sanitary convention in the U. S. (Philadelphia, 1857); also as secretary for several years of the College of Physicians of Philadelphia. During many years he was a frequent contributor to *The American Journal of the Medical Sciences*, *The North American Medico-Chirurgical Review*, and *The Medical Examiner* of Philadelphia, chiefly in their review departments. He edited two successive editions of Taylor's *Manual of Medical Jurisprudence*, with notes and references. D. June 22, 1885.

Hartshorne, Henry, A. M., M. D.: son of Dr. Joseph Hartshorne; b. in Philadelphia, Mar. 16, 1823; graduated B. A. at Haverford College in 1839, and M. D. in the medical department of the University of Pennsylvania in 1845. He was appointed in 1859 Professor of the Practice of Medicine in the medical department of Pennsylvania College. In 1865 he was elected Professor of Hygiene in the University of Pennsylvania, on the institution of this chair, under an endowment for the purpose by Dr. George B. Wood. He held also successively a number of other professorships, the most important of which were at Haverford College and in the Woman's Medical College of Pennsylvania. He was the author of several works, among them a *Monograph on Glycerin*; *Essay on Cholera*; *Guide to the Medicine-chest*; *Conspectus of the Medical Sciences* (1869); and *Essentials of the Principles and Practice of Medicine* (4th ed. 1874). He published a small volume of poems, *Summer Songs*, in 1865, and became editor of *The Friends' Review* in 1874. D. at Tokio, Japan, Feb. 10, 1897.

Hartshorne, Joseph, M. D.: b. near Alexandria, Va., Dec. 12, 1779; became a resident pupil at the Pennsylvania Hospital and a medical student in the University of Pennsylvania in 1800, and graduated M. D. in 1805. He was elected a colleague of Dr. Physick as one of the attending surgeons of the Pennsylvania Hospital, and served also in other similar posts. His chief publication was an appendix, with illustrations, to an American edition of a London translation of Boyer's work on *Diseases and Injuries of the Bones*, in which he reports a number of important cases, and describes a dressing for fractured clavicle and a new apparatus for the treatment of fractured thigh, afterward popular for many years as Hartshorne's splints. He was a member of the Society of Friends. D. near Wilmington, Del., Aug. 20, 1850.

Hart'suff, George Lucas: soldier; b. at Tyre, Seneca co., N. Y., May 28, 1830; graduated at the U. S. Military Academy, and entered the army as brevet second lieutenant of artillery July 1, 1852. In Mar., 1861, he was appointed a captain and assistant adjutant-general, and in April sent to Fort Pickens with the secret expedition under Gen. Brown. In July he became chief of staff to Gen. Rosecrans in Western Virginia, participating in the action at Carnifex Ferry, Sept. 10. In 1862 he was appointed a brigadier-general of volunteers, took command of a brigade, and was engaged at Cedar Mountain and Manassas. He also fought at South Mountain and Antietam, being severely wounded in the last-named action, and incapacitated from duty in the field till Apr., 1863. Having been promoted major-general of volunteers he commanded the Bermuda front of the siege-works before Petersburg, assuming command of that city on its capture, and subsequently of the district of Nottoway, which command he held till he was mustered out of the volunteer service Aug., 1865. He afterward resumed duty in the adjutant-general's department, with the rank of lieutenant-colonel, and was retired from active service on the full rank of major-general. D. May 16, 1874.

Hartt, Charles Frederic: geologist; b. at Fredericton, New Brunswick, Aug. 23, 1840. He studied under Prof. Louis Agassiz, and was one of his assistants in the Thayer expedition to Brazil 1865–66. On his return he became Professor of Geology at Vassar College, and in 1868 was chosen to the chair of Geology in Cornell University. During his vacations he made repeated excursions to Brazil, exploring the coast provinces and the Amazon. In 1875, at the invitation of the Imperial Government, he organized the Commissão Geologica do Brazil, which was continued until his death. Nearly all our knowledge of the geology of Brazil is due to Prof. Hartt and to the assistants who have continued his work. His largest published work was *Geology and Physical Geography of Brazil* (1870). D. at Rio de Janeiro, Mar. 18, 1878. The immense collections formed by the commission were incorporated with the national museum.

Herbert H. Smith.

Hart'wig, John Christopher: a German Lutheran minister; b. in Saxe-Gotha, Germany, June 6, 1714; was called to North America to take charge of Lutheran churches in New York State; was a member of the first Lutheran synod in America (1748); held pastorates in New Jersey, Pennsylvania, and New York, and founded the Hartwick Theological Seminary at Hartwick, Otsego co., N. Y., which was opened in 1815. He received in 1761 a patent of 21,500 acres of land, comprising the greater part of the present town of Hartwick. D. at Livingston Manor, N. Y., July 17, 1796.

Hartz, or **Harz**: an isolated group of mountains in Northwestern Germany, forming an elevated plateau, intersected with deep valleys and rising in different places into high peaks. These mountains, which cover an area of about 800 sq. miles, occupying Brunswick and parts of Hanover and Prussian Saxony, are covered with forests, and are exceedingly rich in minerals—gold, silver, lead, iron, marble, and alabaster. As they form the first wall against which the moist and cold winds from the North Sea are broken, most of the summits are destitute of trees; but the slopes are generally heavily wooded—the northern by pines and firs, the southern by oak, elm, and beech trees. Much wood is exported for building and other purposes. The mines were opened in the tenth century, and are still very far from being exhausted. The most important mineral is a peculiarly rich argentiferous lead. Cattle-raising and dairy-farming are important branches of industry. Deer, foxes, and wild cats are still found in the forests. The highest peak is the Brocken, 3,740 feet high, and is the birthplace of many weird superstitions and fairy-tales. The Hartz is one of the most frequented tourist resorts in Germany, accessible by rail from any of the principal towns of the empire and traversed by excellent roads.

Hartzenbusch, haarts-en-boosh, Juan Eugenio: Spanish dramatist and man of letters; b. in Madrid, Sept. 6, 1806; the son of a German cabinet-maker. He studied theology, but owing to the death of his father was obliged to learn his trade, which he practiced until 1833, when he became stenographer of the Government journal. Having been inspired, by the first dramatic performance which he attended in 1821, with the desire of writing plays, he began by translating French and Italian dramas, and rewriting old Spanish comedies for the modern stage. The signal success of his drama *Los Amantes de Teruel*, in 1837, decided him to devote himself entirely to a literary career. In 1844 he was made assistant librarian of the National Library at Madrid, succeeding to the position of chief librarian in 1862, a position which he held until his death, Aug. 2, 1880. In 1847 he was elected a member of the Spanish Academy. Of his dramatic works, which show the influence of the French romantic school, the following may be mentioned as the more important: *Doña Mencía* (1838); *La Redoma encantada* (1839); *Alfonso el Casto* (1841); *El Bachiller Mondarias* (1842); *La Madre de Pelayo* (1846); *La vida por honra* (1854). Other works of his are the *Ensáyos poéticos y artículos en prosa, literários y de costúmbres* (1843); and *Cuentos y fabulas* (1861). Hartzenbusch's critical editions of Lope de Vega, Tirso de Molina, Calderon, and Alarcon, published in Rivadaneyra's *Colección de Autores españoles*, are unfortunately far from being faithful reproductions of the original texts.

H. R. Lang.

Haruga'ri, hăă-roo-gaa'rĕē [O. H. Germ., priest, diviner, deriv. of *harug*, temple, grove]: a German order in the U. S., established in 1847. The aim of this order is principally benevolent and social, though the introduction to the constitution also sets forth, as a general purpose, the preservation and extension of the German language in the U. S. The organization comprises 235 subordinate lodges, which in the different States combine into great State lodges, and these again into one national lodge. The order has its own organ, called *Deutsche Eiche* (German Oaks). Most of the lodges possess libraries, and lectures are often given in the lodge-rooms.

Haruspices: See Aruspices.

Harvard: city (chartered 1891); McHenry co., Ill. (for location of county, see map of Illinois, ref. 1–F); on the Chi. and N. W. Railway; 63 miles N. W. of Chicago. It is in an agricultural region, and has electric lights, artesian water system, flour-mill, carriage-wheel factory, sewing-machine works, and two weekly newspapers. Pop. (1880) 1,607; (1890) 1,967.

Editor of "Independent."

Harvard, John, M. A.: the founder of Harvard College; b. in Southwark, England, in Nov., 1607; was educated at Emanuel College, Cambridge, graduating in 1635. He was ordained as a Dissenting minister, married the daughter of a clergyman, and in 1637 emigrated to Massachusetts, where he was made a freeman. In 1638 some land was set off for him in Charlestown, where he performed the duties of minister. In that year he was one of a committee to consider matters "tending toward a body of laws." D. at Charlestown, Mass., Sept. 14, O. S. (24 N. S.), 1638. He left his library and half his estate toward the founding of a college. Mr. Everett delivered the address at the dedication of his monument at Charlestown in 1828. A bronze statue of Harvard, on the Delta, Harvard University, was unveiled Oct. 15, 1884.

Harvard University: the oldest and largest institution of learning in the U. S. It had its beginning in 1636 in a vote of the general court of Massachusetts Bay, which in September of that year agreed to give £400 toward its foundation. The following year the proposed college was ordered to be at Newtown or Cambridge (as, in remembrance of the English university town, it then began to be called), at a spot 3 miles distant from the present Boston Statehouse. No students, however, had been received in 1638, when John Harvard, a young minister of Charlestown, who had been in the colony but a year, died and left half his property and his entire library to the hardly existent college. His gift amounted to nearly £400, with 260 volumes. The general court immediately ordered "that the college agreed upon formerly to be built at Cambridge shall be called Harvard College." The first class was formed in the same year, and graduated, nine in number, in 1642. About the same number appear in the other classes of the seventeenth century, except that in 1644, 1648, 1672, 1682, and 1688 there were no graduating classes. These are the only empty years in the entire history of the college. Through the eighteenth century the annual number of graduates was between twenty and forty; during the first half of the nineteenth century between fifty and seventy. The class of 1860 first crossed the line of 100; 1883, that of 200; 1893, that of 300. The quinquennial catalogue of 1890 contains the names of 16,930 graduates of Harvard University, more than half of whom were then living. In the year 1893–94 there were 3,156 students in attendance, of whom 2,188 were in the charge of the faculty of arts and sciences. The professors and other instructors number 322, an average of more than one teacher to each ten students.

By the circumstances of its foundation Harvard unites the characteristics of the three types of college prevalent in the U. S.—the sect college, the State college, and the college of individual benefaction. Its charter declares its aims to be "the education of the English and Indian youth of this country in knowledge and godliness." Its first board of overseers were charged with "furthering the college in piety, morality, and learning." Its two mottos, *Veritas* and *Christo et Ecclesiæ*, have a similar significance. During the first century of its existence half its graduates entered the pulpit of Puritanism, and few colleges even now send more men into the ministry than Harvard. Yet it has from the first stood for the humane rather than the rigid spirit in religion. Into none even among its earliest constitutions does a word of dogmatic restriction enter. Its Divinity School is forbidden to exact "assent to the peculiarities of any denomination of Christians" from either instructors or students. Until 1870 it was mainly a Unitarian college, but it is now managed in the interest of no single sect. All its faculties and all its governing boards include men of diverse religious beliefs. Its chapel exercises—daily morning prayers, Sunday preaching, and Thursday vesper services—are voluntary. The board of six preachers in charge of these services has had ministers of six denominations among its members. The president, who until 1829 had, with a single exception, been a minister, has since that date generally been a layman. The university, in short, while under strong religious influence, is thoroughly unsectarian.

The relations of the university to the State have been no less peculiar. The general court at first intrusted the government of the college to a board of overseers; but in 1650 a charter was granted, by which the college was made a corporation, consisting of the president, five fellows, and a treasurer, to be known as "the president and fellows of Harvard College." This corporation had power to fill vacancies in its numbers, with the approval of the overseers, and continues in its original form as "the corporation," acting under the charter first issued in 1650, and with its rights and privileges confirmed by a special section in the constitution of the Commonwealth of Massachusetts, framed in 1780. The State government retained control of the board of overseers until 1865, when all official connection between the college and the State was broken by the passage of a legislative act directing that vacancies occurring in the board of overseers thereafter should be filled by the alumni of the college "voting on commencement-day in the city of Cambridge." Instructors are allowed neither to vote nor to become overseers. The corporation holds and manages the property of the university, the overseers having ordinarily no voice in the investment or other disposition of university funds. But in all matters relating to statutes and regulations, the appointment of professors and other instructors, and in general the internal administration of university affairs, the consent of the overseers is necessary. That board consists of the president and treasurer, *ex officio*, and of thirty other persons elected for terms of six years, five retiring each year. All indications of State control have disappeared, except that the Governor is still escorted to commencement by his bodyguard, and that the assembly there gathered is called to order by the county sheriff.

From the beginning, Harvard has derived its chief support from private benefactions. The exemption of its property from taxation is a continual and weighty public gift, but the university has received no other subsidy from the State since 1814. Throughout its entire history government grants seem never to have discouraged individual bounty; since 1870 the gifts from private sources have amounted to $350,000 a year. Its property at present consists of $8,000,000 of interest-bearing funds, of nearly 700 acres of land, and of more than 60 buildings occupied by the university. To these should be added the immense collections of its

museums, and its library of 430,000 volumes and 400,000 pamphlets, a library increasing at the rate of 13,000 volumes a year. In round numbers $1,000,000 is received and expended annually for university purposes. As the majority of the students are poor or in moderate circumstances, $90,000 is appropriated each year to fellowships, scholarships, and other forms of aid. In the public dining-halls 1,500 persons are boarded at a charge of $3 to $4 a week, but the college dormitories are sufficient to lodge hardly more than a third of the students in residence.

The name Harvard University designates the entire complex institution; its central portion is the college. In this the degree of A. B. is given to students of four years' standing who have completed satisfactorily eighteen courses, sixteen of them elective. By a course is understood a single line of study in which three hours a week of instruction are given throughout a year. Each student chooses four such courses at the beginning of the year from a list printed by the faculty of arts and sciences. The courses offered for election number 349. The plan of the elective system, gradually matured at Harvard during half a century, is to fix the quantity and quality of study, but to leave the choice of topic to the individual student. Accordingly, it may in a sense be said that members of the three upper classes are free to choose any studies they desire; but as the advanced and technical courses of each department presuppose careful elementary training, the choice is in practice much restricted. During his brief college life a student is able to pursue only about one-thirteenth of the instruction offered.

Each department of the university has its own dean and faculty, but the College, the Graduate School, and the Lawrence Scientific School have also a faculty in common, called the faculty of arts and sciences. The Graduate School, giving the degrees of A. M., Ph. D., and S. D., has this year (1893–94) 252 students; the Scientific School (1847), giving the degree of S. B., has 280. In Cambridge, too, though governed by independent faculties, are the Divinity School (1819), with its 36 undergraduate and 11 graduate students, which requires of candidates for its degree of D. B. that they shall already possess the degree of A. B.; and the Law School (1817), whose course is three years and whose students number 353. The other departments of the university are not in Cambridge. In Boston are the Medical School (1783), containing 446 students and 81 instructors, and requiring a four years' course of study; the Dental School (1867) and the School of Veterinary Medicine (1882), each giving its degree after a graded course of three years. The School of Agriculture and Horticulture, known as the Bussey Institution (1861), is in Jamaica Plain, within the limits of Boston. The beautiful Arnold Arboretum occupies 120 acres of the Bussey estate. The library (1839–77), observatory (1846), botanic gardens (1805), university (1852–89) and Peabody museums (1876–89), memorial hall (1870–76), the gymnasiums (1879 and 1890), boat-houses (1870 and 1890), and athletic-grounds are all in Cambridge. To students in one department of the university instruction in all others is open without additional charge. Summer school courses, yielding no degree, and mainly in science, history, language, and physical training, are offered in Cambridge during six weeks of July and August for a small fee, and are attended by large numbers of teachers and other students. The annual fee in most of the departments of the university is $150, but that of the Divinity School is $50, and that of the Medical School $200.

Radcliffe College.—In 1878 a company of men and women of Cambridge and Boston were organized under the title of "A Society for the Collegiate Instruction of Women." This society, quickly known to popular speech as "The Harvard Annex," employed such teachers of Harvard College as were willing to undertake the labor of giving to young women the instruction already given in the college to young men. Its building, overshadowed by the Washington elm, is known as Fay House. In 1893 application was made to the Legislature for a charter and for the right to grant degrees. Prior to that date it had given only certificates of study. The institution is now called Radcliffe College, in memory of Anne Radcliffe, Lady Moulson, the founder of the first scholarship in Harvard College; its board of visitors (without whose consent no instructor can be appointed) is the corporation of Harvard University; its degrees will be signed by Harvard's president; but its property is held by an independent board. Radcliffe College started with an enrollment of 250 students.

The following are the names of the presidents of Harvard University: Henry Dunster, 1640–54; Charles Chauncy, 1654–72; Leonard Hoar, 1672–75; Uriah Oakes, 1675–81; John Rogers, 1682–84; Increase Mather, 1685–1701; Samuel Willard, 1700–07; John Leverett, 1707–24; Benjamin Wadsworth, 1725–37; Edward Holyoke, 1737–69; Samuel Locke, 1770–73; Samuel Langdon, 1774–80; Joseph Willard, 1781–1804; Samuel Webber, 1806–10; John Thornton Kirkland, 1810–28; Josiah Quincy, 1829–45; Edward Everett, 1846–49; Jared Sparks, 1849–53; James Walker, 1853–60; Cornelius Conway Felton, 1860–62; Thomas Hill, 1862–68; Charles William Eliot, elected in 1869.

Quincy's *History of Harvard University* (Cambridge, 2 vols., 1840) gives the fullest account of the college. W. R. Thayer's *Historical Sketch of Harvard University*, in the *History of Middlesex County* (Boston, 1890), is compact and interesting. *The Harvard Graduates' Magazine*, a quarterly journal begun in 1892, contains a careful record of whatever concerns the university. The annual reports of the president and treasurer are sent free on application, as are also pamphlets descriptive of each of the departments and of the conditions of admission. GEORGE HERBERT PALMER.

Harvest-bug: (*Leptus autumnalis*) one of the *Acarus* family, which receives its name from the fact that it attacks the workmen at harvest. It thrives especially about the middle of July, is found on blades of grass and other growths, and thence gains access to the legs, thighs, and abdomen of persons walking in the fields. It has a minute, brilliant red or pink body, and occasions intolerable itching and sometimes even ulceration. WILLIAM PEPPER.

Harvest-flies: See CICADA.

Harvest Moon: the name given in high northern latitudes to the full moon of the lunation which occurs about the time of the autumnal equinox. The circumstance which has made it noticeable and given it its name is that during its lunation the rising of the moon for several successive days before and after the full takes place nearly at the same hour, thus favoring the work of the farmer during harvest, whereas, taking the year through, the rising is retarded on an average about fifty minutes per diem. The cause of this phenomenon is to be found in the inclination of the earth's orbit, or the ecliptic to the equator. The moon's apparent daily motion (in rising and setting) is parallel to the equator, but its progressive motion in its own orbit is nearly coincident with the ecliptic, there being an inclination of only about five degrees between these two paths. To an observer on the Arctic Circle, when the first point of Libra (the autumnal equinox) comes to the western horizon, the ecliptic coincides with the horizon all around; and if the sun is on the first of Libra at that time, it is sunset to the observer. If full moon occurs at the same moment, the moon will be in the first of Aries, opposite to the sun, and it will be moonrise to the observer. The next evening the sun will have advanced about one degree in its orbit, and the moon thirteen degrees; but this movement will affect the hour of the moon's rising comparatively little, though it will change considerably the azimuth (or distance from north or south point) of its position on the horizon at rising. And, as for several evenings before and after the equinox the moon's orbit will continue to be nearly coincident with the horizon at the close of the day, it follows that for several successive days the moon will rise not very far from the same hour. Though it is to observers on the Arctic Circle that this phenomenon is most strikingly apparent, it is more or less noticeable in all high latitudes, as in Great Britain, Norway, and to some degree in Canada. It does not occur at all at the equator.

Harvey, GEORGE: artist; b. at St. Ninians, near Stirling, Scotland, in Feb., 1806; early showed a great talent for drawing; entered in 1824 the Trustees' Academy in Edinburgh; made rapid progress; became an associate of the Royal Scottish Academy in 1826, in 1829 a fellow, and in 1864 its president. His best-known paintings are those treating subjects of religious history from a Puritan point of view; as, for instance, *Covenanters Preaching*, *Covenanters' Communion*, *John Bunyan and his Blind Daughter*, etc. But he was also very successful as a genre-painter (*The Curlers*, *A Skule Skailin'*, etc.) and as a painter of landscapes. He was knighted in 1867; wrote *Color of the Atmosphere*, which was published, with illustrations, in *Good Words*. In 1870 he published *Notes of the Early History of the Royal Scottish Academy*. D. in Edinburgh, Jan. 22, 1876. Revised by RUSSELL STURGIS.

Harvey, Moses, LL. D., F. R. G. S., etc.: scientist and author: b. at Armagh, Ireland, Mar. 25, 1820; graduated at Belfast College; was Presbyterian minister of Maryport, Cumberland, England, in 1844; from 1852–78 was minister of the Free Presbyterian church at St. John's, Newfoundland, where he also engaged in literary and scientific studies and became a popular lecturer; author of *Lectures, Literary and Biographical*; *Thoughts on the Poetry and Literature of the Bible*; *Lectures on Nineveh and Egypt*; *The Harmony of Science and Revelation*; *Newfoundland—the Oldest British Colony* (in collaboration with Joseph Hatton); *Where are We and Whither Tending* (London, 1887), an estimate of the reality of human progress, etc.

Harvey, William, M. D.: the discoverer of the circulation of the blood; b. at Folkestone, Kent, Apr. 1, 1578; the son of a substantial yeoman; was educated at Caius College, Cambridge, and at Padua, where he studied under Fabricius and took his doctor's degree; returned to England in 1602; became physician to Bartholomew's Hospital, London; Lumleian lecturer on Anatomy and Surgery 1615; was physician to James I. and Charles I.; was attached to the court of the latter, followed his fortunes in the civil war, and became warden of Merton College, Oxford, probably in 1643. Harvey's great discovery of the circulation of the blood seems to have been suggested by him in 1616, announced in 1619, and published in the *Exercitatio de motu cordis et sanguinis* (1628). Other *Exercitationes* on the subject appeared in 1649. His later years were occupied in observations upon generation, upon which he published a treatise in 1651. Servetus, Paolo Sarpi, Cæsalpinus, and perhaps Fabricius, Harvey's tutor, would appear to have believed in the circulation of the blood, but Harvey first established the truth of the doctrine. D. in London, June 3, 1657. (See *Life* by Willis, 1878.) The capillary channels by which the blood is transferred from the arteries to the veins were discovered in 1661 by Marcello Malpighi.

Harvey, William Henry, M. D.: botanist; b. near Limerick, Ireland, Feb. 5, 1811; educated at Ballitore School; spent six years (1835–41) studying the botany of the Cape of Good Hope; keeper of the herbarium of Trinity College, Dublin (1844–56); Professor of Botany (1856–66). He is best known for his published works upon the algæ; e. g. *Manual of British Algæ* (1841); *Phycologia Britannica* (1846–51); *Nereis Boreali-Americana* (1852–58); *Phycologia Australica* (1858–63). His *Flora Capensis*, begun in 1859, was left incomplete. D. in Dublin, May 15, 1866.

Charles E. Bessey.

Harveyized or **Harveyed Steel**: steel that has been face-hardened by the process invented by Hayward A. Harvey (d. Aug. 28, 1893). The process is based on the fact that steel when exposed to a moderate temperature in contact with carbonaceous material absorbs some carbon and becomes harder, that being a characteristic of higher carbon-steels. Although Harveyized steel has been employed for commercial purposes, as in the manufacture of stone-crusher jaws and bicycle and typesetting-machine parts, subject to specially severe wear, its principal application has been in the manufacture of armor. The navies of practically all the maritime powers now specify that armor shall be Harveyized. The armor-plate is placed in a coal or gas-fired furnace, the part to be treated being packed in a mixture of charcoal and bone-black. The parts which are to remain in the original condition are bedded in sand. The plate is exposed to a temperature approximating that of the melting-point of cast iron, the time required being about three weeks, including the period needed to heat the furnace to the required temperature. As soon as withdrawn the plate is chilled by spraying with water. The depth of action usually aimed at is about 1 to 1½ inches, the carbon contents being raised from originally 0·20 to 0·30 per cent. to 0·90 to 1 per cent. The resistance of the armor-plate to impact from projectiles is increased from 60 to 100 per cent., according to the thickness of the plate treated, the increase being smaller with thicker plates. C. K.

Harwich: town of England, in the county of Essex; at the mouth of the Stour; 71 miles by rail N. E. of London (see map of England, ref. 11-L). Its harbor is safe, spacious, fortified, protected by breakwaters, and one of the best on the east coast of England. Harwich exports cement and fish, etc., and imports principally grain, timber, and tobacco. Ship-building and the manufacture of cement are important industries. Dovercourt, near Harwich, is a sea-bathing resort. Pop. (1891) 8,191.

Harwich: town (settled in 1694); Barnstable co., Mass.; on the Old Colony Railroad and the south side of Cape Cod; 85 miles S. E. of Boston (see map of Massachusetts, ref. 5-K). It has 6 churches, 14 public schools, public library, and weekly newspaper; is the center of a large cranberry region; and has important fishing and coasting interests. Pop. (1890) 2,734; (1895) 2,532. Editor of "Independent."

Harwood, Andrew Allen: rear-admiral U. S. navy; b. in Settle, Bucks co., Pa., in 1802; midshipman Jan. 1, 1818; lieutenant Mar. 3, 1827; commander Oct. 2, 1848; captain Sept. 14, 1855; chief of bureau of ordnance and hydrography Aug. 6, 1861; commodore July 16, 1862; commandant of Washington navy-yard and in command of Potomac flotilla 1862–63; secretary of lighthouse board and member of examining board 1864–69; rear-admiral Feb. 16, 1869; retired Oct. 9, 1864. In 1819–21, on board the Hornet, engaged in suppression of African slave-trade and piracy in West Indies; on board Sea Gull, under Com. Porter, operating in West Indies against pirates, 1823; in 1844 member of a commission to visit dockyards and foundries in Great Britain and France and report on ordnance improvements; 1851–52 member of board to prepare ordnance instructions for navy; during the civil war prepared a small work on *Summary Courts Martial*, and in 1867 published his *Law and Practice of United States Naval Courts Martial*. D. at Marion, Mass., Aug. 28, 1884. S. B. Luce.

Harz: See Hartz.

Hasdeu, haas'dow, Bogdan Petriceicu: Roumanian historian and philologist; b. at Hotin (or Chotin), in Bessarabia, Feb. 16, 1838. He studied at Charkov (Kharkof); became Professor of History at Jassy after the Crimean war, and settled in Bucharest after his marriage in 1864, where he became Professor of Comparative Philology at the university. Among his works, besides some poems, are (*Poesii*, 1873) also dramatic works, such as *Răsvan Vodă* (1867); but his most important works are historical and linguistic, and these show wide learning and research. Among them may be mentioned *Archiva istorică a Românilor* (3 vols., 1865–67); *Istoria critică a Românilor* (vol. i., 1875); *Fragmente pentru istoria limbei române* (1876); *Cuvente den bătrâni* (contains texts and studies of the Roumanian language between 1550 and 1600; 2 vols., 1878–80); *Psaltirea publicată rumânesce la 1577 de Coresi* (1881); and above all the great Roumanian dictionary, *Etymologicum magnum Romaniæ*, a work planned on an immense scale, and, so far as completed, superior to any previous work in Roumanian lexicography. Hasdeu has also written numerous articles in scientific journals, and is the editor of *Revista Nouă* (*The New Review*), a literary review begun in 1888. E. S. Sheldon.

Hasdrubal [Lat.]: the name of many famous Carthaginians, among whom may be mentioned—(1) son of Hamilcar Barca and brother of Hannibal; was defeated by the Scipios in a battle on the Iberus, 216 B. C. In 207 B. C. he crossed the Alps and entered Italy for the purpose of bringing help to his brother. He was intercepted, however, and defeated and slain at the Metaurus in Umbria. The first news of this defeat and the consequent ruin of the Carthaginian cause in Italy was conveyed to Hannibal by the bloody head of Hasdrubal, thrown into the camp by soldiers of the Roman army. (2) A son of Gisco, who served in Spain in the second Punic war; was totally defeated by Scipio at Silpia, 206 B. C.; was defeated before Carthage by Scipio, 204 B. C., and committed suicide by poison. (3) A general in the last Punic war. G. L. Hendrickson.

Hase, haa'ze, Benedikt: scholar; b. at Sulza, in Saxony, May 11, 1780; went in 1801 to Paris; was appointed in 1805 to a place in the Royal Library in the MS. department, where he inaugurated a very liberal policy toward foreign scholars; in 1816 Professor of Modern Greek and of Palæography in the School of Oriental Languages; Professor of the German Language and Literature in the Polytechnic 1830; Professor of Comparative Grammar at the Sorbonne 1852; edited *Laurentius Lydus de Ostentis* (Paris, 1823); wrote an introduction to the edition of *Lydus de Magist. Rom.* by Fuss; edited Leo Diaconus for the *Corpus Byz. Script.* (Bonn, 1828); and the new edition of *Stephani Thesaurus Linguæ Græcæ*, aided by De Sinner and Fix, afterward by W. and L. Dindorf, who continued the work after his death. D. Mar. 21, 1864. See Guigniaut, *Notice historique sur la vie et les travaux de C. B. Hase* (Paris, 1867). Revised by A. Gudeman.

Hase, haa'ze, Karl August: theological author; b. at Steinbach, Saxony, Aug. 25, 1800; studied at Leipzig; im-

prisoned in 1819 for belonging to the Burschenschaft; became a private tutor in divinity at Tübingen 1823; graduated at Leipzig 1828; became in 1829 Professor of Philosophy there; Professor of Theology at Jena 1830. He was long a prominent rationalist; in 1844 became an editor of the *Protestantische Kirchenzeitung*. He published *Das alten Pfarrers Testament* (Tübingen, 1824); *Lehrbuch der Evangelischen Dogmatik* (Stuttgart, 1826; 6th ed., Leipzig, 1870); *Gnosis* (Leipzig, 1826–28; 2d ed. 1870); *Hutterus Redivivus* (Leipzig, 1828; 12th ed. 1883); *Das Leben Jesu* (Leipzig, 1829; 5th ed. 1865; in English by J. F. Clarke, 1859); *Kirchengeschichte* (Leipzig, 1834; 11th ed. 1886; English trans. by Blumenthal and Wing); *Ideale und Irrthümer* (Leipzig, 1872; 4th ed. 1891); *Geschichte Jesu* (Leipzig, 1876; 2d ed. 1891); *Annalen Meines Lebens* (Leipzig, 1891). D. Jan. 3, 1890.

Hasebroek, haa'se-brook, Johannes Petrus: poet; b. in Leyden, Holland, Nov. 6, 1812; educated in his native place; completed his theological studies in 1836, and became pastor at Heiloo. In 1840 he was called to Breda, where he married Anna Maria van Tets. In 1849 he transferred his labors to Middleburgh, but in 1851 he again made a change, this time to Amsterdam, where he remained till his retirement from active life in 1883. As a poet, Hasebroek is chiefly known for the gay, tender, half-humorous, half-serious verses put by him in the mouth of one *Jonathan*. The volume containing these (*Waarheid en Droomen door Jonathan*) appeared first in Haarlem in 1840 (7th ed., Leyden, 1887). Besides this, he has published the following volumes of verse: *Windekelken* (1859); *Nieuwe Windekelken* (1864); *Sneeuwklokjes* (1878); *Winterbloemen* (1879); *Vesper* (1887). A list of Hasebroek's prose essays and discourses is given by J. ten Brink, *Geschiedenis der Noord-Nederlandsche Letteren in de XIX^e Eeuw* (vol. i., Amsterdam, 1888).
A. R. Marsh.

Hashish, hash'ēsh [Arab. *hashīsh*, hay, herbage]: a variety of *Cannabis sativa* (hemp); is cultivated in districts N. of Calcutta for the production of (1) *bhang* (Hindustani), *hashish* (Arabic), the dark-green stalks and green leaves used in smoking, or as a constituent of a sweetmeat (*majun*); (2) *ganja*, the flowering shoots brought into the London drug-market under the name of *guaza*; (3) *charas*, or *churrus*, the resin which exudes from the branches and leaves of the plant. It has been shown that an extract of the hemp grown in the U. S. shares the qualities of that of India, but doubtless in a less degree, for the hemp of hot countries has more of the active resin (*churrus*) than the hemp of temperate climates. Hashish has long been employed in medicine in Asia. Arabs, Persians, Indians, Chinese, and South Africans esteem it for its intoxicating powers, the symptoms produced by it seeming to be particularly agreeable to them. Many people of European race experience very disagreeable effects from overdoses, and upon those who are intoxicated by its use the effects are extremely varied. This uncertainty of effect greatly limits its use in medicine, but carefully prepared extracts give, as a rule, satisfactory results medicinally. Upon some persons its influences as an anodyne and hypnotic in certain diseases are very happy. Though poisonous doses produce alarming symptoms, the drug does not cause death. Revised by H. A. Hare.

Haskell: town (founded 1884); capital of Haskell co., Tex. (for location of county, see map of Texas, ref. 2–F); 60 miles N. of Abilene. It is on an attractive table-land in an agricultural and stock-raising region, and has an abundant water-supply from springs and artesian wells. The county, which is in the southern part of the famous Panhandle of Texas, was created in 1858, and remained unsettled till the founding of Haskell town. Pop. (1890) 745.
Editor of "Free Press."

Has'lingden: town; in Lancashire, England. It is situated 7 miles S. E. of Blackburn (see map of England, ref. 6–G), in a mountainous region rich in coal mines and stone quarries, and carries on extensive manufactures of woolen and cotton. Pop. (1891) 18,225.

Hassam, Childe: genre and landscape painter; b. in Boston in 1859; pupil of Boulanger and Lefebvre, Paris; member Society American Artists (1890), American Water-color Society, and president New York Water-color Club; gained third-class medal, Paris Exposition, 1889. He usually paints street scenes, finding his subjects in New York, Boston, and Paris, and his landscape work is notable for luminousness and brilliancy of color. Studio in New York.
W. A. C.

Has'sard, John Rose Greene: journalist: b. in New York city, Sept. 4, 1836; graduated at St. John's College, Fordham, N. Y., in 1855. He assisted in preparing *The New American Encyclopædia*; was editor of *The Catholic World* in 1865, and was engaged on the Chicago *Republican* in 1865–66. From 1866 he was on the editorial staff of *The New York Tribune*, first as musical critic and after as literary editor. He published a *Life of Archbishop Hughes* (1866); *The Ring of the Nibelungs* (1877); a *Life of Pius IX.*, and a school *History of the United States* (1878); and *A Pickwickian Pilgrimage* (1881). D. in New York city, Apr. 18, 1888. Revised by H. A. Beers.

Hasselquist, Tuvey Nelson, D. D.: Lutheran theologian; b. at Ousby, Sweden, Mar. 2, 1816; removed to North America 1852; for many years the leader of the Swedish Lutheran Church in the U. S.; was for nearly twenty-three years president of the Theological Seminary at Rock Island, Ill. D. at Rock Island, Ill., Feb. 4, 1891. H. E. J.

Hasselt: town of Belgium; the capital of the province of Limbourg, on the Demer; 18 miles by rail N. W. of Maastricht (see map of Holland and Belgium, ref. 9–G). It has large distilleries, salt-refineries, and manufactures of linen and lace. On Aug. 6, 1831, the Dutch troops under the Prince of Orange won a victory over the Belgians here. Pop. (1891) 14,314.

Hassler, haas'ler, Ferdinand Rudolph: surveyor; b. at Aarau, Switzerland, Oct. 6, 1770; was brought to notice in the U. S. by Albert Gallatin; Professor of Mathematics at West Point Military Academy 1807–10; sent as scientific ambassador to Europe, with salary of a foreign minister; the first superintendent of the U. S. Coast Survey, which he conducted in 1816–18 and in 1832–43 (see Coast and Geodetic Survey); for years chief of the Bureau of Weights and Measures. He was author of text-books on mathematics; of a *System of the Universe*, in 2 vols.; and of many valuable scientific reports, including *Report to the United States Senate on Weights and Measures* (1832), and another to the Secretary of the Treasury on the same subject (1842). D. at Philadelphia, Nov. 20, 1843.
Revised by J. W. Powell.

Hassler Expedition (so known from the vessel used, the Hassler, which was named in honor of the first superintendent of the U. S. Coast Survey): an expedition by the Coast Survey along the Atlantic coast and to the Pacific, by way of the Straits of Magellan. Prof. Agassiz and a few assistants accompanied the expedition. The steamer sailed from Boston Dec. 4, 1871. Only surface observations were made on the passage to St. Thomas. At Barbados dredgings rich in results were made in 100 to 120 fathoms, and along the coast of Brazil the dredge was used with success. Rio de Janeiro was reached Jan. 23, 1872. After stopping at Montevideo for coal, the next halting-place was San Matias Bay, Patagonia, where the bluffs showed fine sections of the strata underlying the Patagonian plains. In the Straits of Magellan stoppages were made every night, and occasionally a day or two was spent in interesting localities. Thus at Possession Bay an excursion inland was made by members of the party as far as Mt. Aymon, which was found to be an extinct volcano, and the easternmost of a chain of similar ones extending in a westerly direction. Elizabeth and Magdalen islands, great breeding-places of birds; Sandy Point, a Chilian penal settlement: Glacier Bay, with a glacier which reached nearly to the sea-level; and Sholl Bay were other stopping-places where abundant collections were made and interesting observations recorded on the former and present state of glaciers. The channels of internal navigation were followed through Smyth's Channel to the Gulf of Penas. On the coast of Chili, San Carlos, Lota, and Talcahuano were visited. The steamer went from the latter place to Juan Fernandez, while Prof. Agassiz went by land to Valparaiso. Some deep soundings were taken in the neighborhood of that island. Valparaiso, Caldera, Pisco, Callao, Payta, and the Galápagos islands were next visited, and finally San Francisco was reached in Aug., 1872, after touching at Panama, Acapulco, Magdalena Bay, and San Diego. Some of the zoölogical results of the expedition have been published by Messrs. A. Agassiz, Lyman, and Pourtalès, but the death of Prof. Agassiz prevented the publication of his numerous observations, except in the preliminary form of letters to Prof. Peirce. Revised by J. W. Powell.

Hastings, hās'tingz: parliamentary and municipal borough of England, in Sussex; on the English Channel; 62

miles S. S. E. of London (see map of England, ref. 14–L). Here William the Conqueror landed, and the decisive battle known as the battle of Hastings was fought in 1066 at Senlac, in the vicinity. (See BATTLE). The excellent harbor was ruined in the time of Elizabeth by a storm, and Hastings is now best known as an elegant and much-frequented watering-place. It is the premier Cinque port. There are numerous hotels, excellent schools, a public park, three public gardens, a fine esplanade 3 miles long, and a long pier having at its extremity a pavilion accommodating from 2,000 to 3,000 people. One member is returned to the House of Commons. St. Leonards-on-Sea is practically part of Hastings. Pop. (1891) 52,340.

Hastings: city; capital of Barry co., Mich. (for location of county, see map of Michigan, ref. 7–I); on the Thornapple river and the Chi., Kal. and Saginaw and the Mich. Cent. Railways; 32 miles S. E. of Grand Rapids. It is in a wheat-growing region, and has 6 churches, 2 public schools (cost $60,000), 2 ward schools, new jail and court-house ($60,000), 5 periodicals, and manufactures of felt boots, furniture, lawn hose-reels, steam-engines, etc. Pop. (1880) 2,531; (1890) 2,972; (1894) 3,014.

EDITOR OF "BANNER."

Hastings: city (founded 1853); capital of Dakota co., Minn. (for location of county, see map of Minnesota, ref. 10–F); on the Mississippi river, and the Chi., Mil. and St. P. Railway; 20 miles S. E. of St. Paul. It is an important grain and lumber market; has 3 flour-mills, several elevators, sawmills, and manufactures of furniture, carriages, and wagons, and foundry products, and contains 12 churches, good public and parochial schools, public library, and 3 newspapers. Pop. (1880) 3,809; (1890) 3,705; (1895) 3,848.

EDITOR OF "GAZETTE."

Hastings: city: capital of Adams co., Neb. (for location of county, see map of Nebraska, ref. 11–F); on the Burl. and Mo. River, the Fre., Elk. and Mo. Val., the St. Jo. and Grand Is., and the Mo. Pac. Railways; 96 miles W. of Lincoln. It has 14 churches, German Baptist College, Presbyterian colleges (cost of grounds and buildings $75,000), Roman Catholic convent and College of the Visitation (grounds and buildings $80,000), high school ($25,000), Bethany Home, Asylum for the Incurable Insane, free hospital, sewage system ($100,000), water-works, ($100,000), gas and electric light plants, and 3 daily, 6 weekly, and 2 other periodicals. It is in an agricultural and stock-raising region, and has numerous manufactures of importance. Pop. (1880) 2,817; (1890) 13,584. EDITOR OF "NEBRASKA."

Hastings, THOMAS, MUS. DOC.: b. in Washington, Conn., Oct. 15, 1784; removed to Clinton, N. Y., with his father when twelve years of age; was editor of a religious journal of Utica, N. Y., 1824–32; became a music instructor and composer of sacred music in New York city. Author of *Spiritual Songs* (1832); *Christian Psalmist* (1836); of several volumes of poems, hymns, etc., and compiler of many collections of church music. Many of his compositions are widely known and very popular. D. in New York, May 15, 1872.

Hastings, THOMAS SAMUEL, D. D., LL. D.: clergyman; b. in Utica, N. Y., Aug. 28, 1827; graduated at Hamilton College 1848, and at Union Theological Seminary 1851, and after another year there of study was pastor of the Presbyterian church, Mendham, N. J., 1852–56. From 1856 to 1881 he was pastor of the West Presbyterian church, New York city. In 1881 he was made Professor of Sacred Rhetoric in Union Theological Seminary, and was its president from 1888 to 1897 when he resigned.

Hastings, WARREN, LL. D.: statesman; b. at Churchill, Oxfordshire, England, Dec. 6, 1732; was educated at Westminster, where he distinguished himself as a scholar. He went to Bengal in 1750; was taken prisoner by Surajah Dowlah 1756; served under Clive 1757; was resident at the court of Meer Jaffier 1757–61, and became a member of the council at Calcutta 1761, under the presidency of Vansittart, who had been introduced by Lord Clive from Madras. Generally, the period of Vansittart's government is described as forming the most revolting page of the history of British rule in India. The members of the council, the commanders of the troops, and the commercial residents plundered on a great scale. The youngest servant of the company claimed the right of trading on his own account, free from taxation and independent of any local jurisdiction. Hastings returned to Great Britain in 1764, and expended the considerable fortune he had acquired for the relief of his poor relatives; returned in 1769 to India, where he had hitherto been a general favorite. He now secured rapid advancement. He was made second in the Madras council 1769; became president of the supreme council of Bengal 1772; assisted the Nabob of Oude against the Rohillas 1773–74; and was appointed the first Governor-General of India 1774–85. He immediately quarreled with the councilors in 1774. The next four years were years of turbulent discord between the Governor-General and the council, each claiming supreme authority. Hastings received notice in 1778 that his resignation was accepted, but disavowed the resignation and refused to give up the office; married the divorced Baroness Imhoff, to whom he had for nine years been avowedly attached, in 1778; sent an expedition against the French in 1778; fought a duel with Philip Francis in 1780; made Sir Elijah Impey judge of the court of appeal in 1781; compelled the Madras government to give up the revenues of the Carnatic to the nabob in 1783, in disobedience of the orders of the directors; made the conquest of Benares in 1784, and concluded the treaty of Chunar; resigned and went to England in 1785. Meanwhile, a long struggle had gone on in Great Britain between the East India Company and the ministers of the crown for the supreme control of Indian affairs and the attendant patronage; and Hastings's success was the company's mainstay. Articles of impeachment for high crimes and misdemeanors were presented by Burke against Hastings in Feb., 1786. In his famous trial, which began Feb. 13, 1788, and ended Apr. 23, 1795, the ability and eloquence of Burke, Sheridan, and Fox failed to convict him, it having been conclusively shown that India had improved greatly under his rule, and that he was extremely popular with the natives and with the majority of the Europeans of his government. As a ruler he was one of the ablest India ever had; but being a man of positive character, he could not fail to make enemies; and there is no doubt that his quarrel with Francis in India made the latter his bitter opponent. Hastings expended his fortune in defending himself in the great trial, and was afterward supported by a large yearly allowance from the East India Company. D. at Daylesford, Aug. 22, 1818. See Mill, *History of India*; Lyall, *Warren Hastings*; Stephen's *Nuncomar* in *National Biography*; and Macaulay's brilliant but untrustworthy essays on *Warren Hastings*.

Revised by C. K. ADAMS.

Hat: See HEAD-DRESS and HAT-MAKING.

Hatasu, haä'ta-soo (variously called *Hatshepset*, *Chnemt-Amun*, *Ma-ka-Ra*, or *Ramaka*): an Egyptian queen of the eighteenth dynasty; daughter of Thothmes I., sister of Thothmes II., and half-sister of Thothmes III. She was associated successively with all three in royal office; as coregent in the later years of the first, as queen of the second, and as guardian and coregent with the last. She left many monuments, some of which were dedicated to her father. After the death of Thothmes II., she erased his name from some of his inscriptions, inserting instead her father's name or her own. In turn her name was similarly treated by Thothmes III., an evidence of the lack of good feeling between them. Further mutilation of her monuments on account of the presence of the name of the god Amon is to be traced to the fanatic zeal of the heretic king of the same dynasty, Amenophis IV., or Khunaten. She assumed man's attire and caused herself to be addressed as a male. A significant change of costume, involving the covering of the upper part of the body, occurred at this time. (See EGYPT, ANCIENT.) The chronology of her reign is uncertain. She probably ruled in all about twenty years; Thothmes III. was associated with her in her sixteenth year. The monuments mention the names of all three of the children singly and together, indicating their association in office. With Thothmes III. she was engaged in mining in the Sinai peninsula, as their cartouches, found in Wadi Maghara, show. Gradually, however, Thothmes III. gained the supreme power and the final fate of the queen is unknown, but it is suspected that she was the victim of violence. The inscriptions at Ombos and Medinet Habu show the changed relations of the two.

Hatasu built at Thebes the wonderful temple known as Deir el-Bahri. She also erected several obelisks near it, one of which, 97½ feet high and composed of Syenite granite, according to its own inscription was quarried, cut, moved, polished, inscribed, and set up in the short space of seven months. The temple stands against the sandstone cliffs to the W. of the Nile, beyond the low ground. It is a gigan-

tic structure on four levels connected by majestic staircases. An avenue of sphinxes led toward the river. The building is among the finest in Egypt and its inscriptions are executed with great care and fidelity. On its rear wall against the finest to call is a series of representations of the famous naval and trading expedition sent out by Hatasu in her ninth year to the land of Punt in quest of incense. Five ships, equipped with oars and sails and fully manned, proceeded to the south along the Red Sea coast. The arrival and meeting with the natives and some native scenes are depicted; the loading and the arrival of the ships at Thebes also are shown. The objects brought back were gold, precious stones, ivory, ebony, balsam, incense, and even living trees, apes, greyhounds, and giraffes. Hatasu's period was one of peace at home, but of growing insubordination among tributary people both east and west. Thothmes III. had practically to reconquer the whole world anew.

CHARLES R. GILLETT.

Hatch, EDWIN, D. D. (Church of England): b. at Derby, England, Sept. 4, 1835; graduated at Oxford 1857; was Professor of Classics in Trinity College, Toronto, Canada, 1857–62; rector of the high school, Quebec, 1862–67; vice-principal of St. Mary Hall, Oxford, England, 1867, till his death there, Nov. 10, 1889. In 1883 he became rector of Purleigh, and in 1884 university reader in Ecclesiastical History. He was Bampton lecturer 1880, and as such produced that remarkable book, *The Organization of the Early Christian Churches* (London, 1881; 2d ed. 1882.; Germ. trans., by A. Harnack, Giessen, 1883). He also wrote *The Growth of Church Institutions* (1887); *Essays in Biblical Greek* (1889); and the posthumous Hibbert lectures, *Greek Influence on Christianity* (1890); and with H. A. Redpath, *Concordance to the Septuagint and other Greek Versions of the Old Testament* (1892, *sqq.*). See *Memorials* edited by his brother (1890). SAMUEL MACAULEY JACKSON.

Hatch, JOHN PORTER: military officer; b. in Oswego, N. Y., Jan. 9, 1822; graduated from the U. S. Military Academy, and was appointed brevet second lieutenant of infantry July 1, 1845, rising through successive grades to be colonel of Second U. S. cavalry 1881; in the Mexican war he took part in various engagements from Palo Alto to the final capture of the city of Mexico, and was breveted first lieutenant and captain for gallantry in battle; subsequently in garrison and on frontier duty; engaged on frequent expeditions against hostile Indians up to 1861. In the civil war he was appointed brigadier-general of volunteers Sept., 1861, and commanded a cavalry brigade in the Shenandoah valley and Northern Virginia; engaged at second battle of Bull Run and Chantilly; at the battle of South Mountain Sept. 14, 1862, commanded a division and was severely wounded; subsequently commanded various districts in the South; breveted from major to major-general for gallant services during the war; promoted colonel Second Cavalry June 26, 1881; retired by operation of law Jan. 9, 1886.

Hatchel: See HACKLE.

Hatch'ie River: a stream having its source in the N. E. of Mississippi. It flows N. into Tennessee, and then W. N. W. to the Mississippi river. Its mouth is 25 miles N. of Memphis. Small steamboats can run for half the year as far up as Bolivar, Tenn., 150 miles from its mouth. Its valley is very fertile. Its lower portion is often called the *Big Hatchie*.

Hatching: See INCUBATION.

Hatchment: an *achievement* or display of the heraldic bearings of any person. (See HERALDRY.) Especially, in modern Great Britain, a tablet painted with the escutcheon, etc., and hung on the front wall of a house in which there has died, or which belonged to, the person whose arms are represented on the *hatchment*. R. S.

Hatfield: town; Hampshire co., Mass. (for location of county, see map of Massachusetts, ref. 3-E); on the Connecticut river and the N. Y., N. H. and H. Railway; 5 miles N. of Northampton. Hatfield has considerable manufactures of lumber, etc., and is the seat of an academy. It was during colonial times much exposed to Indian attacks, and spirited fights occurred here May 30 and Oct. 19, 1675. On Sept. 19, 1677, the Indians made a bloody assault upon the settlement. Pop. (1880) 1,495; (1890) 1,246; (1895) 1,262.

Hatfield, EDWIN FRANCIS, D. D.: b. in Elizabethtown, N. J., Jan. 9, 1807; graduated at Middlebury College, Vermont, in 1829; spent two years (1829–31) in Andover Theological Seminary; was ordained by the third Presbytery of New York May 14, 1832; was pastor of the Second Presbyterian church of St. Louis, Mo., 1832–35; of the Seventh Presbyterian church of New York city 1835–56; and of the North Presbyterian church 1856–63. He became special agent of the Union Theological Seminary in New York 1864–66, and again 1870–73, raising a large sum of money for its endowment. From 1846 he was stated clerk of the General Assembly. In 1850 he received the degree of D. D. from Marietta College, Ohio. Dr. Hatfield also did much literary work. He published *Universalism as it Is* (New York, 1841); *Memoir of Elihu W. Baldwin, D. D.* (1843); *St. Helena and the Cape of Good Hope, with Incidents in the Missionary Life of the Rev. J. M. Bertram* (1852); *The History of Elizabeth, N. J.* (1868); *The Church Hymn-book, with Tunes* (1872); *The Chapel Hymn-book* (1873); *The Poets of the Church: a Series of Biographical Sketches of Hymn-writers, with Notes on their Hymns* (1884). He also edited *The New York Observer Year-book* for 1871, 1872, and 1873. He was moderator of the General Assembly in 1883. D. at Summit, N. J., Sept. 22, 1883. He gave his library of more than 6,000 volumes to Union Theological Seminary. Revised by S. M. JACKSON.

Hathor, haa'thor ("House of Horus"): the Egyptian goddess of love, beauty, and joy; daughter of Ra, and wife of Tum. Among her other titles were "Lady of Heaven," and "Eye of Ra." She was represented in many forms, corresponding to the attributes for which she was worshiped, and in the later periods she was variously identified with Nut, the sky, Isis, Mut, Sechmet the cruel, and Bast the friendly. In general she was pictured as a cow, or as a cow-headed woman with horns and the sun-disk. The Hathor columns were so called from their capitals, which consisted of a Hathor-head adorned with cow's ears. Her sanctuary at Denderah in the sixth nome of Upper Egypt was said to have been founded by Khufu (Cheops, fourth dynasty) and repaired by Pepi (sixth dynasty), and has been preserved as a building of the Græco-Roman period. She also had a sanctuary at Hermopolis. She was one of the few Egyptian deities served by female attendants. An exceedingly early cult of Hathor in connection with the god Sopt, which continued till Ramses III., was that in Sinai, especially in Wadi Maghara, where she was regarded as the protectress of the mines. She was also called "Mistress of Punt," and was a patron of the sailor, being invoked for a favorable wind. The "Seven Hathors" were regarded as a sort of fairy godmothers who presided at the birth of royal children and foretold their fates, more especially the manner of their death. Another distinct deity of the same name presided in the nether regions, and there dispensed the water of life.

CHARLES R. GILLETT.

Hat-making: the processes involved in the manufacture of hats, the term in its generally accepted sense having reference to those processes in which special tools or special kinds of machinery are used, and including the making of caps. The manufacture of felt caps as a distinct trade was established in Nuremberg, Germany, as early as 1380, and in France during the reign of Charles VI. (1380–1422). In 1510 the manufacture of beaver hats was begun in England, and in ten years' time the industry was established in Scotland and Ireland, as well as in France and other continental countries. In 1604 a felt-makers' society was incorporated in England, and in 1667 a hatters' society, which included manufacturers in Scotland and Ireland. By 1691 the quality of the hats made in England had improved to such a degree that the importation of hats from the Continent almost ceased. Meanwhile the English colonies in North America had achieved success in the same line of business. About 1655 the General Assembly of Virginia offered a premium of 10 lb. of good tobacco for every good fur or felt hat made in the province. About 1670 some hatters of Massachusetts petitioned the general court for exclusive privileges connected with their trade, and were promised them on condition that they would produce as good and as cheap articles as were imported. In 1675 the exportation from Massachusetts of wool and of raccoon furs was forbidden, and nine years later the felt-makers of Pennsylvania made an attempt to prevent the exportation from that colony of furs used in the manufacture of hats. In 1723 petitions were presented to Parliament asking that the importation of hats from the colonies be prohibited, because the business of the hat-makers of that city was injured thereby. The colonial governments accordingly were ordered to impose severe penalties upon any one who attempted to export hats, and the law remained in force until

the colonies declared their independence. The hat-making industry was established in Danbury, Conn., soon after the Revolution broke out, and it is said that a regular factory was opened in Salem, Mass., as early as 1761. Up to 1834, when the silk hat or "water-proof hat," as it was then called, was introduced from France, napped hats, or those having a nap of beaver fur felted into a prepared "body," were made in nearly every town in the U. S., the materials being mostly bought at home. The inability to make silk hats, or at least to make them for the same price as that for which the imported ones were sold, and the growing custom among storekeepers of selling ready-made hats of various kinds, drove many old-fashioned hat-makers out of the business and tended to concentrate the manufacture in cities. The principal centers of hat and cap making in the U. S. are New York, Philadelphia, Danbury and Bethel, Conn., Newark and Orange, N. J., Boston, Baltimore, Chicago, St. Louis, and San Francisco. In 1880, according to the census returns, the number of establishments (not including those making wool hats) was 489; the capital employed was $5,455,468; the number of hands employed, 17,240; the amount of wages paid, $6,635,522; the value of materials used, $9,341,352; and the value of products, $21,303,107.

Beaver or napped hats were in general use in the U. S. up to about 1835. In the finer qualities the beaver nap was felted into a body of rabbit's fur. When beaver's fur became scarce the fur of other animals was substituted, and the wool of the lamb and llama took the place of rabbit's fur for the body. The fur was cut from the skins by hand, until machinery for the purpose was invented in the U. S. Up to 1810 all hats were made on round blocks, no allowance being made for possible differences in the shapes of heads. Hats in general use nowadays are mostly of three kinds: felt, silk, and straw.

Felt Hats.—The furs of the coney, hare, nutria, muskrat, and beaver are used the most in the manufacture of felt hats. Before cutting the fur from the skins they are washed and the projecting hairs removed, either by plucking or shearing; coney skins are generally plucked, hares' sheared. The fur then undergoes a process called carroting, to increase the felting property of the fur. This process is accomplished by laying the skins on a table, fur uppermost, and applying the carrot (nitrate of mercury) with a stout brush; the skins are then laid together in pairs, fur sides in, and put into a drying-room. After remaining in the room long enough for the mercurial solution to have the desired effect, they are taken to a machine made expressly for the purpose and the pelt cut from the fur. The various kinds and qualities of fur are then mixed together, according to the body required and the fancy of the manufacturer, generally in the proportion of two of carroted fur to one of raw. Raw fur is that which has been treated the same as carroted, excepting that the mercurial solution is omitted. It is generally finer in quality, and the felting remains on the surface. The fur is then again cleaned in a cone-shaped box with large teeth on the inside, between which the teeth of a rapidly revolving cone move. On the large end of this cone are fan-blades which cause a draught of air to flow inward through a feed-hole in the front and into a receptacle for the fur placed back of the machine. The mixture is thoroughly stirred and then fed into the machine. The teeth separate the fleeces, intermingle the mixture, and prepare it for the blowing-machine. This is a large structure divided into several sections. The fur is fed evenly to a slowly turning apron, from which it is passed into a pair of rollers. In front of the rollers is a rapidly revolving picker which tosses the fur, the lighter particles falling on an apron which conveys it to the next section, while the heavier substances, such as hair, pelt, dirt, etc., fall through a space between the apron and picker. The fur is thus treated in each section, till at last it leaves the machine thoroughly cleaned and ready to be formed. The machine on which forming is done consists of a wide oil-cloth belt, a pair of feed-rolls, picker, a hollow metallic drum with small blades running longitudinally across its surface, an open turntable, and a powerful exhaust fan. A copper cone full of small holes is placed on the turntable, the fan creates a current of air into which the fur is thrown from the drum, the drum takes it from the picker, the picker from the feed-rolls, and the feed-rolls from the apron. The apron and feed-rolls revolve slowly, the picker, drum, and fan at a tremendous speed. When the fur is all on the cone, just enough for one hat, it is wrapped in wet cloths and immersed in hot water for about a minute, is then stripped from the cone and given to the hardener. The next process is the shrinking of the body from a large loose, cone-shaped mass, about 28 by 36 inches, to a strong closely felted fabric not much more than one-third of its original size. Superfluous hairs are then shaved off and the body is given a second shrinking. When all moisture has been removed the body is ready to be stiffened, the process consisting of the application of a solution of shell-lac, so that each and every fiber will be incrusted. The next process is that of blocking, which is done by immersing the bodies in boiling water and shaping them one at a time over blocks suited to the final shape of the hat. Dyeing comprises two operations, mordanting and coloring. The mordant mostly used consists of a solution of bichromate of potash and tartar, in which the hats are left about an hour and a half, after which they are soaked to remove all chemicals not fastened to the fiber. A good black dye can be made of logwood and a small quantity of madder, and fancy colors either by using the various woods alone or combining them; for instance, logwood yields a blue, fustic a yellow, madder a red, and the three combined, in proportion to their strength, a brown. The hat should remain in the dye-bath from one and a half to two and a half hours. The next step is finishing, for which purpose the hat is taken to a steaming-table, in the middle of which are iron pots through which live steam passes. The hat is held in the steam until it becomes soft, and is then pulled over a block, which gives to the crown its final shape. It is then put into a drying-room, and left there long enough to dry out the condensed steam, when a coat of water-stiffening is applied to the inside to strengthen weak places. The hat is again dried and pulled a second time over the block and ironed, to remove wrinkles and unevenness. After the hat has been thoroughly ironed, both crown and brim, it is pounced with emery-paper; this, aided by singeing, removes the hair and long nap, and leaves it as smooth and fine as a piece of doeskin. It is next curled. The brim is first cut to the desired width, and the edge softened with a hot iron, and turned over with small hand-tools to suit the fashion. It is next placed on a hollow iron table called a baker, through which steam passes. This heats the brim from the under side, while the upper is covered with hot sand-bags. When the brim is soft enough it is taken from the baker to a bench, the sides rolled up, and the front and rear pitched down in accordance with the prevailing style. The trimming which follows is done by girls, and consists of sewing on the binding and band, whipping in the leather, and sticking in the lining with cement.

The above relates wholly to stiff hats. Soft hats are treated essentially the same, excepting that in the stiffening process very little shell-lac is used, and they are pounced before they go to the finishing-room.

Silk Hats.—These are made mostly of muslin and silk plush. The muslin is torn up into short lengths, about 7 feet, immersed in water-stiffening, and stretched upon frames to dry. The muslin for the brim is heavy and framed four ply, one ply being put on the frame at a time, and the whole rubbed together; that for the side crown is light and framed one ply; the tip is medium and one ply. The side crown-pieces are cut on the bias, the brim and tip into squares. The side crown is cut to fit the block, the ends stuck together with a hot iron, and the block set in. The first ply of the tip is the surplus piece from the side crown, which is ironed over and to the side, and the two joined firmly together by a very narrow and thin piece of prepared muslin called robbin. The heavy top piece is now laid on and ironed to the first. The center of the brim piece is cut out, the edges of the cut are softened with an iron, and the piece is drawn over the tip down to the brim board. After the edge of the margin is beveled down the joint between the brim and crown is still further strengthened by ironing a piece of robbin over the seam; the brim is ironed and rounded, and two small pieces of muslin are stuck on the upper brim to brace the front and rear. The side crown is now varnished and a thin piece of unstiffened, unbiased muslin ironed to the first ply, and a like piece ironed to the second in the same manner. The whole crown is now varnished, and two pieces of plain muslin are laid together on the tip and ironed fast. The body now receives a coat of varnish, after which it is dried and varnished twice more. The plush is cut into three pieces, side crown and upper brim on the bias, tip oval, and a piece of merino for the under brim is cut square. The side crown is sewed

to the tip, but the selvage ends are left free. The cover, body, upper and under brims are now ready to be finished. The under brim is first ironed on and the surplus merino trimmed off, and the plush is fastened to the upper brim in the same manner. The cover is drawn over the body and the seam place marked. It is then laid upon the bench and the nap brushed back from one side to avoid cutting, and to be used later to assist in hiding the seam. The plush is cut with a large pair of shears at the marked place and the cover drawn over the body again, the tip stuck, and the seam laid. The plush is then moistened with a wet sponge, the nap worked out and ironed dry, after which it is taken to a veluring-machine, in which it is revolved under a velure till the nap is properly arranged and thoroughly cleaned and straightened out; after this it is dry-ironed and blocked. The block on which the body is made and the hat finished is in five pieces, which being very large in the tip must be separable to get it in the hat. The pieces expanding and contracting unequally make the surfaces uneven where they meet. These irregular places, owing to ironing, show through the plush, and are worked out over a poutance block. The curling and trimming in silk hatting are nearly identical with the same operations in felt hatting.

Straw Hats.—The principal material used in this branch is straw braid, which comes prepared for sewing together. Before the braid is made into hats it is washed with soap and alkali, and while wet is suspended from the roof of a tight wooden apartment, and bleached by burning sulphur. The sewing is done on machines by young women, and about the only thing used besides the machines is a block to fit the hat on. The braid is first dampened to make it pliable, and allowed to remain in this state for several hours. A few rows, called a button, are sewed by hand, and all the rest by machine. A flat piece, a little larger than the tip of the block, is sewed, laid on the block, and bent over its edges to start the sides, which, when sewed a layer or two beyond the band edge, are bent at right angles, and the sewing is continued till the brim is made to the required width. The hat is then immersed in glue, the surplus being removed with a sponge, and is then hung up to dry. The next step is pressing, done by men. Hand pressing consists of moistening and steaming the body, and ironing it over a block and flange till it is thoroughly shaped. It is then trimmed, which requires about the same operations as silk and felt hatting. The majority of straw hats are pressed on hydraulic machines, which, though giving a high-class finish, is hardly the thing for fine goods. Yet some shapes, principally ladies' hats, could not be done so well by hand. ROBERT DUNLAP.

Hat'temists: the followers of one Pontianus van Hattem, a Dutch minister who was deposed from his pastorate in Zealand for Spinozism in 1683, and died in 1706. He was, indeed, a pupil of Spinoza and his doctrinal system, a mystical pantheism in which all clear distinction between good and bad disappeared. The Hattemists were fatalists and Antinomians, and taught that the whole duty of the elect was to be patient and to maintain tranquillity of mind. They denied the existence of moral evil and the corruption of the nature of man. The sect was suppressed by the Dutch Government in 1733.

Hatteras, Cape: See CAPE HATTERAS.

Hatte'ria: a genus of reptiles embracing the sole living representatives of the order *Rhynchocephalia*. Externally they resemble the common lizards, but in their structure, especially in their osteology, they present many peculiarities which are of great interest to the naturalist, since they show these forms to be the modern representatives of the ancestors of not only the true lizards, but the crocodiles as well. Thus the vertebræ are concave at either end (amphicœlous), the ribs have but a single head, there is an infratemporal bar in the skull, there is a well-developed parietal foramen, through which, as Spencer has shown, nervous connection is made with a highly developed PARIETAL EYE (*q. v.*). Another interesting peculiarity is the immovable union of the quadrate bone (see OSTEOLOGY) by a suture with the skull. There is but a single living species, *Hatteria* (or *Sphenodon*) *punctata*, from New Zealand, where it is called Tuatara by the natives. The fossil representatives of the order *Rhynchocephalia* are found in rocks as early as the Permian.
J. S. KINGSLEY.

Hatton, JOHN LIPTROT: composer and pianist; one of the most prolific and popular of England's song-composers; b. in Liverpool, 1809; was self-taught in music. He settled in London in 1832, and began a professional career as composer, pianist, and conductor. His earliest opera was *The Queen of the Thames*, brought out in 1842; then came *Pascal Bruno* at Vienna (1844). He visited the U. S. in 1848 on a concert tour, and again in 1867. His opera *Rose, or Love's Ransom* was produced in 1864, the cantata *Robin Hood* in 1856 at the Bradford festival, and the oratorio or sacred drama *Hezekiah* in 1877, at the Crystal Palace. He wrote incidental music for many of Shakspeare's plays, two cathedral services, several anthems, and an immense number of songs and part-songs both for male and for mixed voices. He died at Margate, Sept. 20, 1886.—His daughter, Mrs. CHARLES G. MOORE, living in Canada, has inherited much of his musical talent, and is a fine composer. D. E. HERVEY.

Hatzfeldt, haats'felt, PAUL MELCHIOR HUBERT GUSTAV, Count von: German statesman; b. Oct. 8, 1831; son of Countess Sophie von Hatzfeldt, the friend of Lassalle; accompanied Bismarck to Paris in the Franco-German war; was minister at Madrid 1874; ambassador at Constantinople 1878; foreign secretary 1882; ambassador to London 1885.
C. H. T.

Hauberk, haw'bêrk [M. Eng., from O. Fr. *hauberc*, older *halberc*, from O. H. Germ. *halsberge*; *hals*, neck + *bergan*, protect]: a defensive garment of chain-mail, the most important piece of body-armor of the Middle Ages, during the thirteenth and fourteenth centuries. The haubergeon, or HABERGEON (*q. v.*), was probably a shorter garment of the same kind, but the true hauberk reached the knees or came below them; it had long sleeves, and often mittens forming part of the sleeves, and pierced with openings in the palms to allow of thrusting out the hands; moreover, a hood or coif which covered the head was also made in one piece with the body, and could be drawn forward or thrown back on the shoulders at pleasure. Such a hauberk weighed about 25 lb., without its necessary linings of leather or other material, meant to keep the body from the severe bruises of sword-strokes taken upon the steel links. In the excessive piling-up of bodily defenses peculiar to the knights of the fourteenth and fifteenth centuries stuffed garments were worn under the hauberk, and plates or splints over it, but it was not abandoned until the advance in the armorer's art made complete and manageable suits of plate possible for the noble, and plate arm-pieces, leg-pieces, gorgets, and the like, accessible to the poorer man, who secured them to his stuffed *gambeson*, or quilted *jazerant*, or *brigandine*. See ARMOR. RUSSELL STURGIS.

Hauch, howkh, JOHAN CARSTEN: Danish writer; b. May 12, 1790, at Frederikshald, Norway, where his father was a Danish official; studied at the University of Copenhagen, where in 1821 he took the degree of Ph. D.; 1827–46 lectured on Physics at the Academy of Sorö; 1846–48 held the professorship of Scandinavian Language and Literature at the University of Kiel, but on the outbreak of the rebellion in Holstein returned to Denmark, and became (1851) Oehlenschlager's successor as Professor of Æsthetics at the University of Copenhagen. His lyrical poems are comparatively few, and not very prominent, though some of his ballads and elegies are beautiful. His dramas include *The Two Sisters from Kinnachiff* (1849); *Tycho Brahe's Youth* (1852); and *The King's Favorite* (1853). Among the largest and most interesting of his dramatic works are his tragedies *Tiberius* (1836); *Svend Grathe* (1841); *Mark Stig* (1850). He attracted most attention, however, by his excellent novels, *Vilhelm Zabern* (1834); *The Alchymist* (1836); *The Castle on the Rhine* (1845); *Charles de la Bussière* (1855), and others. D. at Rome, Mar. 4, 1872.
Revised by D. K. DODGE.

Hauck, howk, MINNIE: opera-singer; b. in New York city, Nov. 16, 1852; made her first appearance in a concert in New Orleans about 1865; studied under Errani in New York, and made her operatic *début* in America in *La Sonnambula* in 1868; appeared in London in 1868, in Vienna in 1869, and later in Brussels, Paris, and Moscow, and again in London in 1878, everywhere making a great success. She sings with equal facility in English, French, German, Italian, and Hungarian, and has a very large operatic *répertoire*. Her best parts are considered to be Carmen in Bizet's opera of that name, and Katherine in Goetz's *Taming of the Shrew*. She is married to the Chevalier de Hesse-Wartegg.
D. E. HERVEY.

Hauff, howf, WILHELM: romance-writer and poet; b. in Stuttgart, Germany, Nov. 29, 1802; studied divinity at Tü-

bingen 1820–24; and in 1827 became editor of *Das Morgenblatt* (Stuttgart). He was a writer of romances and poems, some of which have become true *Volkslieder*. Among his works are the still popular novel *Lichtenstein* (1826); *Die Bettlerin vom Pont des Arts*; *Das Bild des Kaisers*, *Märchen* (1826; many later editions); *Mittheilungen aus den Memoiren des Satans* (1827); *Der Mann im Monde*, a satire on Clauren (1827); *Phantasien im Bremer Rathskeller* (1827). See Klaiber, *Wilhelm Hauff. Ein Lebensbild des Dichters* (1881). D. in Stuttgart, Nov. 18, 1827.

Revised by JULIUS GOEBEL.

Hauge, how'ge, HANS NIELSEN: reformer; b. in the Smaalenene country, Norway, Apr. 3, 1771. After only a common peasant's education he began to preach in 1795. He protested against the rationalism and secularization prevalent among the Norwegian clergy, and opposed to them a movement laying especial stress upon the spiritual priesthood of all believers, but connecting therewith, as was charged, very serious extravagances in undervaluing an educated ministry, ordination, etc. His zeal attracted many followers, who did not, however, withdraw from the established church, and led to his imprisonment from 1804–14. D. at Aker, near Christiania, Mar. 29, 1824. His followers became known as Haugians, or Readers. In the U. S. Elling Eilsen, who adopted Hauge's position, founded a synod in 1846, which numbered 14,000 communicants in 1893, chiefly in Minnesota, South Dakota, and Wisconsin, and has a theological seminary at Red Wing, Minn. See his *Life* by Bang (Christiania, 1874), and by Belsheim (1881). H. E. JACOBS.

Haugians, or **Readers**: See HAUGE, HANS NIELSEN.

Hauksbee, or **Hawksbee**, FRANCIS (the elder), F. R. S.: the inventor of one of the first machines for electrification by friction, and of a variety of other apparatus. He was the author of numerous papers on natural philosophy, also of a work entitled *Physico-mechanical Experiments on Various Subjects touching Light and Electricity, etc.* (London, 1709). He is not to be confused with Francis Hauksbee the younger (1687–1763), an instrument-maker and experimental lecturer on physics, who was educated, elected clerk and housekeeper to the Royal Society in 1723, but was not a fellow. Of the life of the elder Hauksbee but little is known. His first paper appeared in the *Philosophical Transactions* in 1704, and he was elected to the Royal Society in 1705. His last three papers, published early in the year 1713, were posthumous, and it is supposed that he died in 1712.

E. L. NICHOLS.

Haupt, howpt, HERMAN, A. M.: engineer; b. in Philadelphia, Pa., Mar. 26, 1817; graduated at the U. S. Military Academy, and entered the army as brevet second lieutenant of infantry July 1, 1835. In September following he resigned from the army and adopted the profession of civil engineering. He was in 1844 appointed Professor of Civil Engineering and Mathematics in Pennsylvania College, which position he held till 1847, when he was appointed principal assistant engineer of the Pennsylvania Railroad. From 1849 to 1852 he was general superintendent, and subsequently became chief engineer and director of that company. For many years he was engaged upon the Hoosac Tunnel, Massachusetts, as chief engineer and contractor. During the civil war he was aide to Gen. McDowell, with the rank of colonel, and chief of bureau of U. S. military railways in charge of construction and operation. In Sept., 1862, he was promoted to be brigadier-general U. S. volunteers, but declined the appointment; general manager of the Piedmont Air-line Railway from Richmond, Va., to Atlanta, Ga., 1872–76; chief engineer Pennsylvania Transportation Company and Seaboard Pipe-line 1876–78; general manager N. P. Railroad 1881–85; and its general superintendent 1885–86. Revised by JAMES MERCUR.

Haupt, LEWIS MUHLENBERG: civil engineer; b. at Gettysburg, Pa., Mar. 21, 1844. He was educated at the Lawrence Scientific School of Harvard College, and at the U. S. Military Academy, where he graduated in 1867. During 1867–69 he served on the U. S. Lake Survey. In 1869 he resigned from the U. S. Corps of Engineers and was appointed engineer of Fairmount Park, Philadelphia. From 1872 to 1892 he was Professor of Civil Engineering in the University of Pennsylvania, and in charge of the geodesy of Pennsylvania for the U. S. Coast and Geodetic Survey. He is the author of many papers on rivers and harbors, and has devised a method of improving harbors by the use of vertical deflectors for currents and reaction breakwaters for littoral drift, and has published *Engineering Specifications and Contracts* (1878); *The Topographer* (1884); and *The American Engineering Register* (1886). In 1892 he resigned his professorship in order to engage in civil and maritime engineering practice. He was for a time assistant engineer of the Fourth Lighthouse District.

Haupt, MORITZ: philologist; b. in Zittau, Germany, July 27, 1808; pursued his university course at Leipzig 1826–30; privat-docent 1837; professor extraordinary 1838, and Professor of the German Language and Literature 1843; called in 1853 to the University of Berlin as Professor of Classical Literature; in 1861 secretary of the Academy of Sciences. He devoted himself to both classical philology and the Old German; edited with Hoffman *Altdeutsche Blätter* (1836–40, 2 vols.); founded in 1841 *Zeitschrift für deutsches Alterthum* (Leipzig); published a new edition of Lachmann's *Nibelungen* (Berlin, 1852); in same year poems of *Walther von der Vogelweide*; *Der arme Heinrich* (1842), his masterpiece, and other Old German works; his classical publications were editions of Catullus, Tibullus, and Propertius, Ovid's *Halieutica* and *Metamorphoses* with German notes, the *Cynegetica* of Gratius and Nemesianus Olympius; also from Hermann's unpublished remains, *Bion and Moschus* (1849); and *Æschyli Tragœdiæ cum Commentariis* (2 vols., Leipzig, 1852; 2d ed. 1859). His numerous contributions to philological journals were collected in three volumes of *Opuscula* (1875–76). Cf. Chr. Belger, *M. H. als akademischer Lehrer* (Berlin, 1879); Bursian, *Gesch. der class. Philol. in Deutschland* (p. 800 ff.) D. in Berlin, Feb. 5, 1874.

Revised by ALFRED GUDEMAN.

Hauran, haä-oo-raän' [Heb. *Châuran*, deriv. of *hur*, cave]: the present Arabic as well as English name of a district in Syria S. of Damascus and E. of the Jordan, mentioned by Ezekiel (xlvii. 16, 18), and nowhere else in the Old Testament, as the appointed northeast boundary of the Holy Land after the captivity in Babylon. Its dimensions are not indicated. In the Greek and Roman period, Hauran (Gr. Ἀυρανῖτις) was one of the four provinces of BASHAN (*q. v.*). The Arabian geographers make it embrace the greater part of ancient Bashan; and so do some modern travelers, who say the natives regard it as consisting of three parts—*en-Nûkrah*, *el-Lejah*, and *Jebel Hauran*. This whole region is volcanic, very fertile, and contains hundreds of deserted or ruined towns, with many Greek inscriptions, referred mostly to the Roman period. Druses, Bedouin, and a few Christians now inhabit the region. Others restrict the application of the name to the more level part of the district (the ancient *Auranitis*), which has a gently undulating surface and slopes strongly westward. It yields great crops of grain. See works by Robinson, Porter, and Wetzstein.

Revised by S. M. JACKSON.

Hausa (how'sa) **States**: the large area in the Western and Central Sudan, where the Hausa language predominates, but not constituting any political division. This area embraces the present great Fulbe states of Gando and Sokoto with Adamawa, tributary to Sokoto. The region is mostly E. of the Niger river, and N. of its Benue affluent, with the Sahara as its northern and Bornu as its eastern boundaries. The field of the Hausa language is greater than that of any other in Central Africa. It is in fact a Lingua Franca, and is the common vehicle of communication among tribes speaking different languages. The Hausa people are still the predominating element in the population. Brave but not fond of war, commercial rather than fanatical, they were very gradually subjugated (1600–1800 A. D.) by the Fulbe, the warlike and fanatical propagators of Islam. While the Fulbe imposed their rule and religion upon the Hausa, the language of the conquered became to a large extent that of the conquerors. The Hausa are of the pure Negro type, and their land is the only part of Africa which, without the aid of Caucasian influences, has carried cattle-raising, agriculture, manufactures, particularly of cloth, leather, and metals, trade and commerce, to an advanced position. They are well clothed, and have many large, well-built towns. The Central Sudan, of which the Hausa territories form a large part, is estimated (*Bevölkerung der Erde*, 1891) to have eighteen people to the square kilometer, making it more densely peopled than any other division of Africa except Zanzibar. See Barth's *Travels in North and Central Africa*; Staudinger's *Im Herzen der Haussaländer* (Berlin, 1889); Hallen's *On Opening Relations with the Hausa Race*; and *Proceedings of the Scottish Association* (1891).

C. C. ADAMS.

Hauser, how'zer, KASPAR: a foundling whose origin and history have given rise to much interesting discussion. On May 26, 1828, he was found in the streets of Nuremberg, with a letter directed to a cavalry officer in the city, and dated "From the Bavarian border, place unknown, 1828." The letter contained a meager and doubtful account of his life, giving the date of his birth as Apr. 30, 1812, but not disclosing his birthplace. His helplessness excited sympathy, the more so as he was a fine-looking youth, and the mystery which surrounded him made him and his history the subject of intense curiosity. He himself could tell little about his past life, except that he had been kept in a dark place under ground, and attended by a man who did not show his face. Shortly before he was released, this mysterious attendant had taught him to walk and to write a few words. He was well cared for in Nuremberg, and his education began, but attempts to assassinate him were made in a most mysterious manner, and at last he was stabbed in the royal garden at Anspach, and died Dec. 17, 1833. Very different views have been propounded in explanation of this story. The noted jurist Feuerbach made it the subject of his *Crime against a Soul* (1832), in which he made out a strong case for the identity of Hauser with the hereditary Prince of Baden born in 1812. Julius Meyer, *Authentische Mittheilungen über Kaspar Hauser* (1872), considers him an impostor. Prof. Daumer, *Kaspar Hauser, sein Wesen, seine Unschuld, seine Erdolchungen und sein Ursprung* (1873), like Feuerbach, considers him a son of the Grand Duke Charles of Baden. But the greatest interest in the story of Hauser arises from the curious psychological facts presented by his career, and the important speculations and discussions to which they gave rise among philosophers.

Revised by F. M. COLBY.

Hausrath, hows'rät, ADOLF, D. D.: German professor of the Reformed Church, but of the Tübingen school; b. at Carlsruhe, Jan. 13, 1837; studied at the Universities of Jena, Berlin, and Heidelberg. In 1867 he became Extraordinary and in 1872 Ordinary Professor of Theology in Heidelberg. He published *Der Ketzermeister Konrad von Marburg* (Heidelberg, 1861); *Der Apostel Paulus* (Heidelberg, 1865; 2d ed. 1872); *Geschichte der altestamentlichen Literatur in Aufsätzen* (1864; 2d ed. 1877–79); *Neutestamentliche Zeitgeschichte* (1868–73, 4 vols.; 2d ed. 1873–77; 3d ed. of vol. i., 1879; Eng. trans., London, 2 vols., 1878–80); *Religiöse Reden und Betrachtungen* (Leipzig, 1873; 2d ed. 1882); *David Friedrich Strauss und die Theologie seiner Zeit* (Munich, 2 vols., 1876–78); *Kleine Schriften religionsgeschichtlichen Inhalts* (Leipzig, 1883); *Arnold von Brescia* (1891). Under the pseudonym George Taylor he has published the historical romances *Antinous* (1880; 6th ed. 1886; Eng. trans., London, 1884); *Klytia* (1883; 5th ed. 1884; Eng. trans. 1883); *Jetta* (1884; 3d ed. 1884; Eng. trans. 1886); *Elfriede* (1888; Eng. trans., 2 vols., 1888).

SAMUEL MACAULEY JACKSON.

Haussmann, Baron GEORGES EUGÈNE: b. in Paris, Mar. 27, 1809; was educated at Paris; studied law, and became an advocate; was sub-prefect of various departments, and prefect under the presidency of Louis Napoleon. In 1853 the latter appointed him prefect of the Seine, and under his administration various beautiful and costly improvements were completed. Much opposition was made to his enormous expenditures, which involved the city in a debt of some 800 million francs. Prudently leaving France for a time after the fall of the empire, he was appointed Sept. 3, 1871, director of the Crédit Mobilier. He was elected to the Chamber of Deputies 1877. D. in Paris, Jan. 11, 1891.

Revised by C. H. THURBER.

Hautboy, hō'boi: See OBOE.

Haute-Garonne, ōt'gaä'ron' [Fr., Upper Garonne; *haute*, femin. of *haut*, high + Garonne]: department of France; on the frontiers of Spain. Area, 2,429 sq. miles. The southern part is high, occupied by the Pyrenees, and rich in minerals; lead, copper, iron, and zinc are mined; excellent marble is quarried. The northern part is very fertile, and produces much wine, fruit, and grain. The transit trade with Spain is very considerable. Capital, Toulouse. Pop. (1896) 459,577.

Haute-Loire, ōt'lwaar' [Fr., Upper Loire]: department of Central France; on the upper part of the Loire. Area, 1,916 sq. miles. It is mountainous, mostly occupied by the Margerides, which connect the Cévennes with the mountains of Auvergne, and whose lofty peaks are covered with snow half the year. The chief industries are agriculture, coal-mining, and the manufacture of lace. Capital, Le Puy. Pop. (1896) 316,699.

Haute-Marne, ōt'maarn' [Fr., Upper Marne]: department of Northeastern France; on the upper part of the Marne. Area, 2,402 sq. miles. It is hilly and mountainous, rich in vines and forests. Its chief product is iron; numerous mines and furnaces are worked throughout the whole department. Capital, Chaumont. Pop. (1896) 232,057.

Hautes-Alpes, ōtz'aalp', or ōt' aalp' [Fr., Upper Alps, *hautes*, femin. plur. of *haut*, high + *Alpes*, Alps]: department of Southeastern France. Area, 2,158 sq. miles. It is entirely covered by the Alps. The lofty summit, Des Écrines, is situated here, and rises 13,442 feet above the level of the sea. The soil is unproductive, but there are heavy forests and mines of lead, copper, iron, and coal. Capital, Gap. Pop. (1896) 113,229.

Haute-Saône, ōt'sōn' [Fr., Upper Saône]: department of Northeastern France; on the upper part of the Saône. Area, 2,062 sq. miles. It is mountainous, traversed by numerous branches of the Vosges Mountains, which here are covered with splendid forests, and are rich in coal and iron. Besides agriculture and the timber-trade, a considerable industry is carried on in mining and in the manufacture of glass and china. Capital, Vesoul. Pop. (1896) 272,891.

Haute-Savoie, ōt'sää'vwää' [Fr., Upper Savoy]: department of France; separated from Switzerland in part by the Lake of Geneva, which extends along the northern border. Area, 1,667 sq. miles. It contains Mont Blanc, and its surface is elevated and not very productive. Forest products, cattle, wool, and cheese are the leading articles exported. Capital, Annecy. Pop. (1896) 265,872.

Hautes-Pyrénées, ōt'pēē'rā'nā [Fr., Upper Pyrenees]: department of France; on the frontier of Spain. Area, 1,749 sq. miles. Branches of the Pyrenees traverse it, and form beautiful valleys watered by the Adour, the Arros, and the Gave-de-Pau. The mineral springs, especially those of Bagnères, Barèges, and Cauterets, are celebrated and much frequented. The well-known woolen stuff called barège is made here. Capital, Tarbes. Pop. (1896) 218,973.

Haute-Vienne, ōt'vēē'en' [Fr., Upper Vienna]: department of Northwestern France. Area, 2,130 sq. miles. It is covered with low mountains, the highest point of which is Le Puy de Vieux, 3,200 feet high, and which are rich in minerals—copper, lead, tin, and porcelain clay. The soil is not very fertile. Horses, cattle, and sheep are reared in great numbers. Capital, Limoges. Pop. (1896) 375,724.

Haüy, ää'wēē', RENÉ JUST, Abbé: mineralogist; b. of humble parents at St.-Just, Picardy, Feb. 28, 1743; became a church-singer at Paris, and a teacher in the College of Navarre 1764; laid before the Academy of Sciences in 1781 his brilliant discovery of the geometrical law of crystallization; was chosen to the Academy 1783; took orders in the Church; was imprisoned in 1792, and escaped death at the hands of the revolutionists through the exertions of Geoffroy Saint-Hilaire, his pupil; keeper of the cabinet in the School of Mines 1794, a member of the Institute 1795, Professor of Mineralogy in the Museum of Natural History in 1802, officer of the Legion of Honor in 1815. His principal works are an *Exposition de la théorie de l'électricité et du magnétisme* (1787); *Traité de minéralogie* (1801); *Traité élémentaire de physique* (1803); *Traité des caractères physiques des pierres précieuses* (1817); *Traité de crystallographie* (1822).

Haüy, VALENTIN, Abbé: a brother of the mineralogist Haüy; b. at St.-Just, Nov. 13, 1746. Becoming acquainted with Mlle. Paradis, a blind pianist, he resolved to devote his time to the instruction of the blind, and invented the art of printing with raised letters for the blind. The schools of this philanthropist were everywhere failures, owing to his lack of judgment, yet he is universally recognized as the "apostle of the blind." Though a cleric of the Roman Catholic Church, he was twice married, the second time to an ignorant market-woman. He was also for a time, it appears, a sub-priest of the Theophilanthropists. From 1806 till 1817 he lived at St. Petersburg. He had, says Dr. Howe, "genius, generosity, and zeal, but lacked common sense." Author of *Essai sur l'éducation des aveugles* (1786) and *Mémoire historique sur les télégraphes* (1810). D. in Paris, Mar. 19, 1822. See Strebitzky, *Valentin Haupt à St.-Pétersbourg* (Paris, 1884).

Havana, ha-van'a [Eng. spelling of Span. name, *La Habana*]: capital of the island of Cuba; the most important city of the West Indies, and one of the principal commercial marts of America; situated on the northern shore of the island, on an inlet of the Gulf of Mexico; in lat. 23° 8′ N., lon. 82° 22′ W. (see map of West Indies, ref. 3–B). Its harbor is one of the finest in the world; entered through a narrow, strongly fortified channel three-eighths of a mile long; opening into a large and deep basin capable of accommodating 1,000 vessels; lined with commodious, mostly covered wharves, and provided with a capacious dry dock. In the older part of the city the streets are generally very narrow and dirty, but the more modern portion contains many spacious and beautiful avenues, with a broad macadamized drive in the center, lined with palm-trees. The architecture of the city is mostly that of Southern Spain—the houses low, with one or two stories, massive, with flat roofs, the large windows provided with iron shutters and wooden blinds, but not glazed, and the walls gayly painted with red, blue, and yellow. The most prominent among the public buildings are the opera-house, one of the largest in the world; the cathedral, built in 1724, and containing, it is believed, the ashes of Christopher Columbus, transferred from St. Domingo in 1796; and the palace of the governor-general, with apartments for the different government officers. None of these buildings, however, is very remarkable, but with respect to its public parks and promenades Havana perhaps surpasses all other cities in the world. The Pláza de Armas, in front of the governor's palace; the Alaméda de Paula, along the bay; the Párque de Isabel; the Paséo de Tacon, a magnificent drive with double rows of trees; and other promenades traverse and surround the city, charming the visitor not less with their liveliness and gayety than with their trees, flowers, fountains, and statues. The city is well provided with water from the Chorrera by an aqueduct about 7 miles long, and has about fifty public fountains. It has a university, an excellent botanical garden, many scientific, educational, and benevolent institutions, and is the seat of the government of Cuba and of a Roman Catholic bishop. Its manufactures are not important, with the exception of those of tobacco. Of the cigar-factories more than 100 may be reckoned as of first rank. The royal factory of La Hauradez, which occupies a whole square, produces daily 2,500,000 cigarettes. In 1888 182,636 bales of tobacco were exported, an increase of 7,000 over the preceding year; and the export of cigars numbered nearly 220,000,000, while it was only 163,000,000 in 1887. The other great export is sugar. The total value of the exports in 1888 was $30,000,000, and of the imports $12,600,000. The principal imports are rice, lard, flour (American and Spanish), and jerked beef. Havana communicates by weekly lines of steamers with Spain, France, England, and the U. S.; by telegraph with Key West, Kingston, and Aspinwall; and by rail with Cardenas, Cienfuegos, Matanzas, and all the most important points of the island of Cuba. Havana was founded in 1519; previous to that time there was a place of the same name on the south side of the island. Yellow fever has broken out frequently since 1761, and its ravages in the hot months are often severe. Pop. (1893) about 250,000. Revised by M. W. HARRINGTON.

Havana: city (founded 1827); capital of Mason co., Ill. (for location of county, see map of Illinois, ref. 5–D); on the Illinois river, opposite the mouth of Spoon river, and the Ill. Cent., the Fulton Co. N. G., and the Jack. S. E. Railways. It is a shipping-point for corn and Osage-orange hedge-plants; has 6 churches, 3 public schools, and manufactures various agricultural implements. Pop. (1880) 2,118; (1890) 2,525. EDITOR OF "MASON COUNTY DEMOCRAT."

Havana: village; Schuyler co., N. Y. (for location of county, see map of New York, ref. 5–F); on the Chemung Canal and the N. Cent. Railway; 3 miles from the head of Seneca lake; 18 miles N. of Elmira. It has magnetic springs, and manufactures foundry and machine-shop products, flour, woolen goods, plaster, pottery, etc. Pop. (1880) 1,274; (1890) 1,751.

Hav'elock, Sir HENRY, K. C. B.: soldier; b. at Bishop-Wearmouth, England, Apr. 5, 1795; studied at the Charterhouse, and read law in the Middle Temple under Chitty; entered the army in 1815; went to India in 1823; met with a great change in his religious views on the voyage, after which he joined to his military duties the religious instruction of the men under him; became a preacher of the Baptist denomination; served with distinction in Burma 1824–26, and during the Afghan war; became adjutant-general for the Queen's troops in India 1851; served in Persia 1856–57; became a brigadier 1857; gained over Nana Sahib the brilliant victories of Cawnpore, Bithoor, etc.; relieved and re-enforced Lucknow Sept. 25, 1857; was made K. C. B. and baronet, the patent for the latter title being sealed the day after his death. The title was confirmed to his eldest son. D. at Alum-Bagh, Nov. 25, 1857.

Haven, ERASTUS OTIS, D. D., LL. D.; bishop of the Methodist Episcopal Church; b. in Boston, Mass., Nov. 1, 1820; graduated at Wesleyan University 1842; was for some years an instructor at Sudbury, Mass., and principal (1846–48) of the Amenia Seminary, New York; entered the ministry 1848; was stationed in New York until 1853, when he became Professor of Latin in the University of Michigan; in 1854 took the professorship of English Language, Literature, and History; editor of *Zion's Herald*, Boston, 1856–63; member of the Massachusetts board of education 1858–63; member of the State Senate 1862–63; president of the University of Michigan 1863–69; president of Northwestern University, Evanston, Ill., 1869–72; corresponding secretary of the board of education of his Church 1872–74; became chancellor of Syracuse University 1874; was elected bishop May 12, 1880. He published *Young Men Advised* (New York, 1856); *Pillars of Truth* (1866); *Rhetoric* (1869). D. at Salem, Ore., Aug. 3, 1881.

Haven, GILBERT: bishop of the Methodist Episcopal Church; b. in Malden, Mass., Sept. 21, 1821; graduated at Wesleyan University, Connecticut, in 1846; was appointed the same year Professor of Greek and Latin in Amenia Seminary, New York, and principal of the same institution in 1848. In 1851 he joined the New England conference of the Church, and occupied several important pulpits. In the civil war he was the first commissioned chaplain (Apr. 18, 1861), and served in Butler's regiment. In 1865 he was appointed to special service in Mississippi; was (1867–72) editor of *Zion's Herald*, Boston, and in 1872 was elected bishop. Author of *The Pilgrim's Wallet* (New York, 1865); a sketch of his travels (1862) in Europe; of a volume of sermons, chiefly relating to slavery and the war, entitled *National Sermons* (Boston, 1869); and of *Our Next Door Neighbor, or a Winter in Mexico* (1875). D. in Malden, Mass., Jan. 3, 1880. His *Christus Consolator*, with notes by his son, William Ingraham Haven, was published in 1893.

Haven, JOSEPH, D. D., LL. D.: theologian; b. in Dennis, Mass., Jan. 4, 1816; graduated at Amherst College 1835; ordained pastor of the Congregational church in Ashland, Mass., 1840; pastor at Brookline, Mass., 1846–50; Professor of Mental and Moral Philosophy in Amherst College 1850–58; Professor of Systematic Theology in the Chicago Theological Seminary 1858–70. In 1873 he became Acting Professor of Mental and Moral Philosophy in the Chicago University, and died there May 23, 1874. In addition to numerous sermons and articles in the religious journals and reviews, Dr. Haven published *Mental Philosophy* (1857); *Moral Philosophy* (1859); and a collection of essays entitled *Studies in Philosophy and Theology* (1869).

Hav'ercamp, SIEGEBERT: numismatist; b. at Utrecht, Holland, in 1684; studied theology, and was for several years a minister, but in 1721 was appointed to the chair of Greek in the University of Leyden, which he afterward changed for that of history in the same university. He published new editions of Josephus, Sallust, Tertullian's *Apologeticus*, Lucretius, Censorinus, and Eutropius; wrote *Introductio in Antiquitates Romanas* (1730); *Introductio in Historiam Patriæ* (1739), etc.; but it was as a numismatist that he showed the greatest merit. His principal works in this line were *De Numismate Alexandri Magni* (1722); *Thesaurus Mordtianus, sive familiarum Romanorum numismata omnia* (1734); *Nummophylasium reginæ Christinæ* (1742); and other minor essays and criticisms. D. at Leyden, Apr. 23, 1742.

Revised by ALFRED GUDEMAN.

Hav'erford College: an institution in Delaware co., Pa.; founded in 1832 by members of the Society of Friends under the name of Haverford School, and made a college, with authority to grant degrees, in 1856. It has a large farm and beautiful grounds. Besides the two chief college halls there are two well-furnished astronomical observatories, laboratories, a gymnasium, and a commodious library and alumni hall, with an admirably selected library of 30,000 vol-

nmes. The plan of the institution limits the number of the resident students. Since 1849 others besides the sons of Friends have been admitted. The principals have been Samuel Hilles, John Gummere, Daniel B. Smith, and Joseph Harlan; the presidents, Samuel J. Gummere, Thomas Chase, and Isaac Sharpless. Haverford College was the first collegiate institution founded and conducted entirely within the Society of Friends. In 1893 it had ninety-five students.

Revised by F. B. Gummere.

Haverfordwest: town; capital of Pembrokeshire, Wales (see map of England, ref. 11–C); picturesquely situated on the Cleddy; carries on considerable export trade in cattle, butter, cheese, and corn. Pop. (1891) 10,354.

Haverhill: city (settled 1640, incorporated as a town 1645 and as a city 1870); Essex co., Mass. (for location of county, see map of Massachusetts, ref. 1–I); at the head of navigation on the Merrimack river, and on the Boston and Maine Railroad; 32 miles N. of Boston. It contains 25 churches, high school, 9 grammar schools, public library, Masonic temple, 2 Odd Fellows' halls, G. A. R. hall, K. of P. hall, soldiers' monument in marble, Hannah Dustin monument in bronze, 4 parks, 5 hotels, 15 miles of street railway, and 2 daily, 3 weekly, and 2 monthly periodicals. Ayers and Rocks villages are within the city limits. Two iron bridges connect Haverhill with the towns of Bradford and Groveland. The census of 1890 showed 722 manufacturing establishments (representing 64 industries). These had $7,925,810 capital, employed 14,988 persons, paid $6,815,474 in wages, and had products valued at $25,340,361. The principal manufactures were boots and shoes ($5,926,222 capital); boot and shoe stock ($1,525,865); woolen hats ($460,919); and slippers ($440,353). Pop. (1880) 18,472; (1890) 27,412; (1895) 30,209.

Editor of "Gazette."

Haverhill: town; one of the capitals of Grafton co., N. H. (for location of county, see map of New Hampshire, ref. 6–E); on the Connecticut river and the Concord and Montreal Railroad; 84 miles N. N. W. of Concord. It has several villages, and manufactures of leather, lumber, starch, paper, whetstones, boxes, etc., and has a large granite industry. It has an academy and a fine park, near which the public buildings stand. Pop. (1880) 2,455; (1890) 2,545.

Editor of "Courier."

Haverschmidt, haa'ver-shmit, François: poet; b. at Leeuwarden, Holland, Feb. 14, 1835; educated at Leyden, became pastor of the little parishes of Fondgum and Raard in 1859; in 1862 he was called to Nieuwediep in North Holland, and thence in 1864 to Schiedam. His poetical career began in his student days, and he contributed many pieces to the Leyden *Studenten-Almanak*. These pieces he represented to be from the poetic remains of one Piet Paaltjens, and by this name he is chiefly known in Holland. The influences that were strong upon the young poet were those of Alfred de Musset and Heinrich Heine. Yet there is much that is native and original in these grotesque utterances of Dutch *Welt-Schmerz*. In later years Haverschmidt gathered his pieces together, with additions, under the title *Snikken en Grimlachjes, Academische Poezie van Piet Paaltjens* (Schiedam, 1867; 6th ed. 1889), and this collection constitutes his main achievement. Worth mentioning, however, are his prose sketches published with the title *Familie en Kennissen* (Schiedam, 1876). For his *Life*, with bibliography of his works, see J. ten Brink, *Geschiedenis der Noord-Nederlandsche Letteren in de XIX^e Eeuw* (vol. iii., Amsterdam, 1889).

A. R. Marsh.

Haversian Canals: See Bone and Histology.

Haverstraw: village; Rockland co., N. Y. (for location of county, see map of New York, ref. 8–J); on the Hudson river, and the N. J. and N. Y., the N. Y., Ont. and W., and the W. Shore Railways; 38 miles N. of New York city. It has good schools, large print-works, employing about 1,000 hands, a rolling-mill for copper, and a mill for making paper bags. Principal business, brick-making. Pop. (1880) 3,506; (1890) 5,070.

Havet, aă'vā', Pierre Antoine Louis, Doct. Litt.: philologist; b. in Paris, France, Jan. 6, 1849; educated in Paris; Professor of Latin successively in l'École pratique des hautes études, la Faculté des Lettres de Paris, and le Collège de France; author of *Le Querolus, comédie latine anonyme* (1880); *De saturnio Latinorum versu* (1880); *Abrégé de grammaire latine* (1886); *Cours élémentaire de métrique grecque et latine* (1886; 3d ed. 1892).

B. I. W.

Havre, or **Havre de Grâce**, aav'r'de-grăas': town; in the department of Seine-Inférieure, France; at the mouth of the Seine, 143 miles N. W. of Paris by rail (see map of France, ref. 2–D). It is beautifully situated at the foot of a range of hills whose tops are lined with elegant villas. The city has fine broad streets; the new city-hall and barracks are magnificent buildings; the Church of Notre Dame was built in the sixteenth century. The old fortifications of Havre were demolished in 1856; it is now defended by forts erected on the surrounding heights. Its harbor, consisting of ten spacious basins, and well provided with wet and dry docks, is one of the best harbors of the world, and, next to Marseilles, Havre is the most important commercial place of the country. One-fifth of the foreign commerce of France is transacted in this city. The average number of vessels entering the harbor is 6,100, with a tonnage of 2,900,000. It is prominent as a place of embarkation for emigrants, and communicates directly with New York, Havana, Rio de Janeiro, Calcutta, and all the chief commercial places in Europe, exporting wine, brandy, oil, and different kinds of French manufactures, cloth, leather, jewelry, etc., and importing cotton, sugar, coffee, tea, and spices. Notwithstanding all its natural facilities and costly improvements, it has not been able to compete with Antwerp, for the reason that its inland communications are still insufficient. Pop. (1896) 119,470.

Havre de Grace, hav'er-de-gras': city; Harford co., Md. (for location of county, see map of Maryland, ref. 1–F); on the Susquehanna river near its entrance into Chesapeake Bay, and on the Balt. and O., and the Phila., Wil. and Balt. Railways; 36 miles N. E. of Baltimore. It is at the natural outlet to tide-water, through the Pennsylvania and Susquehanna Canal, for the anthracite coal of the Wyoming and Shamokin regions, and for the bituminous coal of the Juniata, as well as the lumber, minerals, manufactures, and agricultural products from the valleys of the Susquehanna and its tributaries. It has an extensive shoe-manufactory, tin-can factories, flour-mills, ship-yards, saw and planing mills, fruit-canning and fish-packing establishments, etc. The village has a fine harbor and a large trade in coal and lumber, also extensive shad and herring fisheries, and in this vicinity the celebrated canvas-back ducks are secured in large numbers. Pop. (1880) 2,816; (1893) 5,244.

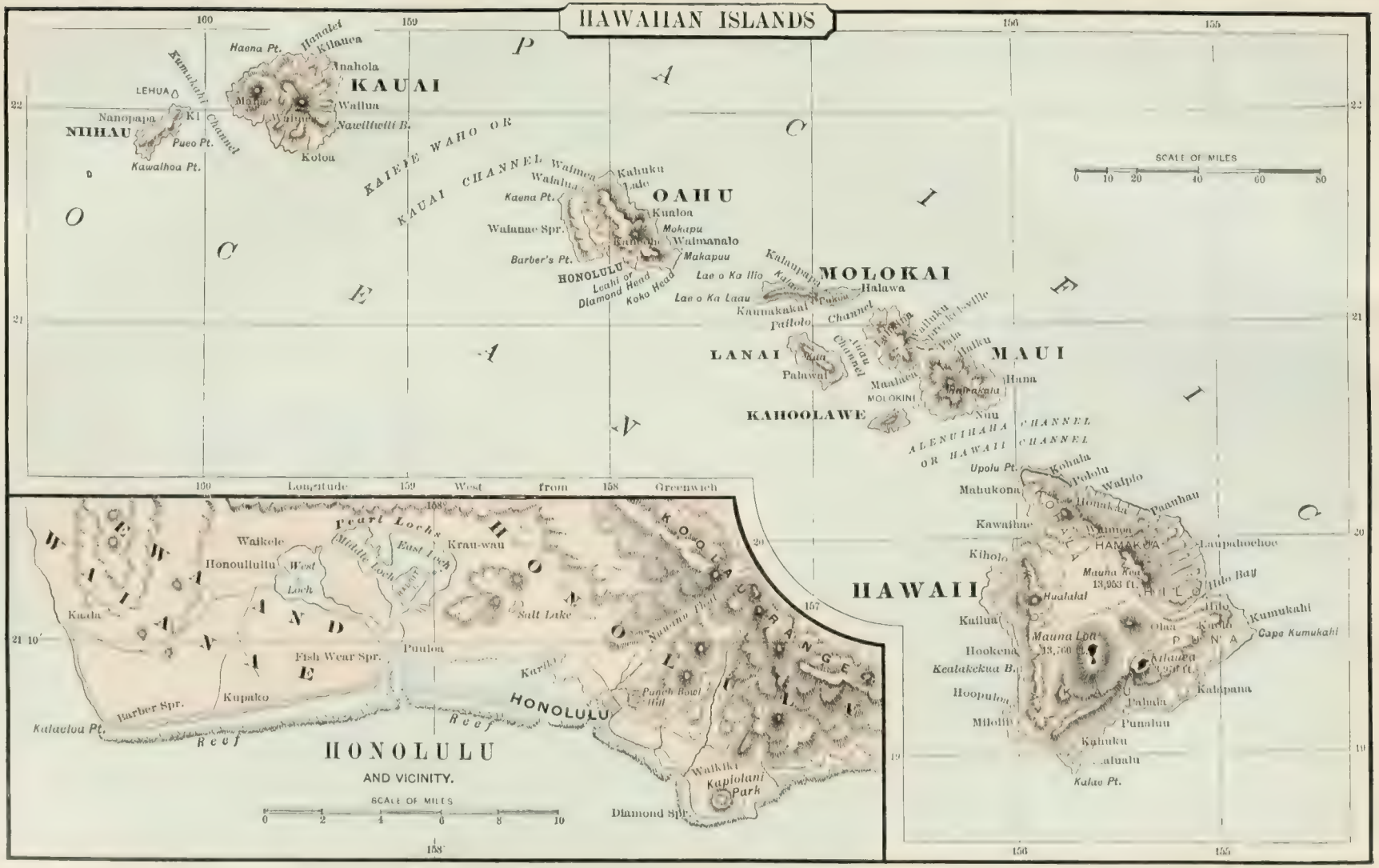
Editor of "Republican."

Hawaii, hăă-waa'ee-ee: an island of the Hawaiian or Sandwich islands; in lat. 20° N., lon. 155° W., of triangular form, about 90 miles long by 70 broad. Area, 4,384 sq. miles. It was called Owhyhee by Capt. Cook. It contains two-thirds of the area of the islands, but only one-third of the population. The interior is in general an uninhabited wilderness. A northern plain and the eastern slope are most productive. Here are sugar estates and cattle and sheep ranches. The mountains are relatively low and the slopes gradual. On Hawaii are the great volcanoes of Mauna Keo in the N. E., Heralalai in the N. W., and Mauna Loa in the S. Kilauea is an enormous crater, 1,000 feet deep, lying to the E. of Mauna Loa. Pop. 25,000. This was also the name of the republic now occupying the Sandwich Islands.

Hawaii-Nei, **Hawaiian Islands**, or **Sandwich Islands**: an archipelago in the Pacific Ocean; 3,500 miles W. of Mexico and 2,700 miles S. W. of San Francisco; governed since July 4, 1894, as a republic.

Configuration and Area.—The islands are between lats. 18° 50′ and 22° 50′ N., and lons. 154° 50′ and 161° 40′ W. They are twelve in number, with a total area of 6,677 sq. miles: Hawaii, about 4,000 sq. miles; Maui, 800 sq. miles; Kahoolawe, 65 sq. miles; Lanai, 100 sq. miles; Molokai, 200 sq. miles; Oahu, 500 sq. miles; Kauai, 640 sq. miles; Nŭhau, 95 sq. miles—habitable; and Molokini, Lehua, Kaula, and Nihoa, barren rocks. The group extends in a N. N. W. direction from Hawaii. The islands are all high, increasing in size and altitude toward the S. E.

Physical Features.—There are two active volcanoes on Hawaii—viz., Kilauea and Mauna Loa. The following eruptions are known to history: (1) In 1789, from Kilauea, accompanied by earthquakes and the discharge of poisonous gases, by which nearly 100 persons were killed; (2) in 1801, from Mt. Hualalai, the third in height on Hawaii; (3) in 1823, from Kilauea; (4) in 1832, from Kilauea and Mauna Loa; (5) in 1840, from Kilauea; (6) in 1843, from new craters and fissures near the summit of Mauna Loa; (7) in 1852, from a fissure on the north side of Mauna Loa; (8) in 1855, from the same place, continuing thirteen months; (9)


HAWAIIAN ISLANDS
KAUAI
NIIHAU
LEHUA
OAHU
MOLOKAI
LANAI
MAUI
KAHOOLAWE
HAWAII
Haena Pt.
Hanalei
Kilauea
Anahola
Waialua
Nawiliwili B.
Koloa
Kumukahi Channel
Nanopapa
Pueo Pt.
Kawaihoa Pt.
KAIEIE WAHO OR
KAUAI CHANNEL
Waimea
Kahuku Lake
Waialua
Kaena Pt.
Kualoa
Waianae Spr.
Mokapu
Waimanalo
Barber's Pt.
Makapuu
HONOLULU
Leahi or Diamond Head
Koko Head
Lae o Ka Ilio
Lae o Ka Laau
Kalaupapa
Halawa
Kaunakakai
Pukoo
Channel
Pailolo
Lahaina
Kaanapali
Wailuku
Spreckelsville
Paia
Halku
Alau Channel
Palawai
Maalaea
MOLOKINI
Hana
Nuu
ALENUIHAHA CHANNEL
OR HAWAII CHANNEL
Upolu Pt.
Kohala
Pololu
Walpio
Mahukona
Honokaa
Pauuhau
Kawaihae
Waimea
HAMAKUA
Laupahoehoe
Kiholo
Mauna Kea 13,953 ft.
Hilo Bay
Hualalai
Hilo
Kumukahi
Kailua
Olaa
Kapoho
Cape Kumukahi
Mauna Loa 13,760 ft.
Hookena
Kealakekua B.
Kilauea 4,000 ft.
Hoopuloa
Kahapana
Milolii
Pahala
Punaluu
Kahuku
Kalae Pt.
SCALE OF MILES
0 10 20 40 60 80
Longitude West from Greenwich
160 159 158 157 156 155
22 21 20 19
HONOLULU
AND VICINITY.
Pearl Lochs
Middle Loch
East Loch
West Loch
Waikele
Honoululu
Krau-wau
Salt Lake
Kaala
Puuloa
Fish Wear Spr.
Barber Spr.
Kupako
Kalaeloa Pt.
Reef
Nuuanu Head
Punch Bowl Hill
Waikiki
Kapiolani Park
Diamond Spr.
SCALE OF MILES
0 2 4 6 8 10
21 10'
158
157

in 1859, from Mauna Loa; (10) in 1866, from Mauna Loa; (11) in 1868, from a new fissure, nearly 3 miles long, in the slope of Mauna Loa, 10 miles from the sea, accompanied by violent earthquakes and irruption of great sea-waves upon the land, by which 79 persons and 200 houses were destroyed; (12) in 1880–81, from Mauna Loa, continuing nine months. The altitude of Mauna Kea, the highest point on Hawaii, is 13,805 feet; of Haleakala, the highest point on Maui, 10,032 feet. The extinct crater of Haleakala is 7 miles long, 3 wide, and 19 in circumference, and is from 700 to 2,000 feet deep. Kaala, the highest point on Oahu, is 4,060 feet above the sea; the altitude of Kauai is about 5,000 feet.

Geology.—The rock of the whole group is volcanic, with the exception of the ancient elevated coral reef and the resulting sandstone. No true fossiliferous rocks are found, although the tufa contains fossilized shells and corals of recent species. On the tops and in the interior of the mountains a variety of trachyte is found, and the bulk of the mountains seem to be composed of phonolites and graystones, forming a complete series from basalt to trachyte. The following are some of the minerals that have been noticed: Sulphur, pyrites, common salt, sal-ammoniac, limonite, quartz, augite, chrysolite, garnet, labradorite, feldspar, gypsum, soda-alum, copperas, glauber salt, niter, and calcite.

Fauna.—By far the greater proportion of animals peculiar to the Hawaiian islands are birds, which number over seventy species, of which nearly fifty have been catalogued and partially described. The larger part of these consist of waterfowl, beach and sea birds. The difficulty with which the forest birds can be observed and procured has rendered progress in describing them necessarily slow. David Malo, the native historian, enumerates as native hogs of several varieties, dogs, mice, the domestic hen, dragon-flies, two kinds of butterflies, millers, moths, flies, wasps, grasshoppers, cockroaches, winged ants, two kinds of spiders, and two kinds of lizards.

The vegetable kingdom is rich in interesting forms. Many new species and varieties have been discovered, and much work has been done in their description and classification.

Climate.—The climate is much affected by locality, and varies from cool, frosty weather to a high average of heat the year through. The N. E. trades blow the greater part of the year, and prevent the heat from becoming oppressive. Certain leeward portions of the island are cut off from the trades by the mountains, and are consequently oppressed with sultry weather, which, however, is tempered by the sea-breezes which in such places almost invariably blow through the day. Showers are frequent in the summer, and in the winter severe southerly and westerly rainstorms, lasting for days and even weeks, are liable to occur. Thunder-storms are rare, but severe. At Honolulu the average height of the barometer is 30·054 inches. The thermometer at the same place ranges from 62° F. at sunrise to 89° at 3 P. M., with an average of 75·7°. At Waimea, Hawaii, at an elevation of 4,500 feet, the average is 64°, the lowest 48°. The average rainfall at Waikiki, near Honolulu, is 48 inches per annum; on the hill, a mile back of the town, 56 inches; at Kalaea plantation, on the opposite side of the island, 61 inches. The rainfall in Honolulu for the year 1837 was 21·1 inches; for 1838 was 46·8 inches, 12 of which fell in October. The former year had 295 days of trade-winds, 44 of S. winds, and 26 variable; and 285 fine, 37 rainy, and 43 variable days; while the latter had 258 days of trade-winds, 71 of southerly winds, and 36 variable, and 275 fine days, 41 rainy, and 49 variable weather.

Soil and Productions.—The soil is fertile and well adapted to planting and grazing. It is estimated that there are nearly 2,000,000 acres of grazing land, besides 290,000 acres of arable land. The mountain sides abound in forests, in which there is a plenty of ship-timber and ornamental woods. Numerous streams, many of them large, flow down the mountains to the sea. Sugar is the principal product. There are between forty and fifty plantations, which raise and manufacture an aggregate of about 40,000 tons of sugar per annum, besides molasses; wool, tallow, hides, rice, pulu, and bananas are exported in considerable quantities, their production being generally profitable. Nearly all the crops of temperate climates can be successfully grown, but are not profitable for want of markets.

In 1890 the value of all the sugar plantations on the islands was estimated at $32,347,690, owned as follows: By citizens of the U. S., $24,735,610; by British, $6,038,130; by Germans, $2,008,600; by Hawaiians, $266,250; and by other nationalities, $299,100. The area of land under sugar-cane cultivation was about 67,849 acres, and the exports of sugar aggregated 292,083,580 lb.

Ethnology.—There are two theories of the origin of the Hawaiians—one pointing to the East, the other to the West. The former claims their relationship with the Toltec branch of the great Nahoa family of Mexico, and presents certain slight physiological and psychological similarities in proof thereof. This hypothesis makes the Hawaiians the oldest Polynesian colony, from which the other branches of the family originated. It is supported by the prevailing direction of the winds and ocean-currents. The other theory, carefully tracing the relationship of all the island-nations of Oceanica, supports the hypothesis, based mainly upon philological research and analogies in customs and implements, that all the Pacific archipelagoes and islands were colonized by successive migrations from Southern Asia; that the family which includes the Hawaiians, New Zealanders, Samoans, Marquesans, Tahitians, Tongans, the Austral islanders, and the natives of Minihiki, was an extremely ancient and primitive member of the great Malay race; and that the Malay Archipelago was the starting-point of their distinct migration. This theory is consistent with the evidence from language, race, manners, and customs, and has the additional support of Hawaiian tradition. A junk from the W., with survivors on board, drifted ashore at the Hawaiian islands in Dec., 1832.

Finances.—The real and personal property had an estimated value in 1891 of $39,000,000; the public debt was $2,313,800; and the postal savings-bank held on deposit $982,661. The estimated value of all Government property, including cash in the treasury, was $6,189,303.

Trade and Commerce.—In 1891 the foreign trade of the kingdom aggregated in value $17,698,270, of which the U. S. had $15,490,556. The number of vessels engaged in foreign trade which visited the various ports was 310, of 284,155 tons, and of these, 224 vessels, of 173,891 tons, belonged to the U. S.

Population.—From the time of Capt. Cook's visit to the arrival of the missionaries in 1820 the decrease of population through war and disease was immense; a pestilence in 1804, called *ahulau okuu*, the character of which is not known, decimated the nation. Cook's estimate of a population of 400,000 in his time was probably too great by 100,000. In 1823 the population was estimated at 142,000. In 1832 the first census was taken, making the number 130,313. In 1884 the number was 80,578—51,539 males and 29,039 females. Of these, 40,014 were natives, 4,218 half-castes, 2,170 born in Hawaii of foreign parentage, 17,939 Chinese, and 12,237 foreigners. The population in 1890 was 89,990. The natives numbered 34,436; half-castes, 6,186; born in Hawaii of foreign parents, 7,495; Chinese, 15,301; Japanese, 12,360; Portuguese, 8,602; natives of the U. S., 1,928; British, 1,344; Germans, 1,034; Norwegians, 227; French, 70; Polynesians, 588; other foreigners, 419. Since the discovery of the islands the native population has rapidly decreased—5,578 from 1884 to 1890. The foreign population is, however, rapidly increasing. The immigration in 1890 was 2,484, and the emigration 1,582, showing an excess of 632 arrivals. Most of the immigrants are Chinese and Japanese.

History.—The Hawaiian islands were discovered by Gaetano, a Spanish navigator, in 1542. Mendana, another Spanish discoverer, ascertained the correct position of the island of Kauai in 1567. Long before these dates (probably about 1527) one or two Spanish vessels were wrecked on the coast of Hawaii, and the few survivors intermarried with the natives. Their descendants are known at the present day by a light skin, which is liable to freckle, and by a Caucasian facial contour, and are designated as *Kekea*. Capt. Cook visited the Hawaiian islands in 1778, sighting the islands of Oahu and Kauai on Jan. 18, and anchoring at Waimea, Kauai, on the 19th. After visiting the island of Niihau, he sailed for the American coast, and, returning, arrived at the island of Maui on Nov. 20, when he met Kamehameha I., then a young man. Capt. Cook afterward spent some time with his vessels at the island of Hawaii, where, by his abuse of the unbounded hospitality and reverence of the natives, he lost their friendship, and was killed by them in a quarrel at Kealakekua Bay on Feb. 14, 1779.

The Hawaiians at this time supported an elaborate feudal system, closely analogous to that of Europe in the Middle

Ages. From a collection of savage tribes, each led by its own chief, the movement from generation to generation, through incessant fighting, had been toward centralization, until, at the time of Capt. Cook's visit, under the sovereignty of five or six independent dukes or kings, they had, in a degree, emerged from barbarism. High chiefs did fealty to the king, supplying food or forces for military service according to royal demands, while lower chiefs in like manner supported them, and were themselves served by the *konohiki*—middlemen between chiefs and people—who were the last representatives of kingly power, and oppressed the common people with great severity. The status of the latter was that of vassals, tenants, and serfs, who, with all they possessed, belonged to the chiefs and were under their protection. In 1790 Kamehameha, then king of a portion of Hawaii, was attacked by Keoua, king of the other part, whom he defeated and captured, thus obtaining possession of the whole island. Inspired with this success, he invaded the neighboring islands, and after several years of hard fighting conquered them all except the territories of Kaumualii, with whom Kamehameha, after one or two futile attempts at invasion, made a treaty, under which the possessions of Kaumualii were to vest in Kamehameha upon the death of the former.

In 1792 and the two following years Vancouver visited the Hawaiian islands, and introduced cattle on May 8, 1819. Kamehameha died at Kailua, Hawaii, after a long and most successful reign, in which he had firmly established his kingdom over the whole group. His eldest son, Liholiho, succeeded him under the title of Kamehameha II., with Kaahumanu, widow of Kamehameha I., as premier, who in influence and power was the real sovereign. Under her sagacious leadership, aided by the bold recklessness of the king, the mighty taboo system of centuries was overthrown, and the conservative party totally routed in a sanguinary battle which lasted for six hours. The universal destruction of the idols followed. Shortly after, on Apr. 4, 1820, the first missionaries arrived from the U. S.—seven men, with their wives. They immediately began to reduce the language to writing. The first printing was done in 1822. In 1823 the king and Kamamalu, his queen, visited Great Britain, where they both died the year following; whereupon Kaahumanu, the premier, became regent, and governed until the majority of Kauikeaouli, brother of the late king, a period of nine years. In 1825 the Ten Commandments were adopted as laws by the Government, and a few criminal laws were enacted in 1827 and 1829. The first Roman Catholic missionaries arrived July 7, 1827. The priests and their converts were from time to time exposed to severe persecutions by the Government until 1839, when Commander Laplace of the French frigate Artémise obtained, under threats of war, civil and religious privileges for Roman Catholics. Kauikeaouli assumed the government in 1833 as Kamehameha III. In 1840 Kamehameha III. and the chiefs promulgated a constitution granting civil rights to the people. On Feb. 25, 1843, the provisional cession of the islands to Great Britain, in consequence of the harsh demands of Lord George Paulet, occurred; which arrangement was terminated and the Hawaiian flag restored by Admiral Thomas on July 31 in the same year. In 1846 Kamehameha III. approved of the famous Land Act, by which he released the royal right to a large portion of the lands of the kingdom and provided for their conveyance to the people. In 1849 the temporary occupation and embargo of the port of Honolulu by the French took place. In 1852 the constitution was revised by the king and legislature, by which free suffrage was established as a civil right. Kamehameha III. died on Dec. 15, 1854, and was succeeded by Alexander Liholiho (son of Kinau, the daughter of Kamehameha I.), who reigned as Kamehameha IV. The chief monument of his reign is the Queen's Hospital. In 1856 he married Emma Naea (adopted daughter of Dr. Rooke), who in 1858 gave birth to a son who lived but little over four years. After a quiet and prosperous reign of nine years, he died on Nov. 30, 1863. In 1862 an English Reformed Catholic mission arrived. Lot Kamehameha, brother of the late king, succeeded him as Kamehameha V., and was noted for his forcible abrogation of the national constitution and promulgation of a new one limiting the right of suffrage by a property qualification. His reign was commercially prosperous, and Honolulu, the capital, was beautified with fine public buildings. He died Dec. 11, 1872, without issue, leaving the Kamehameha dynasty extinct. After a four weeks' interregnum under the regency of the cabinet, Lunalilo, a high chief, upon the unanimous nomination by the people, was elected king by the Legislature. His short reign of one year was noted for the institution of measures for the restoration of the liberal principles of the old constitution, for the unpopular ministerial effort for commercial reciprocity with the U. S. on the basis of the cession of the Pearl river lagoon, and for the bloodless mutiny of troops at the barracks in Honolulu. Lunalilo died Feb. 3, 1874, and left no issue. On Feb. 12 Kalakaua was elected king by the Legislature, notwithstanding the determined opposition of Queen-Dowager Emma, which culminated at the election in a riot by her supporters, in which many of the representatives were severely injured and the legislative hall was partially demolished. Order was restored by armed forces from British and U. S. war-ships in the harbor. In 1887 the progressive party demanded a new constitution providing for a cabinet removable only by vote of the Legislature. This was accepted by Kalakaua, who afterward, however, tried to regain his lost power. Kalakaua died in Jan., 1891, and was succeeded by his sister, Queen Liliuokalani, who from the first was opposed to the new constitution. Soon she began to evade some of its essential provisions, especially by the repeated appointment of ministries in opposition to the votes of the legislature, and gave further offense by her alliance with a lottery project and the opium interest. Finally it was learned that she intended to proclaim a new constitution restoring the royal power. This caused her overthrow by a small but influential portion of the population. A provisional government, representing for the most part the U. S. element, was promptly organized, and the marines and sailors of the U. S. S. Boston were landed for the protection of American life and property, and the prevention of incendiarism. This circumstance was regarded by the friends of the queen as indicating the intention of the U. S. to support the revolutionists. The provisional government at once took steps to secure annexation to the Union. A treaty with this end in view was arranged at Washington, and had been sent to the U. S. Senate for ratification when President Cleveland came into power. The treaty was then withdrawn by the President, who condemned the action of the U. S. minister to Hawaii at the time of the revolution as compromising the neutrality of the nation that he represented. Overtures to the provisional government for the restoration of the monarchy were rejected, and on July 4, 1894, the islands were proclaimed a republic under the presidency of Sanford B. Dole. The Government now consists of a Council of State, a Senate, and a House of Representatives, each with fifteen members.

The independence of the Hawaiian islands was recognized by the U. S. in 1829, and more formally in 1843; by Belgium in 1844, and by Great Britain and France later in the same year.

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S. B. Dole.

Haweis, Hugh Reginald: clergyman and author; b. at Egham, Surrey, England, Apr. 3, 1838; graduated at Trinity College, Cambridge, B. A. in 1859; since 1866 has been curate of St. James's, Marylebone. In 1868 he became editor of *Cassell's Magazine*. He has been a prominent advocate of cremation, and has written much on religion and music. His publications include *Music and Morals* (London, 1871); *Ashes to Ashes* (1874); *Christ and Christianity* (1886–87); etc.—His wife, Mary Eliza (Joy) Haweis, has written *Chaucer for Children* (1876); *Beautiful Houses* (1882); and other books relating to Chaucer and to the decorative arts.

H. A. Beers.

Hawesville: city; capital of Hancock co., Ky. (for location of county, see map of Kentucky, ref. 3–E); on the Ohio river and the Lv., St. L. and Tex. Railway; 84 miles W. S. W. of Louisville. It is the center of a large coal-mining region, has several mines in operation in its vicinity, is chiefly engaged in coal-mining, tobacco-growing, and hard-wood lumbering, and contains 6 churches, 2 public schools, flour-mill, hub-factory, shingle-mills, distillery, and weekly newspaper. Pop. (1880) 872; (1890) 1,013; (1893) 1,250.

Editor of "Plaindealer."

Hawfinch [*haw*, hedge < O. Eng. *haga*, akin to *heeg* (> *hedge*) : Germ. *hecke*] : the common grosbeak of Europe and Asia, *Coccothraustes vulgaris*. It is a shy forest bird, but is quite destructive of small fruits, seeds, and the like. It is variegated with black, white, brown, and gray of various tints, and is 7 inches long.

Hawick, haw'ik : town of Scotland ; in the county of Roxburgh, at the confluence of the Teviot and the Slitrig ; 45 miles N. N. E. of Carlisle (see map of Scotland, ref. 13–I). It is the center of the Scotch manufactures of stockings, plaids, shawls, and blankets. There are also dye-works and tanneries. Pop. (1891) 19,204.

Hawk [M. Eng. *hauk*, older *havok* < O. Eng. *hafoc* : O. H. Germ. *habich* (> Germ. *habicht*) : Icel. *haukr*] : a popular name for the many birds of prey of the family *Falconidæ*, mostly smaller than those known as eagles, and having, as a rule, shorter wings than the true or noble falcons. The term is, however, a very vague one, simply excluding on the one side the vultures and eagles, and on the other the buzzards, falcons, harriers, and kites. It may include more than a hundred species which may be arrayed in genera varying in number from twelve to twenty, according to the fancy of the student. The genus *Accipiter* is, however, regarded as the typical one. The more important species are described under their alphabetical heads. The differences between the various forms are such as can be appreciated only by the specialist. Revised by F. A. Lucas.

Hawk'bit : the fall dandelion (*Leontodon autumnalis*) ; naturalized from Europe, and now a common weed in meadows and roadsides from New England to Pennsylvania. It is a perennial, composite plant, with a cluster of toothed root-leaves, and a tall scape bearing one or more yellow flower-heads in the autumn. Charles E. Bessey.

Hawkesbury : a river of New South Wales ; flows first N. E. nearly parallel with the coast, and then S. E., entering the Pacific at Broken Bay, 20 miles N. of Sydney. The Sydney-Newcastle railway crosses it by a seven-span bridge 2,900 feet long, opened in 1889. The river is 330 miles long, but the upper portion is called the Wollondilly.

Hawkesbury : a village of Prescott County, Ontario, Canada ; on the river Ottawa, opposite Grenville, with which it is connected by ferry (see map of Ontario, Canada, ref. 1–I). It is at the end of a branch of the Canada Atlantic Railway. It has manufactures of lumber. Pop. 2,000.

Hawkesworth, John : author ; b. in London, 1715 or 1719 ; was a clockmaker's apprentice ; read law, and in 1744 became compiler of parliamentary debates for *The Gentleman's Magazine* ; for the same periodical was critic 1765–72 ; was the author of 70 of the 140 papers published in *The Adventurer* (1752–54), in consequence of which he received the doctorate from the Archbishop of Canterbury. He was author of *Zimri*, a good oratorio (1760) ; *Edgar and Emeline*, a drama (1761) ; *Almoran and Hamet*, a tale (1761) ; prepared for the Government an account of the first voyage of Cook, with some account of the voyages of Byron, Wallis, and Carteret (3 vols., 1773), a work which called forth severe criticisms ; translated Fénelon's *Télémaque* (1768) ; prepared a good *Life of Swift*. D. Nov. 17, 1773.

Hawking : See Falconry.

Hawkins, Benjamin : b. in North Carolina, Aug. 15, 1754 ; educated at Princeton ; was an excellent French scholar ; became Washington's interpreter in his intercourse with the French officers of his army ; was with him at the battle of Monmouth. In 1780 was chosen commercial agent of North Carolina, and 1781–84 and 1786–87 was a delegate to Congress ; 1789–95 was a Senator from the same State under the new Constitution. In the latter year he was appointed by Washington agent for superintending all the Indians S. of the Ohio, an office which he retained until his death, making his headquarters at a station in Georgia, now known as the town of Hawkinsville. To each successive President, from Washington to Madison, he tendered his resignation, which was not accepted. D. June 6, 1816. See Chappell's *Historical Miscellanies of Georgia*.

Hawkins, Benjamin Waterhouse, F. G. S., F. L. S. : writer on anatomy ; b. in London, Feb. 8, 1807 ; educated at St. Aloysius's College ; studied art under William Behnes, the sculptor ; began the pursuit of natural science in 1827, and in 1852 began the restoration of extinct animals in model, his previous labors (1842–47) in studying living forms of animal life at Knowsley Park having fitted him for the work. In 1868 he removed to the U. S. His lectures in the United Kingdom and the U. S. did much to popularize science. His restorations of fossil animals for the Crystal Palace Park, near London, are good examples of his skill in modeling. He was author of *Popular Comparative Anatomy* (1840) ; *Elements of Form* (1842) ; *Comparative View of the Human and Animal Frame* (1860) ; *Atlas of Comparative Osteology* (with Huxley, 1865) ; *Artistic Anatomy of the Horse* (1865) ; *Artistic Anatomy of Cattle and Sheep* (1867) ; *Artistic Anatomy of the Dog and Deer* (1876), etc. D. in 1889.

Hawkins, Sir John : naval hero ; b. at Plymouth, England, 1532. He early began a seafaring life, became master of a vessel, and in 1562 carried a cargo of slaves from Africa to the Spanish West Indies ; though Spanish law prohibited foreigners from trading there, he easily disposed of his cargo ; and his success led him to undertake similar and more extensive expeditions in 1564 and 1567 ; in these he had several ships. English noblemen and, it is said, Queen Elizabeth had financial interests in the voyages. Ultimately Hawkins was attacked by a Spanish fleet in the harbor of Vera Cruz (Sept. 24, 1568), and escaped with difficulty after losing several vessels. Notwithstanding their irregularity, Hawkins's exploits won him great fame ; he was elected to Parliament in 1572, was appointed treasurer of the navy in 1573, and had great influence in all naval affairs. As rear-admiral he commanded a division of the English fleet in the fight with the Spanish Armada July, 1588, and shortly after was knighted. In 1590 he was associated with Frobisher in an unsuccessful descent on the Portuguese coast. Four years later he was second in command in Drake's expedition to the West Indies, and died at sea, off Puerto Rico, Nov. 12, 1595. Herbert H. Smith.

Hawkins, or **Hawkyns**, Sir Richard : naval hero ; son of Sir John Hawkins ; b. probably at Plymouth, England, about 1562. He made several trading or freebooting voyages to the West Indies, commanded the Swallow in the fight against the Armada July, 1588, and in 1590 was with his father on the Portuguese coast. In 1593 he undertook a voyage around the world in the Dainty. He passed the Straits of Magellan, ravaged the coasts of Chili, and took and sacked Valparaiso. A strong Spanish fleet under Don Beltran de Castro was sent in pursuit of him, and he was eventually defeated and captured after a splendid resistance in San Mateo Bay (June 22, 1594). Don Beltran took him to Lima, where the viceroy refused to give him up to the Inquisition ; he was sent to Spain in 1597 and imprisoned ; escaped in 1598, but was recaptured, and was finally ransomed in 1602. Next year he was knighted ; in 1604 he was elected to Parliament, and shortly after he was made Vice-Admiral of Devon. In 1620–21 he was vice-admiral of Sir Robert Mansell's fleet sent against the Algerine pirates. D. in London, Apr. 17, 1622. Herbert H. Smith.

Hawkinsville : town ; capital of Pulaski co., Ga. (for location of county, see map of Georgia, ref. 5–H) ; at the head of navigation, on the Ocmulgee river and on the E. Tenn., Va. and Ga. Railway ; 40 miles S. of Macon. It is in a cotton-growing region, and has cotton warehouses, cotton-factory, steam grist-mill, carriage and wagon factories, Masonic temple, Odd Fellows' hall, and weekly newspaper. Pop. (1880) 1,542 ; (1890) 1,755.

Hawk-moth [named from their manner of flying, which resembles that of a hawk] : any member of the *Sphingidæ*, a family of nocturnal lepidopterous insects, of which there are more than 300 known species, quite largely from tropical America. Among them are some of the largest of the Lepidoptera. They have short bodies and narrow, strong wings, and their flight is swift and powerful. They often stand poised in the air like humming-birds, and in general obtain their food from flowers after the manner of humming-birds, whence they are popularly called humming-bird moths, or hawk-moths. The larvæ have sixteen legs, and are remarkable for their large size and their habit of elevating the fore part in a manner fancied to resemble the position of the sphinx (hence the name *Sphinx* for the typical genus). The larvæ are mostly destructive plant-feeders, and among them is the well-known tomato-worm (*Protoparce celeus*). The U. S. have many species.
Revised by F. A. Lucas.

Hawks, Francis Lister, D. D., LL. D. : clergyman ; b. at New Berne, N. C., June 10, 1798 ; graduated at the University of North Carolina in 1815, and became a successful

lawyer, but in 1827 was ordained minister of the Protestant Episcopal Church; and was rector of St. Thomas's church in New York city. In 1837 he became one of the founders of *The New York Review*, and in 1839 established St. Thomas's Hall, a school at Flushing, N. Y., by which he was heavily involved in debt. He was (1840–42) editor of *The Church Journal*. In 1843–44 he resided in Mississippi, and was elected bishop of the diocese, but declined the office. He was (1844–49) rector of Christ church, New Orleans, and was chosen first president of the University of Louisiana. In 1854 Dr. Hawks declined the bishopric of Rhode Island. Sympathizing with the South during the civil war, he held (1861–65) the rectorship of Christ church, Baltimore. In 1865 he accepted the ministry of the chapel of the Holy Saviour, New York. When in the practice of law he published several volumes of legal reports and a digest, and afterward *Contributions to the Ecclesiastical History of the United States* (1836–41); *Narrative of Commodore Perry's Expedition* (1856); *History of North Carolina* (1857–68); and in connection with the Rev. William Stevens Perry *Documentary History of the Protestant Episcopal Church* (1863); and a large number of other works. D. in New York city, Sept. 27, 1866. Revised by W. S. Perry.

Hawksbee: See Hauksbee.

Hawk's-bill Turtle: popular name of the species of sea-turtle (*Eretmochelys imbricata*) which furnishes the "tortoise-shell" of commerce; given on account of its horny beak, which suggests that of a bird of prey. This turtle is an inhabitant of the tropical seas, but usually the individuals of the Indian and Pacific Oceans are separated as a distinct species, *E. squamata*. See also Testudinata. F. A. L.

Hawkshaw, John: civil engineer; b. in England, Apr. 9, 1811. He constructed the Southeastern Railway and the Charing Cross and Cannon Street Railways in London, and was also engaged on the East London Railway and the Inner Circle Junction Railway. He built a bridge over the Thames at Staines, a drawbridge at Kingston-on-Hull, the Londonderry bridge in Ireland, Nerbudda bridge in India, and completed the Clifton suspension bridge begun by Brunel in 1843. He was consulting engineer on the navigation of the Weaver, in England, the Suez Canal, the Amsterdam Ship-canal, the navigation of the Nile, and the Panama Canal. He built an intercepting sewer 7 miles long at Brighton, drained Cardiff, and planned sewers for Dover. He was knighted in 1875. He was a frequent contributor to discussions in the Institution of Civil Engineers. The index alone of subjects treated by him prior to 1880 occupies six closely printed pages. In 1862 he was president of the Institution of Civil Engineers, and in 1875 of the British Association, and he was an honorary member of the American Society of Civil Engineers. D. June 2, 1891.

J. James R. Croes.

Hawley: borough; Wayne co., Pa. (for location of county, see map of Pennsylvania, ref. 2–J); at the junction of the Paupack and Lackawaxen rivers, and on the Erie and the Erie and Wyo. Val. Railways; 35 miles N. by E. of Scranton. It contains five churches, public school with eight grades, and weekly newspaper, and its principal industries are silk and lumber manufacturing and glass-blowing and cutting. Pop. (1880) 1,882; (1890) 1,968; (1893) 2,200; with suburbs, 2,700. Editor of "Times."

Hawley, Christopher Eldridge: civil and mining engineer; b. at Binghamton, N. Y., Aug. 17, 1833; educated at College Hill, Poughkeepsie, N. Y.; engaged first on railways in New York and Pennsylvania; in charge of the Enriqueta and New Almaden mines in California 1863–67; in charge of irrigation-works in the province of La Mancha, Spain, 1867–70; engaged in professional work in Arizona, South America, and Europe, and as mining engineer for various coal companies in Pennsylvania; contributed frequently to the press; has written much upon the mechanics of the bicycle, and was the first in the U. S. to declare that the safety type of wheel must be adopted before bicycling could be established on a permanent basis. C. H. Thurber.

Hawley, Gen. Joseph Roswell, LL. D.: U. S. Senator; b. at Stewartsville, N. C., Oct. 31, 1826. His parents were natives of Connecticut, and he received his early education in the schools of Farmington and Hartford, Conn., and Cazenovia, N. Y., and graduated at Hamilton College, New York, in 1847. He studied law at Cazenovia and Farmington, and in Sept., 1850, began practice in Hartford. He very early took a deep interest in the politics of the U. S., and was an active opponent of slavery, especially of its extension to the U. S. Territories, and was one of the founders of the Republican party in Connecticut. In Feb., 1857, he gave up the practice of law and became editor of the Hartford *Evening Press*. Upon the outbreak of the war of 1861–65 he enlisted in the army (Apr. 15, 1861), being the first man in Connecticut to enroll his name for the volunteer service. He went to the field as captain in the First Regiment Connecticut Volunteers; was commissioned a colonel in 1862, and a brigadier-general in 1864, though he had commanded a brigade for a long time previous to this promotion. He was military governor at Wilmington, N. C., on the occupation of that city by the Federal troops; was breveted major-general in 1865; was Gen. Terry's chief of staff at Richmond after the surrender of Lee, and was mustered out of service in Jan., 1866. He was elected Governor of Connecticut in Apr., 1866, held the office one year, and returned to journalism as editor of the Hartford *Courant*, with which the *Press* had been consolidated. He was elected to the Forty-second Congress from the first Connecticut district Nov. 5, 1872, to fill the vacancy caused by the death of Hon. Julius L. Strong, receiving the largest Republican vote ever cast in the district; was re-elected to the Forty-third Congress Apr., 1873. On the organization of the Centennial commission to arrange for the celebration of the one hundredth anniversary of the independence of the U. S., he was chosen its president. Afterward he was elected to and served through the Forty-sixth Congress; was elected U. S. Senator Jan. 19, 1881, for six years from Mar. 4, 1881; re-elected 1887, and again in 1893.

Hawthorn: See Crataegus.

Hawthorne, Julian: author; son of Nathaniel Hawthorne; b. in Boston, June 22, 1846. He was prepared for college at Concord; graduated at Harvard College in 1867, and then studied engineering in the Scientific School of Harvard and at Dresden. Being on a visit to New York in 1870, when the Franco-German war broke out, he determined to remain at home, and joined the staff of hydrographic engineers in the New York dock department, under Gen. McClellan. The success which some minor contributions to various New York magazines met with induced him to give up engineering for literature. From 1874 till 1882 he lived in Europe. Author of a number of novels, including *Bressant* (1873); *Idolatry* (1874); *Garth* (1877); *Sebastian Strome*, *Noble Blood* (1884); *John Parmelee's Curse* (1886); *Of Saxon Studies* (1876); the biography *Nathaniel Hawthorne and his Wife* (1885); and *The Professor's Sister* (1888).

Hawthorne, Nathaniel: author; b. at Salem, Mass., July 4, 1804. In early youth he was sent, on account of feeble health, to live upon a farm at Raymond, Me. He graduated at Bowdoin College in 1825, in the same class with H. W. Longfellow and G. B. Cheever. He then returned to Salem to live with his widowed mother. While here he published occasional articles, mostly tales, in different periodicals. In 1826 he published anonymously *Fanshawe*, an unsuccessful romance. He went to Boston in 1836 and edited *The American Magazine*, an illustrated periodical, which was soon bankrupt. In 1837 appeared *Twice-told Tales*, which was made up from his previous contributions to periodicals. This work gradually drew the attention of cultivated persons to the wonderful powers of its author, and in 1845 another series appeared. He was (1838–41) employed in the Boston custom-house. In 1842 he joined for a time in the Brook Farm experiment. In 1843 he married and went to Concord, Mass., where he lived in the old parsonage, afterward immortalized by him in *Mosses from an Old Manse* (1846). While here he was the associate of Emerson, Thoreau, Ellery Channing, and other congenial friends. He was (1846–50) surveyor of the port of Salem. While here he wrote that powerful tale *The Scarlet Letter* (1850), his most successful romance. He lived (1850–52) in Lenox, Mass., and here he produced the *House of the Seven Gables* (1851) and *The Blithedale Romance* (1852), and in the latter year published a *Life of Franklin Pierce*, who was a college friend to whom Hawthorne was warmly attached. He was U. S. consul at Liverpool 1853–57, and afterward spent some years in Italy. He lived (1860–64) in Concord, Mass., and while journeying for his health with Mr. Pierce he died at Plymouth, N. H., May 19, 1864. Besides the works mentioned above are *True Stories from History*, etc. (1851); *The Wonderbook* (1851); *The Snow Image*, etc. (1852); *Tanglewood Tales* (1853);

The Marble Faun (1860; in some respects his best effort); and *Our Old Home* (1863). After his death appeared a series of *Notebooks* (1868–72); *Septimius Felton* (1872); and parts of the unfinished *Dolliver Romance*. In person he was tall, large, and imposing, but he was as shy, sensitive, and impressible as any woman. Mr. Hawthorne's wife, SOPHIA PEABODY (1810–71), illustrated one of his stories before their acquaintance, and after his death edited the *Notebooks*, and published a volume of *Notes* of her own (1868). Another posthumous romance by him (*Doctor Grimshawe's Secret*) was edited by his son (1883).—His daughter UNA edited her father's *Septimius Felton*. His biography was written by his son (1885). Revised by HENRY A. BEERS.

Haxo, aak sō', FRANÇOIS BENOÎT, Baron: military engineer; b. at St.-Dizier, Lothringia, June 24, 1774; a general of French engineers; distinguished himself at the siege of Lerida, Mequenenza, and Tarragona, under Suchet; directed the construction of fortifications at Belfort, Sedan, Grenoble, and l'Écluse; also the operations at the siege of Antwerp 1830. He is best known out of France by what is called the "Haxo casemate," formed in the parapet, and, though arched over, covered with earth, and open behind to the terreplein; the guns fire through embrasures formed in an extension of the parapet beyond its ordinarily retired position in his system, and are not only secured from the enemy's fire, but may be hidden by masking the embrasures. D. June 25, 1838.

Hay [< M. Eng. *hey* < O. Eng. *hīg*: O. H. Germ. *hewi* (> Mod. Germ. *heu*): Goth. *hawi*, cut grass; cf. Germ. *hauen*: Eng. *hew*]: forage-plants cut for fodder and cured for storage. The plants commonly used for making hay are many kinds of grasses, several leguminous plants, particularly the clovers, and a few plants of other natural families. As a rule, plants are in the best state to be cut for fodder when in blossom or just out of blossom, though in general a greater weight of nutritive material at some expense of palatability and digestibility will be obtained if the plants are allowed to stand till nearly mature. During the ripening of the seed the stems become woody and stiff, preparatory to sustaining the weight of the heads, and this woody fiber is formed at the expense of the starch, gum, sugar, and soluble cellulose contained in the cells and juices of the stem and leaves.

The manner of curing is no less important than the time of cutting. If exposed to the sun, turned often, and dried rapidly and thoroughly, grass and clover become harsh and brittle, the leaves fall off, the sweet odor departs, and a great part of the value of the hay is lost. The object sought is not to dry hay so that it will keep, but to cure it so that it will make the most nutritious fodder and be dry enough for storing. Slow drying, with sufficient exposure to the air to prevent fermentation, causes the juices of the plants to become thickened, and when such a degree of inspissation is reached that the hay will not heat and mould when placed in stacks or in the mow—a point not difficult to determine with sufficient accuracy—the process is complete. Such hay will be found green, fragrant, and tough, the leaves even of clover not breaking and falling off. A greater weight of hay will be obtained, and it will prove more nutritious and be better relished by animals. The cutting of grass for hay is done by hand-scythes or by horse-power mowing-machines. The swaths as cut are shaken out and turned to expose all to the action of the sun and air, either by hand or by machines called spreaders or tedders. It is raked together when somewhat dry, either by hand or horse rakes, into long heaps, called windrows, extending in parallel lines across the field. The hay in the windrows is formed into symmetrical, compact conical heaps called cocks, which are of greater or less size according to convenience, and according to the condition of the hay, small cocks heating less readily than large ones. Hay-caps, which are pieces of cotton cloth 4 to 6 feet square, with loops of cord sewed in at the corners, whereby they are pinned with wooden pins or forks to the hay, frequently are used to cover the tops of these cocks in threatening weather. Hay-caps are also made in conical shape of compressed wood pulp treated with oil to make it waterproof. Thus protected, or indeed unprotected, hay will go on curing in the cock for several days. There is no hay superior to that cured in this way, but there is danger of overheating and mildewing. It is stored either under cover in barns or barracks, or in stacks. It may be salted when mowed away, four quarts to a peck of salt being used to the ton. This gives it a fresher color, and it is more relished by the cattle. Moreover, salt may aid in preventing injury from heating in case hay is housed or stacked too green. In addition to the tools already mentioned, horse hay-forks of various kinds are an important aid. They are arranged so that by a system of ropes, blocks, and rods the hay is lifted from the load upon the fork, and delivered in any section of the barn.

Brown Hay.—In some parts of Europe the fermentation of hay housed in a half-cured state or only well wilted before housing is so regulated that the mass becomes both cured and cooked by the operation. The result is a very compact mass, in which the plants lose to a degree their individuality, and which is of a dark-brown color, and so compact that it may be cut with an ax, though it can be broken up by hand. This is fragrant, and highly relished by stock, possessing at the same time a higher nutritive value than the best common hay. The fermentation causes a considerable loss in weight from the dissipation of moisture, and from the consumption of a part of the carbonaceous matter. Coarse grass and plants hardly regarded as fit for fodder, if mingled with grass of a better quality, are thus made to contribute largely to the store of winter forage.

Hay varies greatly in composition and nutritive value according to the plant from which it is made, the growth and period of cutting, and the method of curing. Exposure to a single heavy dew causes fermentations and decompositions within the substance of the moistened stems and leaves, both fragrance and flavor are lost, and the nutritious quality of the hay seriously injured. The average composition of hay made in the U. S., according to Dr. E. H. Jenkins, of the Connecticut Agricultural Experiment Station, is as follows (*Compilation of Analyses of American Feeding-stuffs*, U. S. Dept. Agr. Expt. Sta., Bull. No. 11):

PARTS.	Clover.	Timothy.	Mixed meadow grasses.
Water	15·3	13·2	14·3
Ash	6·2	4·4	4·4
Protein (albuminoids)	12·3	5·9	6·8
Crude fiber	24·8	29·0	26·9
Nitrogen free extract (carbohydrates)	38·1	45·0	46·1
Crude fat	3·3	2·5	1·5
Totals	100·0	100·0	100·0

Except for the amount of crude fiber which it contains, good hay compares favorably with the different kinds of grain as nutritious feed, and it is its bulk, caused by the woody fiber, which particularly adapts it to the use of cattle and horses as a general diet. The money value of the hay-crop in all countries where cattle can not graze during the winter and spring is fully equal to any other farm crop, as generally estimated. Its intrinsic value is really greater, for the value of farm crops in money is fixed chiefly by the convenience and expense of marketing, and this places hay at a disadvantage. To be marketed at a distance it must be pressed into as small compass as possible by hay-presses, worked either by hand or power; and even in this form hay is a bulky article and expensive to transport and to market. Ordinary bales measure 2 feet to 2 ft. 6 in. across the ends, and 4 to 5 feet in length, and usually weigh from 200 to 350 lb.; while those made by the most powerful presses, though of the same size, weigh 400 to 500 lb.

The kinds of grasses and forage-plants most valued for hay, generally cultivated for that purpose in the U. S., are the following: (1) Timothy (*Phleum pratense*), called herds-grass in New England, a well-known grass growing to the height of 2 to 4 feet, flowers in July, yields abundantly for the first cutting—little for the aftermath. (2) Orchard grass (*Dactylis glomerata*), called also cock's-foot, a rough, rather coarse, leafy grass, flowering in June, at the same time with red clover, yields a heavy crop of hay very early, escaping late droughts, which it survives well; makes afterward a great growth of root-leaves, useful for fall pasturage. (3) Redtop (*Agrostis vulgaris*), called herds-grass S. and W. of New York, a grass known under many names, and assuming different forms and colors in different soils. It usually matures rather late, but grows wiry before it fairly flowers in July; is most valuable with other grasses, which it is apt gradually to crowd out; makes good hay—not so much as those previously named. (4) Fowl-meadow (*Poa serotina*), an admirable grass for moist meadows, making an abundance of nutritious, fine, soft hay—better for consumption than for market—and good aftermath. (5) June-grass or blue-grass (*Poa pratensis*) is hardly worthy of being in-

cluded among hay grasses, yet it finds its way into almost all permanent mixed ways, and makes good sweet hay, excellent pasture, and a close sward. The rye-grasses are good, but not equal to timothy and orchard-grass for hay. Sweet-scented vernal grass is present in many soils of the Northern and Eastern States. It gives the odor to new-mown hay so much admired, which is not noticed in Western hay on account of the absence of this grass. In addition to these proper grasses, the clovers are most important, as already mentioned. The most valuable is the common red clover (*Trifolium pratense*), of which there are two principal varieties—the mammoth and medium. The latter is preferable for hay, and may be used alone, or, better, in connection with orchard-grass or timothy, or with timothy, orchard-grass, and red-top mixed. Alsike, or Swedish clover (*Trifolium hybridum*), is partially procumbent in its growth, but with grass to sustain it makes excellent hay. Lucerne, or alfalfa (*Medicago sativa*), is sowed by itself, and after becoming established, where it does well yields at least three heavy crops of hay or green fodder each year.

The greatest consumption of hay is of course in those parts where the winter is long and severe. Grasses adapted to the soil throughout these colder portions of the temperate zone afford rich and abundant summer pasturage, but for winter fodder the chief dependence is hay, and in the U. S. corn-fodder, which, though properly included in the general definition of hay, is never reckoned as such by the farmers.

In the U. S. the hay crop for 1893 amounted to 65,766,158 tons, valued at $570,882,872, the product of 49,613,469 acres. Iowa is the chief hay-producing State.

Revised by H. H. Wing.

Hay, Charles Augustus, D. D.: Lutheran theologian; b. at York, Pa., Feb. 11, 1821; graduated at Pennsylvania College, Gettysburg, 1839; studied theology at Gettysburg, Pa., and Berlin and Halle, Germany; pastor at Middletown, Md., 1844–45; Hanover, Pa., 1848–49; and Harrisburg, Pa., 1850–65; Professor of Hebrew in Theological Seminary, Gettysburg, Pa., 1845–48, and from 1865 till his death there June 26, 1893. His chief contribution to theological literature is his translation (with Dr. H. E. Jacobs) of Schmid's *Dogmatik* (Philadelphia, 1875, 1888). H. E. Jacobs.

Hay, John: author and diplomat; b. at Salem, Ind., Oct. 8, 1838; graduated at Brown University in 1858; studied law at Springfield, Ill., and was admitted to the bar in 1861. Immediately afterward he went to Washington with President Lincoln, serving him as assistant secretary, and subsequently as adjutant and aide-de-camp. During the war of 1861–65 he served for several months under Gen. Hunter and Gen. Gillmore, attaining the ranks of colonel and assistant adjutant-general. He was secretary of legation at Paris 1865–67, when he became *chargé d'affaires* at Vienna by the withdrawal of Mr. Motley, remaining in the latter place till 1868. In 1869 he was appointed secretary of legation at Madrid, and held that position till 1870, when he returned to the U. S. and joined the editorial staff of *The New York Tribune*. Soon after this he became widely known by his dialect poems of *Little Breeches*, *Jim Bludsoe*, *Banty Tim*, etc., afterward published in book-form under the title of *Pike County Ballads* (1871). He also published *Castilian Days* (1871), a series of brilliant sketches of Spanish life, character, and politics. He was associated with John G. Nicolay in writing the *Life of Abraham Lincoln* (1887–89). In 1897 appointed ambassador to the court of St. James.

Hay Asthma, Hay Fever, or **Autumnal Catarrh**: a disease recurring in some individuals at certain seasons every year, as in June (rose cold), in the haymaking season (hay fever), or (in the U. S. especially) in the autumn, whence the name autumnal catarrh. It is a catarrhal affection of the nasal (and sometimes of the bronchial) passages, often with some fever and more or less asthmatic spasm. Sometimes incessant sneezing and coryza are the only prominent symptoms. It is not observed in very hot or very cold countries, on the sea, or at considerable heights in some mountain regions. Probably it is caused by pollen from some plants, this producing violent irritation of the mucous membrane of the nose, which is generally found hypertrophied. It is likely, however, that various other forms of irritation also take part. Removal from districts where the disease prevails is the only means of cure, but the usual palliatives may be employed, and cocaine applied to the nose alone affords great relief to some patients.

Revised by William Pepper.

Hay'den, Ferdinand Vandeveer, M. D., Ph. D., LL. D.: explorer and geologist; b. in Westfield, Mass., Sept. 7, 1829; graduated at Oberlin, O., in 1850, and took a degree in medicine at Albany, N. Y., in 1853, but did not practice medicine until the civil war, when he became surgeon of volunteers and was finally breveted lieutenant-colonel. Except during the civil war he was engaged in the exploration and survey of the great plains and Rocky Mountains from 1853 to 1879, his first work being at private expense and subsequent work under the auspices of the general Government. From 1856 to 1860 his work was carried on in connection with explorations by the War Department. In 1867 he was commissioned by the national Government to make a geological survey of the Territory of Nebraska, and the official organization thus initiated was continued and enlarged year after year, becoming finally the U. S. Geological and Geographical Survey of the Territories, and being succeeded in 1879 by the present U. S. Geological Survey. His writings, chiefly contained in the official reports of his survey, constitute important contributions to geographic, geologic, botanic, and ethnographic knowledge; but his great achievement was the stimulus which his enthusiasm and example imparted to the scientific exploration of the national domain. He was a member of the National Academy of Science and of nearly all the other scientific societies of America, and an honorary member of many scientific societies in foreign countries. D. in Philadelphia, Pa., Dec. 22, 1887. G. K. Gilbert.

Haydn, hīd'n, Franz Joseph: composer; b. in Rohrau, near Vienna, Mar. 31, 1732; son of a wheelwright. Music was cultivated in the home, and Franz Joseph very early revealed his inborn talent. At five years of age a distant relation of the family, Johann Mathias Frankh, who was a schoolmaster in the neighboring town of Hainburg, took him to his home and supervised his general and musical education. During the three years spent with Frankh he learned reading and writing, something of Latin, and the elements of music and of the art of singing. He also began to play on the violin, the drum, of which he was very fond, and several other instruments. At eight years of age his fine voice and his intelligence attracted the attention of the dean of Hainburg, who took him to Vienna and, through the influence of Reuter, the chapel-master, procured him a place as chorister in the Cathedral of St. Stephen. There he diligently followed his art, learning what he could from his associates and from observations in the course of his work. At thirteen he made his first effort at composing by writing a mass, which was so crude that Reuter laughed him to shame. But, not disheartened, Haydn set to work with characteristic patience and industry, teaching himself the art of composition from the dry and obscure works of the period. When by the natural change his fine soprano voice was lost, Reuter turned him into the street penniless. A poor barber named Keller gave him a bed in his garret. There, with a worm-eaten harpsichord, a few books, and some scores, he worked in tranquillity. After a while, by giving lessons for a trifle and playing on the violin and the organ, he gained a livelihood. He was so attracted by the sonatas of Karl Philipp Emanuel Bach as to study closely his style, and he mastered it so well that Bach recognized the success of his effort. Sammartini, a prolific Italian composer of clear and graceful style, exerted the only other influence which affected his early work. He was introduced to Porpora, one of the greatest masters of that day, and knowing what inestimable benefits might be derived from such a source, Haydn devoted himself to Porpora as valet. Finally Porpora received him fully, made him his accompanist, his companion, and gave him invaluable knowledge of the art of Italian singing and of correct, elegant composition. His productions improved much after this, and brought him some personal attention. But, although publishers issued many of his works, he derived little or no benefit from them, being either ignorant of their publication or too retiring to enforce his claims.

The precarious period of his life ended at twenty-eight years of age in 1760, when he became chapel-master to Prince Esterhazy and a member of his household, receiving a salary of 400 florins, which was later raised to 1,000. Rarely do circumstances harmonize so completely with character as in Haydn's life from 1760 till 1790. He was the intimate friend of his beloved Prince Nicholas till death severed the bond. The prince played the violoncello, and fully appreciated the genius of Haydn, who wrote 150 com-

positions for his patron's instrument. In his prosperity, remembering his gratitude to the barber, he married Anne Keller. Her exasperating nature was too much for even the serenity of Haydn. They lived together but a short time before he left her, sharing his means generously for her support. His affectionate but dispassionate heart found consolation in Mademoiselle Boselli, a singer of the court, as well as in the friendship of other congenial and appreciative people about him. By the death of the prince the tie which had made Haydn unwilling to travel was broken. In 1790, at the age of sixty, he visited London, where his enthusiastic reception was a proof of his renown surprising to him. At this time his accumulated fortune was $5,000. In 1795, after a second voyage to London and some of the continental cities, having amassed $100,000, he bought a house and garden near Vienna. There he remained till his death, May 26, 1809, modestly receiving the greatest honors from all parts of Europe.

Haydn was small and slight in stature, and of so dark a complexion that he was nicknamed "the Moor." But his face was kind and unaffected, expressing a placid, healthy, genial nature. He was extremely generous in his recognition of other musicians. He was deeply devout, taking every accomplished work as from God. At the beginning of every MS. are the words "In nomine Domini" or "Soli Deo gloria"; at the end of each, "Laus Deo." When, in the midst of a composition, he was arrested by a difficulty or by the cooling of his imagination, he recited his rosary, which he said invariably brought him success. His character was a remarkable union of genius and industry. Early in life he worked sixteen, even eighteen hours per day, and later never less than five.

Haydn is the father of symphony and of the stringed quartet. He did more to develop instrumental music than any hundred of his predecessors. The leading qualities of his compositions are perfect lucidity of ideas, perfect symmetry in their development and treatment, and the perfect finish of every phrase and part. His works number about 800; of this extraordinary number, his most esteemed compositions are the twelve grand symphonies written for production in London, the fifty last quartets for stringed instruments, and the oratorios *The Seasons* and *The Creation*. Yet these were compositions of his later years. The master was already sixty when he turned his attention from instrumental music, in which he had wrought such wonders, to oratorio, in which he expressed the joyous fullness of his nature. Of the 118 symphonies and 83 quartets that he composed, scarcely a tenth part are ever performed, but *The Creation* retains a perennial freshness.

Revised by DUDLEY BUCK.

Hay'don, BENJAMIN ROBERT: historical painter; b. at Plymouth, England, Jan. 26, 1786; pupil of the Royal Academy, London, in 1804; exhibited his first picture, *A Riposo of the Holy Family*, in 1807. His *Death of Dentatus* (1809) gained a prize of 100 guineas from the British Institution, and his *Judgment of Solomon* in 1814 was awarded an equal prize by the same institution. He had quarreled with the Academy as a body, and in his efforts to place himself at the head of a new school of art was strongly opposed by people of influence, who could not endure his impetuous temper, and his work was constantly depreciated. His *Christ's Entry into Jerusalem* (1820) brought him in over 3,000 guineas in exhibition fees, but it was finally sold for only £240, and is now in Philadelphia. He was in the debtors' prison several times, and led a life of peculiar hardship, but continued to paint ambitious compositions, firmly believing his efforts would finally be appreciated. His *Banishment of Aristides* and *Nero Watching the Burning of Rome*, exhibited in London in 1846, were received with indifference on the part of the public, and he committed suicide in London, June 22, 1846. *Punch* (or *May Day*), painted in 1829, and *The Raising of Lazarus* (1821–23) belong to the National Gallery, London, and in the South Kensington Museum are *Christ's Agony in the Garden* and a chalk drawing. He published *Thoughts on the Relative Value of Fresco and Oil Painting* in 1842, and his *Lectures on Painting and Design* in 1844–46. His *Life* was written by Tom Taylor and published in 1853. WILLIAM A. COFFIN.

Hayduk: See HAIDUK.

Hayem, ăă'yăăń', GEORGES: specialist in medicine; b. in Paris, Nov. 24, 1841. He was educated in Paris; was professor in the Faculty of Medicine, Paris; physician of the St. Antoine hospital; member of the Academy of Medicine; chevalier of the Legion of Honor; founder and editor of the *Revue des Sciences médicales en France et à l'étranger*. Author of *les Grandes médications* (1887); *Du Sang et de ses altérations pathologiques* (1889); and of a large number of memoirs on various professional topics. C. H. T.

Hayes, ISAAC ISRAEL, M. D.: explorer; b. in Chester co., Pa., Mar. 5, 1832; graduated M. D. in 1853 at the University of Pennsylvania; was surgeon to the second Grinnell expedition, under Dr. Kane, 1853–55; commanded an expedition (1860–61) in the schooner United States, and with a small party in a boat and dog-sledges reached (viâ Smith's Sound) land in lat. 81° 37' N.; was a medical officer in the U. S. service in the civil war; went in the steamer Panther to Greenland 1869; received gold medals from the geographical societies of Paris and London; wrote *Arctic Boat-journey* (Philadelphia, 1860); *The Open Polar Sea* (Boston, 1867); *The Land of Desolation* (1871); and *Cast Away in the Cold*, a book for boys (1868). D. in New York city, Dec. 17, 1881.

Hayes, RUTHERFORD BIRCHARD, LL. D.: nineteenth President of the U. S.; b. at Delaware, O., Oct. 4, 1822; graduated at Kenyon College, Ohio, 1842, and at Harvard Law School 1845; began the practice of law at Fremont, O.; removed to Cincinnati 1849; was city solicitor 1858–61; was appointed, June 27, 1861, major Twenty-third Ohio Volunteers, of which W. S. Rosecrans was the first colonel and Stanley Matthews (afterward justice U. S. Supreme Court) lieutenant-colonel. He was promoted lieutenant-colonel Oct. 24, 1861, from which date he commanded the Twenty-third until Dec., 1862. After the unimportant campaign in West Virginia and the disastrous result of the Peninsular campaign, the Twenty-third Ohio was ordered to Washington, arriving there Aug. 24, 1862, and ten days later, with the army of Gen. McClellan, was on its way into Maryland, following the invading Confederate force of Gen. Lee. In the brilliant action of South Mountain, early in the day, Hayes received a severe wound in the left arm which compelled him to leave the field. After the battle of Antietam the regiment was returned to West Virginia, where, Nov. 30, 1862, Hayes rejoined it as colonel, having been promoted Oct. 24. He was soon after placed in command of the First Brigade of the Kanawha division, which he retained until Sept., 1864, when he succeeded to the command of the division. In the summer of 1863 his command was engaged in the pursuit and defeat of Morgan, then raiding through Ohio, and in Apr., 1864, took part in Crook's raid on the Virginia and Tennessee Railroad. He was soon after commissioned brigadier-general of volunteers, to date from the battle at Cedar Creek, at the close of which he received news of his election to Congress from the second district of Ohio. He was now made brevet major-general for gallant services, and resigning from the army June 1, 1865, returned soon after to Cincinnati. In December he took his seat in Congress; was re-elected in 1866, but left his seat in 1867, having been nominated for Governor of Ohio, to which office he was elected in October, and re-elected in 1869. In 1872 he suffered his first defeat for Congress; in 1875 he reluctantly consented to allow his name to be used once more as a candidate for Governor, and was elected for a third time—an honor never before conferred on a citizen of Ohio. The prominent issues were the currency and school questions, which attracted the attention of the whole country and caused his name to be favorably mentioned as the Republican candidate for President for the proximate term, and on June 16, 1876, he was nominated at Cincinnati on the seventh ballot, receiving 384 votes, to 351 for J. G. Blaine and 21 for B. H. Bristow. The ensuing canvass, which was bitter and exciting, was closed by a disputed election, the electoral votes of Florida, South Carolina, and Louisiana, and one of those of Oregon being claimed by both parties. Under the head PRESIDENTIAL ELECTORAL COMMISSION the proceedings are related which terminated in the announcement, Mar. 2, 1877, that R. B. Hayes had been duly elected President of the U. S. The inauguration ceremonies took place on Mar. 5. During the four years of his office the affairs of the Government were conducted in a manner that will command the favorable judgment of history. Especially noteworthy was the skill with which he selected the representatives of the Government at foreign courts. D. at Fremont, O., Jan. 17, 1893. Revised by C. K. ADAMS.

Haygood, ATTICUS GREENE, A. M., D. D., LL. D.: bishop; b. at Watkinsville, Oconee co., Ga., Nov. 19, 1839; graduated at Emory College, Oxford, Ga., 1859; engaged in pastoral and editorial work till 1876, when he became president of

Emory College. In 1890 he became bishop of the Methodist Episcopal Church South. D. at Oxford, Ga., Jan. 19, 1896. He was the author of *Our Children* (1876); *Our Brother in Black* (1881); *Sermons and Speeches* (1883); *Pleas for Progress* (1889); *The Man of Galilee* (1889).

Hayley, William: author; b. in Chichester, England, in 1745; d. 1820. He was educated at Eton and Cambridge; published *Triumphs of Temper* (1781), a poem which had some popularity, and other writings in verse and prose, but is chiefly remembered for his *Life of Cowper* (1802).

H. A. B.

Hayne, Paul Hamilton: poet; son of Lieut. Arthur P. Hayne (1790–1867) of the U. S. navy, and nephew of Governor Robert Y. Hayne; b. at Charleston, S. C., Jan. 1, 1830; graduated at the University of South Carolina. He was editor of *Russell's Magazine* and the Charleston *Literary Gazette*. He served for a time in the Confederate army and wrote a number of popular war songs. His publications include *Poems* (1855); *Sonnets and Other Poems* (1857); *Legends and Lyrics* (1872); and *Life of Robert Y. Hayne* (1878). A complete edition of his poems was published in 1882. D. near Augusta, Ga., July 6, 1886. H. A. Beers.

Hayne, Robert Young: statesman; b. in Colleton district, S. C., Nov. 10, 1791; studied law with Langdon Cheves, admitted to the bar in 1812; served for a time in the war of 1812; distinguished himself in the State Legislature; was in 1818 Speaker of the House, and soon after attorney-general of South Carolina. During his U. S. Senatorship (1823–32) he displayed abilities of the first order, and was among the leading opponents of a protective tariff. In 1824 he enunciated in an able speech the doctrine that such a tariff is unconstitutional. In Jan., 1830, occurred the famous debate between Hayne and Webster on Foote's Resolution (*q. v.*), in the course of which Hayne urged the constitutional right of secession. He was in 1832 chairman of a committee in the South Carolina State convention which reported the celebrated "ordinance of nullification." In the same year he was chosen Governor. To President Jackson's denunciation of the nullification acts, Governor Hayne made a defiant reply, and prepared for resistance of the Federal authority. Meanwhile Mr. Clay's compromise measure averted the threatened danger, and another State convention repealed the nullification ordinance. In 1834 Mr. Hayne became mayor of Charleston, and in 1837 a railway president. D. at Asheville, N. C., Sept. 24, 1839.

Hays, George Price, D. D., LL. D.: minister in the Presbyterian Church in the U. S.; b. near Canonsburg, Pa., Feb. 2, 1838; graduated at Jefferson College 1857, and the Wesleyan Theological Seminary, Allegheny, Pa., 1860. He was treasurer of the Christian commission, Maryland district, 1861–66; pastor of the Second Presbyterian church, Baltimore, Md., 1861–68; fiscal secretary of Wooster University 1868–69; pastor in Allegheny, Pa., 1869–70; president of Washington and Jefferson College (also supplying churches) 1870–1884; Central church, Denver, Col., 1881–85; Second church, Cincinnati, O., 1885–89; Second church, Kansas City, from 1889. He was moderator of the General Assembly 1884. He published *Everyday Reasoning* (Philadelphia, 1879); *The Honest Book* (Cincinnati, 1887); *May Women Speak?* (Chicago, 1889); *Presbyterians* (New York, 1892).

Willis J. Beecher.

Hays, William: U. S. soldier; b. in Richmond, Va., 1819; graduated from the Military Academy at West Point, July 1, 1840; served through the Mexican war with the light artillery. During the civil war he commanded the brigade of horse-artillery of the Army of the Potomac in the Virginia Peninsular campaign of 1862, and the reserve artillery in the battles of Antietam and Fredericksburg; appointed brigadier-general of volunteers Nov., 1862; at Chancellorsville, where he commanded a brigade of the Second Corps, he was wounded and taken prisoner; rejoined the army at Gettysburg, and upon the fall of Hancock, severely wounded, was assigned to temporary command of the Second Army-corps. From Nov., 1863, to Feb., 1865, he was provost-marshal-general of the southern district of New York. Breveted colonel and brigadier-general U. S. army for gallant services in battle. D. at Fort Independence, Boston harbor, Feb. 7, 1875.

Hays City: city; capital of Ellis co., Kan. (for location of county, see map of Kansas, ref. 5–D); on Bay creek and the Kansas division of the Union Pacific Railway; 289 miles W. of Kansas City. It is in an agricultural and stock-raising region, and contains 5 churches, 3 weekly newspapers, grain elevators, and flour-mills. Pop. (1880) 850; (1890) 1,242; (1893) 1,471. Editor of "Free Press."

Hay'ter, Harrison: civil engineer; b. at Falmouth, England, 1825. After a classical and mathematical education, he in 1840 entered and for three years studied in the department of applied science, King's College, London. In 1857 he became assistant to Sir John Hawkshaw, and was his partner from 1870 until the retirement of the latter in 1888. He was engaged upon all of Hawkshaw's works during this period—railways in England, India, Spain, and Russia; harbors of Holyhead, Alderney, Amsterdam; docks (of Buenos Ayres and elsewhere), bridges, drainage-works, Amsterdam ship-canal, etc. He is author of several important papers in *Proceedings* of the Institution of Civil Engineers, of which he is president. William R. Hutton.

Hayti: See Haiti.

Hayward: village (founded 1881); capital of Sawyer co., Wis. (for location of county, see map of Wisconsin, ref. 3–C); on the Namakagon river, and the Chi., St. P., Minn. and O. Railway; 55 miles S. of Ashland. It contains 3 churches, 2 public schools, public library, electric-light plant, improved system of water-works, and weekly newspaper, and is principally engaged in lumbering. Pop. (1890) 1,349; of township (1895) 3,741. Editor of "Journal-News."

Hazara: an Afghan race. See Afghanistan.

Hazara, or **Huzara**: a district in the Peshawar division, the Punjaub, British India; is between lats. 33° 45′ and 35° 2′ N., and lons. 73° 35′ and 74° 9′ E. It is west of Kashmir, south of Kohistan, and on the east side of the river Indus. Area, 3,039 sq. miles. It is wedge-shaped, and consists essentially of a long, narrow valley shut in by lofty mountains. The scenery is picturesque and every available spot is cultivated. The chief crops are wheat, barley, maize, rice, other grains, oil-seeds, and cotton. The rainfall is 47 inches, but artificial irrigation is common. Pop. about 450,000, nearly all Mohammedans. Mark W. Harrington.

Hazard [M. Eng. *hasard*, from O. Fr. *hasard*, hazard (the game), from Span. *azar*, hazard, from Arab. *al zār*, the die]: a game of chance played with dice, for amusement and for money. The character of the game is such that a professional player, who knows all the possibilities and probabilities of the game, has a twofold advantage over another person. Hazard has been long a standing game at all the houses of play in England. The term hazard is used in a technical sense in works on Fire-insurance (*q. v.*).

Hazaribagh, haa-zăa-rĕe-baw′: a district of the Chota Nagpur division, Bengal, British India; between the parallels 23° 25′ and 24° 48′ N., and the meridians 84° 29′ and 86° 38′ E. Area, 7,021 sq. miles. A third of this area is in the valley of the Damodar river, the remainder a plateau rising to the north and west. Much of the district is infertile and covered with jungle, making it a good place for hunting. Wheat, barley, maize, opium, sugar-cane, and cotton are common crops. The climate is healthful; the average temperature is 74°, the rainfall 52 inches. The towns are small; the capital, Hazaribagh, is the largest (pop. 12,000). Parsanath Hill is a celebrated place of pilgrimage for Jains. There are six coal-fields in the district, some of which promise to be important. Pop. 1,200,000, of whom about one-fourth are aborigines and one-half Hindus.

Mark W. Harrington.

Haze: impalpable solid matters in the atmosphere which deaden the blueness of the sky and cut off the sharpness of definition of distant objects. This kind of haze is sometimes called "dry," to distinguish it from the thin cloud, which is invisible in itself, but serves to deaden the color of the sky. Haze is most common in the interior of continents, especially in dry seasons, when it is due to a fine dust. In the northeastern provinces of China it is sometimes like a thin fog and shuts out distant objects. Large conflagrations, like forest fires, give rise to a dense bluish haze which may drift many hundred miles from the burning districts and last many days. Volcanic eruptions sometimes throw into the air enormous quantities of comminuted materials which carry haze with the wind to astonishing distances. The minute particles in the air when sufficiently numerous tint the color of the sun, making it red, or more rarely blue, and give rise to a series of diffraction phenomena which attract much attention. After the eruption of Krakatoa these phenomena painted the sunset sky in glowing colors and rapidly spread over the entire earth. Mark W. Harrington.

Hazel [M. Eng. *hasel* < O. Eng. *hæsel*: O. H. Germ. *hasal* > Mod. Germ. *hasel* < Teuton. *hasalo-*: Welsh, *coll*: Lat. *corylus* (for **cosulus*)]: popular name of a genus (*Corylus*) of trees and shrubs of the family *Cupuliferæ*. Of these, the *C. avellana* and *C. colurna* of Europe and Asia produce the FILBERT (*q. v.*), as well as some of the varieties of nut called cobnut and hazelnut, which are used not only as food, but for their oil. The hazel-bush is extensively planted for copses in Europe, and yields material for hoops, hurdles, gunpowder, etc. The *C. americana*, or wild hazel, and *C. rostrata*, or beaked hazel, yield nuts smaller and not so good as those of the European. There are still other foreign species. Witch hazel is the *Hamamelis virginica*. See HAMAMELIS.

Hazen, WILLIAM BABCOCK: soldier; b. in Hartford, Windsor co., Vt., Sept. 27, 1830; graduated at the U. S. Military Academy July 1, 1855; served with distinction on frontier duty and during the civil war received all the brevets up to major-general. In 1866 he was made colonel of the Thirty-eighth Infantry, and in 1880 he became chief signal officer, with rank of brigadier-general. He published *The School and the Army in Germany and France, etc.* (1872); *Barren Lands of the Interior of the United States* (1874); and *Narrative of a Military Career* (1885). D. in Washington, D. C., Jan. 16, 1887. Revised by B. B. HOLMES.

Hazleton, hā'z'l-tŭn: city; Luzerne co., Pa. (for location of county, see map of Pennsylvania, ref. 3–H); on the Penn. and the Lehigh Val. Railways; 80 miles N. N. W. of Philadelphia. It has valuable anthracite coal-mining interests, is principally engaged in mining and hatting; has 3 daily and 6 weekly newspapers, and from its elevated position has become a popular summer resort. Pop. (1880) 6,935; (1890) 11,872. EDITOR OF "PLAIN SPEAKER."

Haz'litt, WILLIAM: literary critic; b. at Maidstone, Kent, England, Apr. 10, 1778; the son of a Unitarian minister; studied at Hackney College, and for a time labored as an artist, but without high success; became noted as a contributor to journals, writing chiefly upon theatrical and literary topics. He was author of *Memoirs of Holcroft* (1809); *English Grammar* (1810); *The Round Table* (1817); *Characters of Shakspeare* (1817); *View of the English Stage* (1818); *Lectures on English Poets* (1818); *Lectures on English Comic Writers* (1819); *Lectures on the Literature of the Elizabethan Age* (1821); *Table Talk* (1824); *The Spirit of the Age* (1825); *Life of Napoleon* (1827); *Conversations with Northcote* (1830), etc. D. in London, Sept. 18, 1830.

Hazlitt, WILLIAM CAREW: English scholar; grandson of William Hazlitt; b. Aug. 22, 1834; educated at Merchant Taylors' School and the Inner Temple; became a barrister 1861. He is author of *British Columbia* (1858); *History of the Venetian Republic* (2 vols., 1858; enlarged to 4 vols. 1860); *Sophy Laurie* (1865); *Memoir of William Hazlitt* (1867); *Bibliography of Old English Literature* (1867); *English Proverbs* (1869); *Popular Antiquities of Great Britain* (1870), and has performed much editorial and other literary work.

Head, BARCLAY VINCENT, D. C. L., Ph. D.: numismatist; b. at Ipswich, England, in 1844; educated at Queen Elizabeth's School there; is keeper of coins at the British Museum; author of *History of the Coinage of Syracuse* (1874); *Coinage of Lydia and Persia* (1877); *History of the Coinage of Bœotia*. In 1887 appeared his masterpiece, entitled *Historia Nummorum*, an exhaustive historical survey of the science of Greek numismatics and the standard work on the subject. ALFRED GUDEMAN.

Head, Sir FRANCIS BOND, P. C., K. C. H., and knight of the Prussian military order of Merit: author, and Governor of Upper Canada: b. near Rochester, England, Jan. 1, 1793; served with the Royal Engineers at Waterloo; at Fleurus under the Prussian general Ziethen; retired from the army and took charge of a gold and silver mining company in South America; published in 1826 a narrative of his travels entitled *Rough Notes of a Journey Across the Pampas*; in 1835 was appointed Lieutenant-Governor of Upper Canada, where he suppressed an insurrection, for which service he was created a baronet. The title of privy councilor was conferred on him in 1867. Among his many published works are *Bubbles from the Brunnen of Nassau* (1833); *Life of Bruce* (1844); *The Defenseless State of Great Britain* (1850); *The Horse and his Rider* (1860); *The Royal Engineer* (1870). He wore the Waterloo medal, and was a major (retired list). D. in England, July 20, 1875.

Head, Sir GEORGE: b. near Rochester, England, 1782; went to Portugal as commissariat clerk 1809; became assistant commissary-general 1811; was sent to Canada 1814, to Nova Scotia 1816; knighted 1831. Author of *Forest Scenes and Incidents in the Wilds of North America* (1829); *A Home Tour* (1836–37); *Rome* (1849); a translation of Cardinal Pacca's *Memoirs* (1850); a good translation of *The Golden Ass* of Apuleius (1851), etc. D. in London, May 2, 1855.

Headache, or **Cephalal'gia**: a symptom of very many widely differing conditions, but not, as was once believed, a disease of itself. The various forms of neuralgic pains about the face, eyes, or ears may be referred to the head, and simulate headaches in the stricter sense. They are generally easily distinguished by careful examination. As might be supposed, diseases of the brain are frequently attended by this symptom, but particularly when the membranous envelopes of the brain are diseased, or when they are implicated in more deep-seated brain diseases. The violent headaches of meningitis or brain fever are prominent in the symptomatology of this disease. Tumors of the brain, abscesses, etc., sometimes, though not always, cause headaches limited to the area of disease. In the onset of various fevers, such as typhoid fever, and during their course, headache is a frequent occurrence. So, too, in the course of more protracted illnesses, generally accompanied by the presence of poisonous matters in the blood, such as in Bright's disease, in malaria, and in syphilis. But these cases are far less frequent than headaches in persons otherwise well or but little disturbed in health. Certain persons are notoriously subject to recurring attacks of severe or trivial headaches, and a hereditary element not rarely enters into the causation. Especially is this true of the peculiar form of unilateral headache called MIGRAINE (*q. v.*), a form attended also with scintillations before the eyes, disturbances of the stomach, ringing of the ears, and other symptoms. Periodical headaches may also be the expression of the general nervous disorder or weakness called neurasthenia, they may be accounted for by impoverishment of the blood, or diseases of various organs, especially the uterus and ovaries in women. Headache as an expression of disordered stomach or bowels is well recognized. Indiscretion in diet or drinking is very apt to be followed by head-pains, not rarely confined to the region of the forehead. Much attention has been directed to the influence of disorders of vision in the production of headache, and the frequent cures afforded by application of suitable glasses is sufficient proof of the truth of this view. Further causes might be recorded almost without number, and still a small number of cases would remain in which no adequate explanation could be found. There are cases in which, as far as our present knowledge allows us to judge, the headache is the primary disease, rather than a symptom. In seeking to alleviate a condition having so many diverse causes, the strictest investigation into the entire bodily health must be made. In many cases the cause soon becomes evident, in some it may evade the most experienced physician. The treatment prescribed is similarly diverse. It may in one case be directed to a disordered stomach or torpid bowels, in another to proper action of the kidneys or other excretory channels, and in another and larger group of cases to the quieting of pure nervous excitation. Recurrent and unusually severe headaches must always be looked upon as occurrences of gravity.
WILLIAM PEPPER.

Head-dress: the protection or ornamentation of the human head by the adjustment of the hair, the use of a covering of any sort worn upon the head itself, and the addition of jewels, chains, flowers, or the like; or any of these. The variety of head-coverings, although perhaps roughly divisible into hoods, caps, and hats, is indefinitely great, and the different styles of decoration are perhaps as numerous. No more can be done here than to speak of those fashions which are the most nearly associated with our civilization, as the origins of modern styles or as most often found in our literature and art.

The Egyptians in antiquity, as is proved by the numerous reliefs and paintings on the walls of tombs and temples, wore thick and elaborate head-dresses, as the sunny climate and low latitude of the country would make necessary, but not hats with brims. In default of these they used hoods fitting somewhat closely to the head; perukes or wigs, probably of horsehair or tow, for the monstrous constructions represented can not be supposed mere dressings of the hair,

and indeed some of these wigs have been discovered; and large, high caps, the material of which is often doubtful. The largest and highest are cupola-shaped, and are associated with the royal authority; when colored yellow they are generally considered to have been of brass—a sort of helmet; but they are often of other colors. This round-topped cap, when very high and painted white, is taken to be the crown of Upper Egypt; a lower one of a different form, and red, is the crown of Lower Egypt, and the two are associated as the symbol of rule over the whole land. Lower and flat-topped caps are worn sometimes alone, sometimes upon the close-fitting hood. Often a strap under the chin holds the whole head-dress in place. It may be supposed that the huge wigs were worn upon the shaven head; and it is evident that clean shaving was as common in ancient Egypt as it is now in tropical countries of Asia. But elaborate dressings of the natural hair were also common among the ladies of the court. Hairdressing among the Greeks as well was often very elaborate, and in early times, as shown by the sculptures of the sixth century B. C., men as well as women wore their hair long and delicately braided. In some sculptured representations of athletes, heroes, or divinities the long braids are wound around the head horizontally; in others a great number of slender corkscrew-like curls emerge from a band passing round the head above the ears; again in others two or three long curls hang down upon the shoulder, or a braid hangs down the back. A later style was the massing of the hair above the forehead in a dense skein or knot of curls, while it hung free and rather long behind the head. The fashions followed by young girls were generally more simple, and nets and small bag-like hoods were often worn to protect and cover the hair. Under the Macedonian rule it became common to wear a crown-like frontlet, or a band made broader above the forehead so as to give apparent height to the head at that point, while at the same time the hair was so massed as to make the forehead appear low. Crowns in the modern sense had not become known to the Greeks of antiquity; the usual badge of royalty among Asiatic nations was the simple fillet tied around the head, the *diadema*; and a similar badge was employed in Greece.

Among the Greeks caps of cloth, leather, and felt, close-fitting, conical, and shaped like the modern *tarboosh*, were worn, both alone and under the helmet. The vase-paintings show them as worn by seamen, mechanics, and soldiers. A hat with a brim, probably always of felt, and called *pétasos*, is given to hunters; this is also an especial attribute of the god Hermes, and is shown as worn by the young men (*ephebοi*), and this perhaps with some allusion to their especial connection with the worship of Hermes. The pétasos is shown sometimes with a brim wider in some places than in others, and even turned up like the cocked hats of the eighteenth century. The *kausia* was a modification of the pétasos, worn especially among the Macedonians as a sign of royal rank, the diadem or fillet tied around it, with long ends hanging behind. It was, however, the general custom in the towns, and especially with the wealthier classes, to go bareheaded, and it seems to have been thought a sign of imperfect physical condition to need a hat when going about the streets. The higher types of art among the Greeks, being generally based upon the nude or nearly nude body, do not include the use of any headdress.

Among the Romans nearly the same customs prevailed. The peculiar Roman dress, the toga, was worn with the head bare. But the priests wore a skull-cap, and this, with a pointed addition like a spear-head, was their peculiar badge; a soft conical cap was worn by artisans, and the putting of this *pileus* upon a slave's head was one ceremony of his manumission. This *cap of liberty* was used as such an emblem in classical Roman times, but it had not then the special shape, with the pointed top bent or drooping forward, like the "Phrygian cap" of modern usage. In general it was assumed that in the city a Roman would go bareheaded, but on all necessary occasions he wore hat or cap as might be more convenient. No elaborate ornamentation was given to either in the Græco-Roman world, nor was it a custom among men of the Roman world at any time to dress the hair elaborately. On the other hand, the *coiffures* of the ladies of imperial times are of amazing elaboration and variety. It seems as if the essential simplicity of dress, consisting of so few and so nearly invariable garments, even among the elegant and extravagant, left hairdressing as the only field except jewelry for the display of fancy and for the pursuit of novelty.

In antiquity, as in modern times, the badge of royalty was generally something worn upon the head. Instances have been named in the *pschent*, or double crown of Egypt, and the *diadema* or fillet. In their capacity as true haters of kings the Romans gave the fillet to their priests alone; the *corona*, or headdress of honor, was given to the successful soldier or the respected citizen as a special reward. (See CROWN.) During the Græco-Roman epoch the Persians and the neighboring nations used a tall cap, called by the Western nations *mitra*, and one form of this is the "Phrygian cap" of modern times. The form generally worn by persons of dignity has not the nodding, almost volute-like peak of our "Phrygian cap." It ends in an ornament, sometimes like our conventional crown. Its general shape is conical, and this shape continues in Western Asia from the time of the Assyrian empire to the time of the Parthian wars against Rome. It is commonly said that the *miter* of European bishops and the *tiara* of the pope are derived from this headdress, as the word *miter* evidently is from its Greek name *μίτρας*; but it is difficult to establish such origins.

A remarkable chapter in the history of costume is to be found in the use of the *hood*, so common throughout the Middle Ages and so little known since the fifteenth century. The hood of cloth was not unknown to the Romans, and this and a similar garment of skin or leather was very common among the Gauls and Scandinavians, if not throughout Northern Europe, previous to the Roman conquest of Gaul and Britain. It was sometimes made fast to a cape or cloak, and perhaps as often independent, serving to tie over whatever skull-cap or defensive head-piece might be worn. Throughout the Middle Ages it was the commonest garment of the mechanics, field-laborers, and toiling men generally; sometimes small and light, a mere cap, sometimes ample and of heavy material. The latter is perhaps the hood proper, the *chaperon*, which in the thirteenth and fourteenth centuries had attached to it a cape long enough to reach to the elbows and closed in front, so that the face looks out through a slit prepared for it. This garment was worn in different ways; sometimes the cape of it was folded or twisted into a long tippet, and then wound around the head, upon which the face-opening had been adjusted previously. When the cape was smaller the face-opening was put on like a hat, and the whole cape thrown loosely backward over the head. At a later time the hood was made with a long tubular prolongation of its crown, a fashion comparable to the hanging sleeves of a time not much later. A tight-fitting cap tied under the chin had to be worn under these strange hoods to keep the hair tolerably smooth.

One reason for the great use of the hood was evidently the facility with which it was made in the cottage, whereas a hat would require a more skilled kind of labor. Indeed, throughout the Middle Ages the hat is rather the sign of a person of some condition who can mount on horseback and travel. The most remarkable shape is that known as the *bycocket*, a modification of which is the *cap of maintenance* of English heraldry. But it is not in hats and caps that the peculiarities of mediæval head-dress are found. The hair was worn hanging down in some form by all women except the poorest until the twelfth century, and one style was to divide it into thick locks, two or more on each side, and to twine a ribbon around these, in and out, so as to hold them separate and yet together. In the twelfth century a veil was often worn, gathered so closely about the neck and shoulders as to resemble the *wimple* of later times, and to conceal the hair. Then this was re-enforced by a cap or headband passing under the chin, and the veil, and later a linen cap, was worn upon this. The wimple appears early in the fourteenth century—a piece of fine linen covering the throat and chin and the sides of the face, and covered in its turn by the veil; so that for about eighty years it was fashionable to show only the face from the eyebrows to the mouth. Then followed in the fifteenth century the tall or spreading headpieces, *hennins* and *cornets*, made of some colored stuff, probably stiffened with wire or perhaps with starched buckram or with paper. These were divided into two or even three horns at one epoch; then they were conical, from 20 to 30 inches high, and tilted back from the crown of the head; then, toward the close of the century, they were short and nearly cylindrical; but always there were worn with them the most delicate veils, of fine and semi-transparent linen, sometimes embroidered, as the miniatures of the time show clearly. Meantime for the men, as they almost lived in armor, it is only on occasions of state

that the court nobles and their attendants are shown to us as especially adorned by the hairdresser's art, with curled and massed hair and a jewel, an aigrette, or a plume set above the forehead.

This same taste for dainty hairdressing prevailed throughout the sixteenth century. Even after the close of that century, in the last years of Henry IV. of France and the early years of James of Scotland and England, these kings and their grave ministers appear in their trustworthy portraits as carefully combed and curled, the hair and beard alike arranged according to a careful design, and kept in their places by some pomade or cosmetic. Apart from this, the head-dress was simple; men and women alike were rational enough in the great sixteenth century; small and flat caps and hats of reasonable crown and brim were worn even by the courtiers, and the ladies affected small hoods of decorative shape, flat *toques* with small plumes, dainty caps of muslin, and the uncovered hair adorned with jewelry, all in due succession of fashion, but all in good taste and without extravagance of fancy.

The long hair worn in the early part of the seventeenth century is well known to us from the familiar portraits of Charles I. of England. This was varied sometimes by a shorter cut of all except the *love-lock*, falling in curls upon the shoulders and breast and tied with ribbon. The English Puritan's demand for greater strictness of life and manners was thought to be exemplified in his more closely cut hair, though even his locks were long as compared with nineteenth century fashions. The hats had broad and drooping brims, and the elegants wore plumes curled about the crown and lying half hidden in the hollow of the brim. The ladies of the same epoch had a charming fashion of wearing the hair in a mass on each side, sometimes of short curls allowed to flow freely, sometimes in more artificial-looking structures, obviously having a cushion or other support within. And these graceful and essentially simple styles prevailed until after the middle of the century. Then, with the English Restoration and the beginning of the independent reign of Louis XIV., at Mazarin's death, begins the reign of wigs. Their origin was not so very absurd; clearly it had grown to be a conviction that a man was not at his best without long and abundant hair. The abundant locks of the center of all fashion, the young King of France, tended to confirm this opinion. The early perukes, with their extravagant curls falling low on the breast and between the shoulders, were only a carrying to excess of King Louis's fashion of wearing his own hair. But once established, this fashion was to endure for a century of shaved heads, warm caps worn within doors, close-fitting wigs out of doors, and hats only for show, as is evident from the fashion prevalent at times of carrying these accessories under the arm. *Cocked hats* are of the later part of the wig period; they were originally nothing but broad-brimmed hats whose brims were fastened up to the crown, usually at three points; and the *cockade*, since employed in so many ways, was originally nothing but the tuft or other ornament put on where the brim was made fast. Meantime the head-dress of ladies of fashion took several contrasting shapes. The becoming styles of the seventeenth century above alluded to prevailed generally until about 1680; then came the tall fan-shaped structure of linen and lace above the forehead, forming part of the *fontange* head-dress; but there was a return to reason, and it was not until a century later that the extreme of recorded extravagance in style was reached. Then, in the first years of Louis XVI., when the taste in furniture and decoration generally had become much more severe (see COSTUME and FURNITURE), the ladies undertook to start a wholly opposite taste in head-gear. The mass of frizzled and powdered hair wound about with ribbons, stuck with plumes and flowers, and with jewels on occasion, reached a height of a foot or more above the head, and was even higher when the semblance of a cap of gauze was combined with it, or a little hat or a cluster of feathers was set upon it.

The French Revolution put an end to a world in fashion as well as in politics, and it is not necessary to describe here the hats and bonnets of our own epoch.

For bibliography, see that of COSTUME given under the head of DRESS. RUSSELL STURGIS.

Head'ley, JOEL TYLER: historian; b. at Walton, Delaware co., N. Y., Dec. 30, 1813; graduated at Union College 1839; studied theology at Auburn; for two years held a pastorate at Stockbridge, Mass.; was assistant editor of *The New York Tribune* in 1846; and (1856–57) Secretary of State for New York. He published *Letters from Italy* (1845); *The Alps and the Rhine* (1845); *Napoleon and his Marshals* (1846); *Washington and his Generals* (1847); *The Adirondacks* (1849); *History of the Second War between England and the United States* (1853); *The Great Rebellion* (1864); and numerous other popular works. D. at Newburg, N. Y., Jan. 16, 1897. Revised by H. A. BEERS.

Healdsburg: city; Sonoma co., Cal. (for location of county, see map of California, ref. 6–B); on the Russian river, and the S. F. and N. Pac. Railway; 66 miles N. of San Francisco. It is the seat of Healdsburg College (Seventh-day Adventists), is principally engaged in agriculture, quicksilver mining, stock-raising, fruit-culture, and grape-growing, and manufactures and ships a large quantity of wine annually. Pop. (1880) 1,133; (1890) 1,485.

Health [M. Eng. *helth* < O. Eng. *hālð*, deriv. of *hāl*, whole, hale > Eng. *whole*, and (dial.) *hale*]: physiologically, that condition of organized living bodies in which the blood and tissues are in the state of integrity and functional activity inherent in their normal constitution. All of the structures are incessantly undergoing change, owing to the waste and renewal of their ultimate elements, the cells. There is in the constitution of these elements a tendency to development and a tendency to decay or retrograde metamorphosis. Upon their development depend the growth and maintenance of the organism, while in their retrograde metamorphosis we have their destruction after they have performed their proper functions. This tendency to development and to retrograde metamorphosis of the elements of tissues is impressed upon the organism as a whole, but differs in intensity at different periods of life. In the young the tendency to development is greatest, and the result is growth; in the middle-aged these forces are balanced, and the structures are maintained in bulk and symmetry; in the later periods the tendency to retrograde metamorphosis predominates and the organism wastes, and at length falls into inevitable decay and death. At all periods in the life of any organized body, therefore, molecular changes are in active progress in every tissue, and yet while these changes are in exact accordance with the normal constitution of their elements a state of health is maintained. But, though this definition is strictly in accordance with the teachings of physiology, it is evident that such a condition of health can be affirmed only in the most general sense of any complex living organism like man. So infinitely numerous are the elementary parts, and so various and powerful the causes which impair their integrity and prevent their functions, that there must be abnormal conditions constantly occurring which do not sufficiently impair structure and function to enable us to appreciate the deviation from the natural standard. It is only when changes in structure and function are so great as to be detected by the means which we employ for investigation that we can decide that a condition of health does not exist. For the effect of climate, filth, etc., upon the health, see CLIMATE, FILTH DISEASES, HYGIENE, etc. Revised by WILLIAM PEPPER.

Health, Boards of: See HYGIENE.

Healy, GEORGE PETER ALEXANDER: portrait and historical painter; b. in Boston, Mass., July 15, 1808; pupil of Baron Gros and of Couture, Paris; received third-class medal, Paris Salon, 1840, and second-class, Paris Exposition, 1855. He was an honorary member of the National Academy, New York. Among his pictures is *Webster's Reply to Hayne*, in Faneuil Hall, Boston. He painted portraits of many distinguished people in Europe and the U. S. His portraits of Buchanan and Lincoln are in the Corcoran Gallery in Washington. D. in Chicago, June 24, 1894. W. A. C.

Heap, CHARLES SWINNERTON: pianist and composer; b. in Birmingham, England, in 1847; studied under Dr. E. G. Monk and at Leipzig; gained the degree of musical bachelor from Cambridge in 1870, and musical doctor the next year. He has composed much choral and orchestral music, including several cantatas and psalms, two overtures, chamber music, and shorter pieces, both for voices and instruments.

D. E. H.

Heard Island: an island in the Antarctic (South Indian) Ocean, lying S. E. of Kerguelen's Land, extending between 53° 2′ and 53° 14′ S. lat., and between 73° 30′ [illegible] E. lon. It is about 24 nautical miles long and 9 broad, and its highest point (Kaiser Wilhelm Peak) is about 6,000 feet high. It was discovered by Capt. Heard Nov. 25, 1853. Vessels

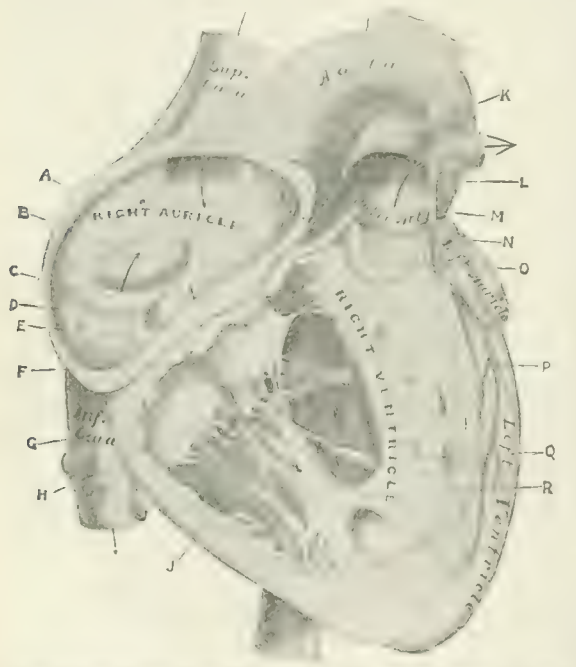
from the U. S. and other countries have here collected large amounts of the oil of sea-elephants and the smaller seals.

Hearing: See Acoustics and Sensation.

Hearn, Lafcadio: journalist and author; b. of an English father and a Greek mother, at Santa Maura, Ionian islands, June 27, 1850. He was educated in England and France, removed to the U. S., and engaged in journalism in Cincinnati and New Orleans. His writings, which are partly narrative and partly descriptive, include *Chita: a Memory of Last Island* (1889); *Two Years in the French West Indies* (1890); and *Youma* (1890). H. A. Beers.

Hearsay Evidence: literally, evidence consisting of what one has been told by others. The term is used, however, in a wider sense to include any evidence not based upon facts with which the witness is personally cognizant, but upon what he has learned from the act or narration of another. With few exceptions, hearsay evidence is inadmissible. See Evidence.

Heart [M. Eng. *harte* O. Eng. *heorte*: O. H. Germ. *herza* (>Mod. Germ. *herz*): Goth. *hairtō*<Teuton. *herton-*: Lat. *cor, cordis*; Gr. *καρδία*]: the great central power which regulates and compels the circulation of the blood. It may really be considered as two organs united in one; the one half governing circulation through the lungs, the other that through all the rest of the body. Thus constructed, the heart is divided by a median *septum* into two lateral halves, *left* and *right*; and each of these is again divided by a horizontal constriction into an upper and a lower portion. There are thus formed four cavities: two upper, *left* and *right*, auricles; and two lower, *left* and *right*, ventricles. The auricles receive the blood from the veins—the right from the body in general, the left from the pulmonary veins; and the ventricles propel the blood—the left to the body, the right to the lungs. The walls of these cavities consist of powerful muscular tissue of varying thickness, the left ventricle being twice as thick as the right, and not rarely reaching half an inch at the thickest part. The auricles are much thinner than the ventricles, as might be expected from their being receptacles of blood rather than active agents in its propulsion. The muscle fibers of the heart-walls are arranged in intricately interlacing bands, which have not as yet been satisfactorily described. In the auricular wall two sets of



The right auricle and ventricle laid open, the anterior wall of both being removed.

A, Annulus ovalis; B, Fossa ovalis; C, Eustachian valve; D, Coronary vein; E, Coronary valve; F, Infundibular segment of the tricuspid valve; G, Right segment; H, Posterior segment; J, Tendinous cords; K, Pectinate muscles; L, Auricular appendage; M, Pectinate muscles; N, N, Isle of Arantius; O, Aortic valve; P, Coronary artery; Q, Papillary eminences; R, Fleshy column.

fibers are found, one superficial and passing transversely from one auricle to the other, and a deep set, consisting of *looped fibers* attached by each end of the constriction between the auricle and ventricle, and *circular bands* passing around each auricle and continuous with the layer of muscular fibers in the walls of the great veins. The fibers in the walls of the ventricles have been divided into seven layers by Pettigrew, but it is only necessary to remember that they have one general arrangement. They pass downward from left to right, curve around the apex of the heart, and reascend from left to right, thus making a *figure-of-eight* curve around the apex of the heart. Microscopically the structure of the heart-muscle fiber is peculiar in being striated by cross-striations, such as are found in all voluntary muscles, but in only one or two other instances in involuntary muscle. Further, the fibers are branched, and have no sarcolemma or outer covering. See also Histology.

On examining the cavities of the heart it is found that the ventricles are of approximately equal capacity, and this is readily explainable, since each must propel a like quantity of blood. Were this not the case, and should the left ventricle force out a larger quantity at each contraction than the right, the blood would soon be gathered in the systemic circulation; and similarly if the right ventricle were more active than the left the lungs would soon be overfilled with blood. The auricular cavities are smaller than the ventricles, but this is compensated by the size of the great veins leading to the auricles.

The walls of the cavities, as seen within, are very uneven, especially in the ventricles. There are various ridges and eminences, called *fleshy columns* and *papillary eminences*. Some of the latter give origin to thin cords, which are attached at the other end to the valves, to whose action they will be seen to be important factors. In the auricles are seen certain remnants of the fœtal communication between the two sides of the heart (see below), and also openings of veins which bring back the venous blood from the walls of the organ. But the most striking feature of the heart's cavities are the openings into the various vessels leading into or from them. Into both auricles open large veins—into the right, the *superior vena cava* from above, the *inferior vena cava* from below; into the left, the four pulmonary veins, two of which not rarely unite before entering the heart. Below, each auricle opens into the corresponding ventricle by a large foramen. Examining the ventricles now, there are seen in each two large foramina—that leading into the auricle, and that into pulmonary artery and aorta, in the right and left ventricle respectively. Each of these orifices is guarded by a valvular mechanism which prevents reflux of blood through the orifice once this has been passed. The valves are formed by reduplication of the lining membrane of the heart, the *endocardium*, a smooth serous membrane which completely covers the inner surface of the cavities, and is continuous with the inner coat of the great vessels springing from the heart. The valves consist of a double fold of this endocardium, between the two sides of which is found a quantity of fibrous tissue, to give strength to the cusp. The valves guarding the auriculo-ventricular orifice are much larger than the aortic and pulmonary. They consist of, on the left side two, on the right side three, leaflets, springing from a fibrous ring which surrounds the orifice, and at the free margin they have attached to them tendinous cords which take origin from the papillary eminences in the ventricular wall. The two leaflets of the left auriculo-ventricular valve have some resemblance to a bishop's miter, hence the name *mitral* is applied to it. The three leaflets of the valve on the right side give to this valve the name *tricuspid*. When the blood is passing from the auricles to the ventricles the valves hang down and allow free passage to the blood. As soon as the ventricle becomes full, however, the backward pressure forces the valve leaflets upward, and eventually together. At the same time the tendinous cords attached to the valves serve to prevent bulging of the valves toward the auricles, and perhaps even maintain a convexity toward the ventricular cavity. The aortic and pulmonary valves consist each of three semilunar cusps whose formation is much the same as that of the mitral and tricuspid, excepting the absence of tendinous cords for support. The base of each cusp is attached to the vessel-wall, and the free edge may fall inward, meeting its fellows, and thus close the orifice; or it may fall outward toward the vessel-wall, and thus allow free passage to the blood. At the center of the free edge of each cusp is a small body (*corpus Aurantii*), semi-cartilaginous in structure, which is intended to close in a small gap which would otherwise be found at the point of junction of the three leaflets when they are closed. During contraction of the

ventricles, when the blood is flowing out through the aorta and the pulmonary artery, the cusps of the valves are pushed toward the walls of the vessels. When the contraction has ceased, and the arteries have become distended, a reflux of blood occurs from contraction of the vessel-wall, and thus the valves are closed by pressure of the blood. The blood, being prevented from flowing back into the heart, is consequently caused to flow out into the distal arteries in a more or less steady stream.

The *shape of the heart* is that of an inverted cone, the position of the apex being indicated by the impulse against the chest-wall. The designation *left* and *right* applied to the cavities is not altogether exact, since the whole organ is somewhat twisted on its long axis, so that the right auricle and ventricle are placed anteriorly, the left being behind.

The *size of the heart* varies with advancing age and in different individuals. As a rough test the old saying that "the heart is as large as the individual's fist" does fairly well. The heart of an adult man is about 5 inches long, 3½ inches broad at the broadest part, and 2½ thick. The *weight* varies from 10 to 12 oz. in the male, and from 8 to 10 in the female; but compared to the body weight it is 1 : 149 in the female and but 1 : 169 in the male. The organ increases in size and weight (more markedly in men than women) up to about sixty years, when a certain degree of atrophy begins.

The *position of the heart in the chest* is easily described. It lies to the left of the middle line and between the two lungs. It is very much imbedded in the left lung. Portions of the lung are behind the left half, to the left of it and in front of it, except about 2 superficial inches. Its base lies under the third rib of the left side, extending 3 inches from the middle (median) line of the body; the right auricle, when filled, extends half an inch to the right of the right border of the breast-bone (sternum) in the second intercostal space, retreating under the sternum in its contraction. The apex is found in the fifth intercostal space, 3½ inches from the median line. Unite this point with the point 3 inches to the left of the median line on the third rib by a curve that will cross the fourth rib at a point 4 inches from the median line, and the left border of the heart is indicated. From the point indicating the apex carry a line to the right and a little upward, so that it will strike the right border of the sternum at the fourth rib, thence upward along this right border to the second intercostal space, and we have followed the external lines that represent the internal position of the heart. In very rare instances the heart is found on the right side of the chest, filling the space on that side which corresponds with its natural position on the left. In these cases the liver may be found on the left, the spleen on the right side of the body, and there may be a general "transposition of viscera"; or the heart alone may be misplaced.

The heart is inclosed in a membranous sac, the *pericardium*. This consists of two portions. First there is a large bag of fibrous tissue which is attached to the great vessels at the root of the heart and spreads out below into a sac of considerable size. This is the *parietal* layer of the pericardium, and incloses the heart, covered by a thin, smooth membrane, the *visceral* pericardium, which is reflected to the inner surface of the parietal pericardium, which it also lines. Thus there is formed a cavity, faced with a smooth serous membrane, which secretes a small quantity of clear fluid, and thus prevents friction in the action of the heart. The outer or parietal pericardium is in relation with the median surfaces of the lungs and below with the diaphragm, to which it is attached by a ligament.

The heart muscle is itself nourished by blood carried by the coronary arteries. They are the first vessels given off from the aorta. Their open mouths can be seen by depressing the membranes of the semilunar valves of the aorta. They descend on opposite sides of the organ, giving off numerous branches till they become capillary and countless. The venous blood of the heart is returned into the right auricle by several veins, which open into it through its outer wall.

The *nerves of the heart* have very little connection with those of the voluntary system, yet it is reported that men have lived who could stop the heart's action at will. The *par vagum*, the great nerve of the lungs and stomach, sends some of its fibers to the heart; so does the phrenic nerve, though chiefly distributed in the diaphragm. The sympathetic nervous system is also closely connected with the heart. But the hearts of many of the inferior animals will beat after they are removed from the body. That of the bullock can be made to beat after such removal by a little irritation. It has been suggested that the muscle of the heart possesses the peculiar power of contracting, in and of itself, without nervous excitation. But since the discovery of nerve-centers of the kind called ganglia about the base of the organ, in the midst of its other structures, it has become probable, if not certain, that an essential part of its nervous supply is centered in itself.

Systole and *diastole* are the contraction and dilatation of the several cavities. The two auricles act simultaneously, as do also the two ventricles. If an animal's thorax is opened and the heart observed *in situ*, it will be noticed that the cycle of the heart's action begins with a peristaltic wave of contraction, commencing in the great veins and spreading downward into the auricles. The latter contract in a similar worm-like manner, forcing the blood into the ventricles, which grow more and more turgid as the auricular systole advances. As soon as the latter ceases, without a pause ventricular contraction begins, and is seen to present a twisting of the ventricle from left to right and from behind forward. The blood is now forced into the aorta and pulmonary artery, which become distended and elongated. With completion of the ventricular systole the heart relaxes, and dilates when blood is again forced into the cavities. The exact duration of these phases can not readily be determined, but it is thought that the whole cycle requires about 0·8 second, of which the auricular systole consumes 0·1 second and the ventricular 0·3 second, leaving a period of pause or passive interval of 0·4 second.

The *impulse of the heart*, or *heart-beat*, is felt in the fifth intercostal space, an inch below and just within the nipple line. It is synchronous with ventricular contraction, and though much difference of opinion has existed as to the cause it seems determined that it is due to the peculiar anatomy of the ventricles. The *figure-of-eight* loop of muscle around the apex causes the heart to twist and move forward when contracting. In the flaccid state the anterior surface of the heart seems to lie in contact with the chest-wall, and when the organ, distended with blood, suddenly grows hard and moves forward by contraction of its fibers, an impulse is communicated to the chest-wall which is readily distinguished by the finger.

The *work of the heart* can not easily be calculated, because it is difficult to determine how much blood is discharged from the ventricle at each beat, and indeed it is likely that this varies largely with varying conditions of pressure, etc. The average of many calculations indicates that there are expelled from each ventricle about 6 oz. (180 grammes) of blood with each contraction. Taking this to be the amount of blood expelled and 250 mm. of mercury (equivalent to 3·21 meters of blood) as the pressure in the left ventricle, the work of the left ventricle done with each beat is 578 grammeters; or at 72 beats per minute, the day's work is 60,000 kilogrammeters. The right ventricle does about one-fourth as much, making a total of 75,000 kilogrammeters; or just about as much work as is done by a moderately heavy man making an ascent of Snowdon. Again, if the amount of blood in the body is one-thirteenth the body weight, or in a man of 75 kilos, 5,780 grammes, and 180 grammes of blood leave the ventricle at each beat, the whole quantity of blood must pass through the heart in 32 beats.

The *sounds* produced by the action of the heart are two, and are represented by the syllables *lub, dupp*. Anybody can hear them by placing the ear on another person's chest in the region of the heart; indeed, one may hear the sounds produced in his own heart if, in the stillness of the night, in bed, he turn on his side and place the palm of his hand over the ear and rest his head on the pillow. The first begins with the first of the ventricular contraction, and continues till it is ended; the second has no more duration than the sound produced by the snapping of a handkerchief. Half a dozen theories have been proposed to explain the first, but the opinion of most authorities now inclines to the view that it is a compound sound, due partly to the friction of muscular fibers on each other and partly to the closure of the auriculo-ventricular valves. Regarding the second, there is but little difference of opinion, for by experiment it has been proved to result from the collapse or striking together of the aortic and pulmonary valves at the close of the systole. The sound is one or single, because the closure on the two sides is simultaneous.

The *fœtal heart*, when it begins to show itself as a beating organ, suggests nothing of the elaborate organization it is

to become before independent breathing life can be possible. It is at first merely an enlargement of a beating blood-vessel. From this state it changes to such forms as are permanent in inferior types of animal life, passing from one to another, but always from a lower to a higher type, till it is completed. (See CIRCULATION OF THE BLOOD.) It grows, and gets a single partition through it, with an opening in this partition. This is a single heart of two cavities, an auricle and a ventricle. After a time a partition is developed in the lower of these cavities. It is then a heart with one auricle and two ventricles. Still later, a partition is formed in the upper cavity, with, however, an opening which allows free communication from right to left. This is a heart of four cavities, which, after closing the opening in the auricular partition, prepares the individual for life in "this breathing world." So long, however, as the lungs have to perform no function, they receive but little blood through the arteries which are to be enlarged into the right and left pulmonary; but most of the blood propelled by the right ventricle, instead of turning to right and left, goes directly forward into the aorta at the concavity of its arch, through a channel that will disappear soon after birth, called the *ductus arteriosus.* At the same time the blood coming into the right auricle, or a part of it, passes freely into the left by the opening described above, which is called the *foramen ovale.* Thus, with the exception of the little blood sent for the nourishment of the lungs, this heart of four cavities acts as a single heart of two cavities. The first act of the newborn is to cry. This is the means appointed by nature to expand the chest and compel the opening of the lungs by the atmospheric pressure. No sooner are the lungs expanded than the blood of the right heart is literally drawn into the lungs, the right and left branches of the pulmonary artery expanding. The ductus arteriosus at the same time closes, and is soon to be obliterated. The blood in the right auricle is all directed into the right ventricle by the mechanical closing of a valve already provided on the left side of the foramen ovale. The valve soon grows into the septum, closing the foramen forever, leaving, however, a little scar-like depression, which is called the *fossa ovalis.*

WILLIAM PEPPER.

Heartburn: See CARDIALGIA.

Heart Disease: a general term under which are included a great variety of affections as diverse in nature and significance as are the various diseases of the liver, the kidneys, or other organs. The relatively greater frequency of one form has occasioned the erroneous popular belief that there is but one form of heart disease, and, in consequence of the serious nature of this one variety, that all cases are dangerous to life. The vital nature of the organ renders any disturbance of its action more or less serious, but it is by no means true that all such disturbances endanger life.

At the very outset we may distinguish two forms of heart trouble: the one, often called *functional*, in which no structural alteration may be found in any portion of the organ, and in the production of which the nervous system plays an important part; the other, termed *organic*, in which there is structural alteration in some part of the organ. As our knowledge of pathology has grown larger and methods of exact research more perfect, the number of functional diseases of this and other organs has steadily diminished, but there still remains a certain number of diseases of apparently purely functional nature. Organic heart disease may affect the envelopes of the heart or pericardium, the muscular structure or the endocardium, and especially the reflections of the latter which constitute the valves. Besides these acquired disorders a number of congenital malformations affecting various parts of the organ occasionally occur.

Functional Heart Disease.—These mainly affect the frequency of the contractions, and therefore of the pulse, or the regularity of the beats, and include also certain painful disorders. In a state of complete health one is not conscious of the beating of the heart except in strained positions. In certain conditions, however, there occurs great acceleration of the contractions, with forcible action, plainly perceptible to the individual. To this condition has been applied the term *palpitation.* Though not infrequently functional in nature, it is an indication, in a perhaps greater number of cases, of organic disease. Excitability of the nervous system, as a result of hysteria or of neurasthenia, or the depression consequent upon many diseases; emotional disturbances, like fright; disorders of digestion, and many other conditions, may lead to such functional palpitations. Overuse of certain substances like tea, coffee, tobacco, or alcohol, may also be the cause, or the palpitations may be symptomatic of various diseases, as exophthalmic goitre or Basedow's disease. In an attack of palpitation the heart-beats become more and more rapid, until a pulse of 150 or 160 is reached, and in exceptional cases a rate of 200 or 300 may be observed, a condition to which the name *tachycardia* (Mod. Lat., from Gr. ταχύς, quick + καρδία, heart) has been applied. During this period of overaction the patient is flushed, there is great anxiety and profuse perspiration; gradually the heart-beats become less frequent, and the patient may fall into a sleep of exhaustion. If the cause of the palpitation is organic disease, the attack is more apt to continue longer, but in some cases of functional disturbances also palpitation may be prolonged. At the same time there may or may not be present irregularity of the beats, and especially is this true of certain cases of organic disease, though in old and dyspeptic persons irregularity may occur without structural disease. Different forms of irregularity have been described, such as the intermittent form, in which an occasional beat is missed, a form in which every other beat is large or small, or in which every third or fourth beat is small, or in which two or three beats following in quick succession are separated by a more or less extensive pause. These forms of action are always to be regarded with great suspicion, as they most frequently indicate serious and advanced disease. Extreme slowness of the heart's action, or *brachycardia* (Mod. Lat., from Gr. βραχύς, slow + καρδία, heart), is a rare form of disturbance, in which the pulse may fall as low as twenty or less per minute. Like palpitation, it may be functional or organic, though more frequently the former.

Of painful diseases the most important is ANGINA PECTORIS (*q. v.*), or "breast pang." In a number of such cases disease of the blood-vessels supplying the muscular structures of the heart itself have been found, but in many others no lesion could be demonstrated, and these must be considered at present as instances of neuralgic disturbance.

Organic Diseases.—In describing different forms it must not be supposed that each is met singly. On the contrary, it is the rule to find several of the structural disorders below described in combination, one usually the result of another. Moreover, it is not impossible that functional disturbance may aggravate an organic disease.

Hypertrophy of the Heart.—This is enlargement, and the term means nothing more, although there are usually other changes attending it. The heart naturally increases in size with advancing years, but the increase is not considerable, and is not regarded as a disease. The pathological anatomy of hypertrophy consists of an increase in the number of muscle fibers, and to a less extent in increase of the size of individual fibers. Cardiac hypertrophy is analogous to the enlargement of the blacksmith's arm or turner's leg; new demands made on its strength produce a multiplication of its muscular fibers. Generally the external cause of this hypertrophy is some obstacle to the circulation, requiring increased strength of muscle to overcome it, as a diseased valve, or a tumor pressing upon a large artery, or a large organ so diseased that the circulation through it is seriously obstructed. It is produced by the mental emotions, which increase the force and frequency of heart-beats, as frequent anger and the anxieties that excite the heart (some depress its action), and, it may be added, by causes that have not yet been discovered. Its subjective manifestations are a strong impulse of the heart-beats, which, however, may be very strong and never be noticed by the affected person, and shortness of breath on exertion, and very little else. The physician discovers it by many signs, the chief of which is the extension of dullness on percussion to the left of the line already given as the left boundary of the healthy heart. The heart, once enlarged, never returns again to its original size. Cardiac hypertrophy of itself does not cause death. The conditions which called forth the enlargement, or secondary disorders, as apoplexy or kidney disease, may lead to a fatal termination, or may await the intercurrence of other and entirely distinct diseases. Indeed, if hypertrophy is produced by obstruction to the circulation, within certain limits it is compensatory and conservative.

Dilatation of the heart is an enlargement of its cavities. The left ventricle may be so dilated that its capacity is considerably greater than would be sufficient to contain the whole of a healthy heart. The dilatation may be in all of the four cavities, or may be confined to one. The ventricles are far more liable to dilatation than the auricles, and the

left much more than the right. Dilatation and hypertrophy very commonly go together, so that hypertrophy with dilatation, associated with and caused by morbid changes in the shape and function of the valves, is the most common form of heart disease. The condition of the heart may be regarded as alternately active and passive—active in systole, passive in diastole. If in the passive state, while the blood is flowing naturally into a heart-cavity, there is at the same time a reflux of blood into the same cavity in consequence of a defective valve, dilatation of that cavity will be sure to occur. The extended wall of such a cavity may not be thicker than it is in health, yet as it bounds a greater space it will require more material, and is hypertrophied by multiplication of the muscular fibers. In this state the heart has been known to weigh 60 oz., or six times its natural weight. Hearts like these are called *enormitas cordis*, or *cor bovinum vel taurinum*. They are frequently found in persons who have had rheumatism and heart disease in childhood, and have grown to manhood with a damaged heart. It is noticeable that children bear these cardiac affections better than adults. The body, as it grows, seems to accept and tolerate an amount of such disease that would overwhelm a grown-up person. When it begins thus early, it is often carried to manhood, and sometimes to advanced manhood. It is the repetition of the attack which is fatal in childhood. Dilatation with hypertrophy is, after it reaches a certain stage of progress, attended by shortness of breath on exertion, sometimes palpitations, irregular heart-beating, and consequently irregular pulse. The chief danger consists in the progressive failure of cardiac power, and therefore of the circulation, the occurrence of dropsy of the legs and body, and finally complete loss of power in the heart. These extreme results are all the more prominent when the muscular structure becomes diseased by fatty degeneration, in which case thinning of the walls and dilatations of the cavities become most marked, and circulatory failure therefore most prominent. This condition of affairs, though not invariable, is common in all cases of advanced cardiac disease.

Simple *atrophy of the heart* (diminished size and weight) occurs with wasting diseases, in which the quantity of blood in the system is diminished also, and it should not be regarded as a disease. It is also found in the general wasting of extreme age.

Diseases of the Valves of the Heart.—Endocarditis, or inflammation of the lining membrane of the cavities of the heart, is a common attendant on acute rheumatic inflammation of the joints, but it may occur without rheumatism. This inflammation is one of the principal causes of derangement and imperfection in these essential appendages of the heart. Thus endocarditis expends its force principally on those duplications of the endocardium which constitute the valves. It deposits a new material between their folds, and at first increases their thickness. A portion of this new material is converted into fibrous structure, and finally the fibers contract. The result is that these valves become thick and unyielding, so that the semilunar can not be applied to the arterial wall when the blood is forced into the aorta or pulmonary artery. The mitral and tricuspid grow stiff and hard, and do not fully give place to the blood passing from the auricle into the ventricle. Again, this new fibrous structure contracts and shortens the valves, so that their parts can not meet properly and prevent the reflux of the blood. So blood from the ventricles sent into the great arteries will flow back again into the heart, to be forced out again by a new contraction. This is *insufficiency* or regurgitative disease of a valve. The stiff, unyielding state, when it obstructs the current, is called *obstructive disease of the valve* (*stenosis*). The valves are thickened also by the deposit between their folds of a yellowish substance, made up partly of small microscopic cells, and partly of fat-globules, called *atheroma*, one of the products of a slow or chronic inflammatory action. In time this atheromatous deposit is apt to be converted into, or rather is replaced by, a hard calcareous material. Such calcareous deposit is usually of limited extent and presents itself as plates or spicules, but the interference with the action of the valves may nevertheless be very great. The presence of calcareous matter, moreover, keeps up a constant irritation, which prolongs the inflammation and therefore leads to further damage. The term *ossification of the valves* was formerly used, but true bony formation is certainly very rare.

Rupture of the valves is possible. The aortic valve may yield in the bottom of one of its cups; or the marginal thread may separate from the deeper part of the cup; or the upper attachments of the cups to the aorta may give way; or the anterior leaf of the mitral valve may be perforated; or one or more of its tendinous cords may be broken. These accidents usually occur after the ruptured part has been weakened by the deposit in it of a plate of atheroma; yet they may yield without previous disease, but then always at the time of great exertion of muscular strength in lifting weights, running, jumping the rope, or the like. Sudden death during great exertion is sometimes produced in this way.

Vegetations on the Valves.—Besides the general thickening of the valves inflammation may occasion certain morbid deposits on them. They are minute hard warts that are formed on the free surface of the valve just below its thickened margin. These are chiefly important as being the occasion of the deposit of masses of the fibrin of the blood upon the valves, so producing large granular-looking warts, which obstruct the outflow from the ventricle. Any roughening of a valve-surface by inflammatory or other disease, or by rupture, may cause the deposit of these *fibrinous concretions*. When they occur they not only obstruct the flow of the blood, and partially disable the valves, but portions of them may be washed off into the arterial current and be carried into a distant organ, as the brain, spleen, or kidney; and one of these reaching an artery too small to receive it, it stops there and cuts off the arterial blood from all portions of the organ usually supplied by the obstructed vessel. This mode of plugging up the arteries is called *embolism*; the plug itself is an *embolus*.

In the advanced stages of these diseases of the valves and muscular structure it is not difficult to arrive at the opinion that there is heart disease. Shortness of breath, induced by exercise, the strong heart-beating, beating of the vessels in the neck, the dropsies, the distress produced by lying down, tell the truth but too certainly. But they do not designate the particular form or forms of disease. This can only be learned by listening to the sounds produced by the action of the heart, and by actual measurement by percussion. Thus, in addition to the two natural sounds, from one to four new ones may be produced, called *murmurs*. These murmurs vary in pitch and quality according to the morbid conditions causing them. They are due to the friction of the blood against roughened surfaces, or the mere passage of the blood through abnormally large or small orifices. The valve diseased and the nature of the disease are determined by the position in which murmurs are heard and their character. If there is a murmur heard most distinctly under the breast-bone, where the third ribs are joined to it, and while the ventricle is contracting (in systole), it is probable that there is obstructive valvular disease, either in the aorta or pulmonary artery, and the chances are thirty to one that it is in the former, for in this proportion at least is valvular disease found more frequently on the left than on the right side. Indeed, the grave valvular diseases of the right heart are almost always found to have occurred before birth. The aortic-valve murmurs are heard somewhat more distinctly at the right border of the breast-bone, and those of the pulmonary valve at the left border. If there is a murmur with and after the second sound heard most distinctly at the same place, it indicates insufficiency—that is, regurgitation, as already explained. It will be remembered that the two hearts contract simultaneously, and that the two second sounds are simultaneous. If, then, the second sound on one side is silenced by deformity of the valve, the valve on the other side is, in all probability, normal, and produces its own normal second sound strongly enough to be heard. A murmur heard most distinctly in the left and lower part of the heart-region (toward the apex) is referred to a diseased mitral valve. If it is in systole, the valve is insufficient, and there is regurgitation from the left ventricle into the left auricle. If it is in "the period of repose"—that is, the period between the second natural sound of the heart and the recurring first—it will indicate an obstruction, from the stiffness or other diseased change in the valve, to the flow from auricle to ventricle, for it is in this period that the auricle is emptying itself into the ventricle.

With two exceptions, these murmurs are positive indications of changes in the form, thickness, dimensions, or structure of these valves. There may be an *anæmic murmur* with the ventricular contraction at the pulmonary opening when the blood is thin, or does not contain its normal quantity of animalized elements—or, in other words, when it contains too much water (*hydræmia* and *chlorosis*)—and there may be actual regurgitation, and the corresponding murmur at the

mitral valve, caused by muscular relaxation, as a result of which the orifice is abnormally large and the valves therefore insufficient to prevent regurgitation. The same rules are applicable to valvular diseases of the right heart, except that the murmurs of the tricuspid valve are heard at the junction of the sternum and fourth right rib.

These are the common forms of heart disease; and there will be in this article no better place than here to say that the popular opinion of their fatality is erroneous. Few persons can hear the announcement that they have disease of the heart, of whatever kind, without hearing it in the command, "Set thine house in order, for thou shalt surely die," and the general expectation is that the death will be sudden. It is true that there are sudden deaths from heart disease, even in persons who have not been ill enough to consult a physician. But these sudden deaths are exceptions. For one such, a quarter of a hundred live on till death comes through some disease which could not have been looked for, or the kidneys become involved in secondary Bright's disease. Every physician of experience can recall cases of heart disease which have persisted for years, giving no trouble beyond occasional shortness of breath after unusual exertion or indiscretions of other kinds. The hypertrophy of the organ which has been above described is here a conservative process tending to equalize the circulation by strengthening that portion of the heart which requires additional power, either because the blood is not permitted to flow out with the wonted ease, or because after expulsion part of the blood regurgitates. It will thus be seen that heart disease of itself is not often a cause of rapid death, but may persist until old age without inducing great discomfort. The mode of life must of course be regulated to avoid causes of increased strain to the heart, and intercurrent diseases must be treated with greater care, as a crippled heart makes them additionally dangerous. Death may finally occur from exhaustion of the heart or from other diseases supervening.

Diseases of the Heart-muscles.—Two important forms of such disease may be recognized: the *inflammatory* and the *degenerative*, the latter being such as are attended by retrograde changes in the structure of the heart without inflammation.

Myocarditis, or inflammation of the heart-muscle, may be an attendant of endocarditis or of pericarditis (inflammation of the investing membrane of the heart), or it may occur independently of such affections. This inflammation may take one of two forms, either *acute purulent* inflammation with formation of abscesses, or a slower chronic inflammation by which there occurs formation of fibrous connective tissue between the true muscular fibers. The latter form is much more common than the former. Purulent myocarditis may be localized, as stated, in the form of abscesses, or it may be present as a uniform infiltration of the muscle with pus. Abscesses usually occur as a result of deposition of septic matter, carried to the heart from some distant point of suppuration through the circulation. They may cause death by leading to rupture of the organ or by general *pyæmia*, or they may be healed. When the latter occurs the pus is gradually absorbed and a scar takes the place of the tissues which have been destroyed and removed. The scar tissue being inelastic, the constant distentions of the cavities lead to gradual stretching, and finally a localized, sacular dilatation, or *aneurism of the heart*, results. This may remain for a long time without giving marked symptoms, or may rupture and lead to rapid death. The more chronic myocarditis with formation of fibrous tissue is much less serious than the purulent form. It may give rise to few or no symptoms for a long time, or may not be recognized until after death, when the morbid changes may be seen at autopsy. It is frequently present in chronic valvular heart disease, and contributes to the gradual weakening of the walls which culminates in dilatation of the cavities. The presence of connective tissue between the muscle fibers gradually deprives the latter of their proper blood-supply, and degenerative changes are apt to ensue, so that fibroid change and fatty degeneration of the heart usually coexist.

Degenerative changes in the heart-muscle include several varieties, but the most frequent is *fatty degeneration*. This must be carefully distinguished from that form of fatty disease in which there is mere deposition of fat within the muscular structure and around the organ, and which is called *fatty infiltration*. In every person there is a certain amount of *adipose tissue* or fat in the layer of pericardium lining the outside of the heart, just as there is a deposit of fat in the subcutaneous connective tissues. In individuals who are very "fat" this adipose tissue grows more and more considerable, until finally the organ is imbedded in a thick layer of fat, and the latter may also push into the muscular structure between the fibers. This condition is called fatty infiltration. Fatty degeneration is quite another thing and of much greater gravity. In this case, as a result of malnutrition from anæmia and various organic diseases there is gradual retrograde change in muscle fibers themselves, causing transformation into fat, and as a result the muscle is greatly impaired, whereas in infiltration the impediment is mainly mechanical, the masses of fat interfering more or less with the muscle which is itself healthy. The appearance of fatty degeneration of the heart is readily recognized by the change of color from the dark red of healthy muscle to a more or less pronounced yellowish tinge, and by the greater softness of the walls. In advanced cases the cardiac power becomes much reduced, the pulse becomes intermittent and irregular, and the cavities widely dilated.

Other degenerations of the heart do not merit notice here. *Rupture of the heart* may occur, as above described, by yielding of the walls in the situation of an abscess or after the healing of such through the scar or aneurism there developed. More rarely rupture may occur in points of great weakness due to fatty degeneration, or deep ulceration from endocarditis. Great and sudden strain is the usual inciting cause. The blood flows out into the pericardial sac and impedes the heart's action. Death is usually very rapid, and there may be no definite indication of the cause. A few cases of slow death have been recorded, but a few hours is the usual limit.

Heart-clot.—At varying times after death the blood in the heart and large blood-vessels coagulates to form dark-red masses, sometimes called *currant-jelly clots*. If there has been time for a separation of the white and red corpuscles of the blood, the latter sinking by their greater weight, the clot formed has a lighter color and may be almost white. Clots may, however, be formed in the heart during life, and indeed they usually occur when death is slow. Under such circumstances the circulation through the heart is very much retarded, and clotting easily occurs. This is especially prominent in diseases of the lungs, in which there is a special impediment to the circulation, and the immediate cause of death in such diseases is usually failure of the heart. Thus in pneumonia or phthisis there are, after death, dense white clots, sometimes almost entirely filling the right ventricle and auricle, and extending far up into the pulmonary artery and its branches. The left heart is less involved in these cases. Occasionally a heart-clot may cause sudden death by becoming detached and obstructing one of the orifices, or, if smaller, the coronary artery. In all cases of heart-clot during life there is the danger that parts of the clot may be detached, carried into the general circulation, and obstruct small arteries in various organs, as the kidneys, spleen, or brain.

Embolism and Thrombosis of the Coronary Arteries of the Heart.—The first of these terms refers to the fact just described that clot or fibrinous concretion may form in the heart, and that a part or the whole of it may be detached and carried forward till it reaches an arterial division too small to receive it; it can not go back, but must remain there, preventing the circulation of arterial blood in the artery beyond it, till it is disintegrated and carried away. It is possible that a portion of a fibrinous concretion on the valves or wall of the left ventricle, so detached, may enter one of the coronary arteries, and so obstruct it. But a section of the aortic valve covers the mouth of each of these vessels during the contraction of the ventricle, and this protected condition must render such an accident very rare. What we are more familiar with is *thrombosis*, or the coagulation of blood in the artery. This cuts off half of the supply of blood to the heart; a pretty rapidly increasing feebleness of the heart-action follows, with a weak and slow pulse, great prostration of strength, extreme paleness of countenance, coldness of the feet and hands, and after these symptoms death occurs in ten to twenty hours in the majority of the cases.

Pericarditis.—As the lining membrane of the cavities is subject to inflammation, so is the external covering. This and the lining of the fibrous pericardium are alike liable. They are indeed but one membrane. Pericarditis and endocarditis often occur at the same time, being both produced by an extension or migration of articular rheumatism, or rather by that same state of the system which causes the articular disease. Either of these diseases may accompany

Bright's disease. Beyond the concurrence with these affections the causes of pericarditis are not well defined. The disease itself, as well as endocarditis, was not intelligently observed until the nineteenth century. The changes produced by pericarditis are: first, an increase in the quantity of blood in the vessels of the membrane; second, absorption of the fluid which in health diminishes the friction between the heart and pericardium; third, exudation of fibrinous material or serous fluid from the blood. Both of these products of this inflammation are commonly found, but the serum is usually much the most abundant and the most oppressive by impeding the action of the heart. When there is little serous fluid, the disease may run its course with but little general disturbance; but when the quantity is large, there is a rapid pulse, oppressed breathing, and a tendency to faint when sitting or standing. The pericardium is distended by its watery contents, sometimes even to tension; and the normal dilatation of the heart-cavities becomes difficult. If the disease runs a favorable course the serous fluid and the fibrinous exudate are gradually absorbed by the blood-vessels and a normal condition of affairs restored. In other cases, after the fluid has been absorbed, or in case of its entire absence from the first, fibrous adhesions may be formed and bind the two layers of the sac together, greatly to the impediment of the heart.

In the early stages of pericarditis there is pain from rubbing together of the dry and inflammed layers of pericardium, and for a like reason a to-and-fro rubbing sound or *friction* may be heard. When effusion of fluid has occurred, both these symptoms disappear, but disturbance of the heart's action now becomes pronounced, and the area of dullness to PERCUSSION (*q. v.*) increases. The heart-sounds under these circumstances become a little less distinct as the heart is buried in water. This is the condition indicated by the phrase "water on the heart," popularly supposed to be a common malady, but it is not found to exist in one in twenty of the cases in which it is suspected. Pus is sometimes, but not often, found in the pericardium after inflammation. In *chronic pericarditis*, implying chronic distention of the heart-sac, the fluid causing the distention is partly pus (seropurulent). Chronic pericarditis is almost always fatal. Acute pericarditis is rarely fatal in the first attack; but in young persons subject to recurring rheumatism each return is more and more dangerous.

Deformities and Defects.—The growth of the heart may be arrested in any of the imperfect stages referred to under the head of *fœtal heart*. (See HEART.) It may have but two cavities, an auricle and ventricle, or two ventricles and one auricle, or two auricles and one ventricle; the pulmonary artery may be small or not developed; so also the aorta may be small or wholly obstructed at its origin; the foramen ovale may remain open after birth; there may be an opening in the septum of the ventricles which will permit free communication from one to the other; the ribs over the heart may be absent, so that the skin is its only chest-covering—indeed in certain rare instances the organ has been found beating and wholly outside the chest (*ectopia cordis*), suspended by its vessels, which were internal; in rare instances there is no heart; such a fœtus usually has no head or arms, but lumpy growths instead, and must always be one of twins, the circulation being produced by the twin heart through the placenta. The most common of these defects is an open foramen ovale, permitting venous blood from the right auricle to mingle with the arterial in the left. This is produced when the current through the pulmonary artery is obstructed. This state of the heart leads to the condition called *morbus cæruleus*. The name, however, applies equally to other congenital defects that permit venous blood to pass into the left heart or into the aorta to circulate in the arteries, producing blueness of the skin. This color is not constant, except in a few, but is produced by crying, a fit of coughing, excitement, or unusual physical exertion. It is not incompatible with a life of limited duration, but is likely to be attended by diminished growth of body, bodily and mental sluggishness, shortness of breath, palpitation at times, and occasional fainting. If the subject of any of these defects survive the first years of life, the defect alone will not probably be the immediate cause of death, but it will diminish the power of resisting a fever, a pneumonia, or any grave disease, and especially one that disturbs the balance of the two circulations. The heart of two cavities and obliteration of the pulmonary artery must be attended by an enlargement of the bronchial arteries if life can be maintained even for a short time. If there are two auricles and one ventricle, the foramen ovale must remain open; if there are two ventricles and one auricle, there is a permanent opening in the septum; if the aorta is obstructed, the ductus arteriosus remains, as well as the opening in the septum. In all these cases the action of the organ is practically the same as in a heart of one auricle and one ventricle.

In spite of this long list of diseases relatively very few deaths are caused by all these agencies put together; a very large proportion of the deaths so occurring are in persons of advanced age; and even when disease fastens on the heart it does not, as a rule, preclude the hope and expectation of "length of days." Counting from youth to age, not one in a hundred has any kind of disease or defect of the heart.

Revised by WILLIAM PEPPER.

Heart's Content: village; on the southeast side of Trinity Bay, Newfoundland; lat. 47° 50′ N., lon. 53° 20′ W. It is the landing-place of the Atlantic telegraph cables extending to Valentia, Ireland. Here is a fine telegraph building. The harbor is good; most of the inhabitants are fishermen. Pop. 880.

Heartwood: See DURAMEN.

Heat [M. Eng. *hete* < O. Eng. *hēto*, deriv. of *hāt*, hot: Germ. *heiss*]: a natural force the existence of which is realized through the sense of feeling. It is difficult to give a *scientific* definition of the term heat in any other way than by the enunciation of the "dynamic theory," upon which all its manifestations depend. In its most common acceptation it refers to the physical effects which bodies in nature, in certain conditions, produce upon others. A person exposed to the direct action of the sun or a fire experiences a feeling of comfort or discomfort, which is involuntarily attributed to some sort of emanation from these sources (see SENSATION); and bodies in certain conditions are observed to produce effects on other bodies near them, or in contact with them, which are attributed to the same kind of influence. It was for a long time supposed that a material agent passed from one body to another. Under this hypothesis it was conceivable that a body might "contain" heat, and that this substance might exist in greater "quantity" at one time than another in the same body; and although the term *heat* and the expressions "quantity of heat," "transfer of heat," and others having significations which involve the idea of quantity, are still retained, even in scientific explanations, the quantities referred to are not those of matter, but of dynamic effects.

The dynamic theory of heat—a theory which has revolutionized the physical sciences—is founded on the assumption that all substances in nature are composed of indefinitely small material molecules, which are maintained by the forces which act upon them in a constant state of vibration or oscillation. When a body, whether solid, liquid, or gaseous, becomes hotter in the popular sense of this term, the scientific condition involved is that the vibrations of the molecules become more rapid; and a decrease in the velocity of vibration of the molecules accompanies or produces the effect called cooling. The forces which act upon the molecules, and which determine the velocity of vibration, are presumed to be their own mutual attractions and opposing centrifugal forces, to which is added the external pressure of the atmosphere or other medium which surrounds the body. Each molecule in motion possesses a certain *vis viva* (living force), or energy, corresponding to that which is manifested by *bodies* having visible or sensible motions; so that the *vis viva* due to the heat-vibrations may be said to represent generally the heat-condition of the body.

The dynamical process of heating or cooling may be effected in various ways. The most common and universal phenomena of this kind in nature take place through *radiation* of heat. If a heated body be placed near another which is cooler, a transfer takes place until an equilibrium is attained in their conditions. This equilibrium is assumed to be effected through the vibrations of an elastic medium which pervades all space, and which is composed of ponderable molecules so small that they penetrate the spaces between the molecules of other substances, and form, so to speak, an atmosphere around them. This medium, which is called the luminiferous ether, may be said to perform the same office in the transfer of heat that the common atmosphere performs in the phenomena of sound. The cooling of a body through radiation implies a loss of energy through the impact of its molecules with the atoms of the ether, waves or vibrations being communicated to the latter

which are propagated in all directions. Another body within the influence of these waves will receive heat by the impulsion communicated to its molecules; or, in other words, an increased rate of vibration will be communicated to its molecules, its energy will be increased, and it will become hotter. In any system of bodies or particles, if no chemical action takes place, and no mechanical or dynamic influence is exerted upon the system from without, any change of heat in one of the bodies of the system is accompanied by a corresponding change of the same kind in an inverse sense in one or all of the other bodies: when, however, any external force is applied to the system, such as friction, pressure, or a shock, the effect of such external energy exerted is manifested by a change of heat in the whole system; and, according to the principles of conservation of energy, these opposite effects must be equivalent. The variations of the heat of a body are thus known by common observation to be connected with the action of ordinary forms of dynamic energy.

The supposed motions of the separate molecules of bodies with which the phenomena of heat are connected can not be made evident to the senses, and hence the dynamic theory was the result of inductive reasoning, and not of observation. It had its origin in the fundamental principle of the science of dynamics, connected with that force in nature which arises from the inertia of matter. The well-known law of dynamics, that when the velocity of a material particle or of a body is changed by the action of a force the *work of the force* in a given time is equal to the *variation* of the *vis viva* of the particle or body, is a law which may be derived directly from the definition of the mass of a body and the principle of measuring forces by velocities. Applied to a system of bodies acted upon by a system of forces, this theorem of dynamics assumes the following general form of expression: *The aggregate work of the forces applied to a system in a given time is equal to the variation of the vis viva of the system in the same time.*

The discovery that this theorem of the transformation of energy, as applied to sensible finite velocities of bodies, is applicable to the insensible or indefinitely small vibrations of the molecules of a body which accompanies the changes of volume and the excitation of energy in the phenomena of heat was definitely demonstrated and received as a new theory about the year 1852. During many years previous to this the subject of the true theory of heat had been discussed, and the new theory was even announced in precise language by Lavoisier and Laplace as early as 1780, in the following language (Verdet, *Théorie Mécanique de la Chaleur*): "Other physicists think that heat is only the result of insensible vibrations of matter." . . . "In this system heat is the living force which results from the insensible movements of the molecules of a body"; "it is the sum of the products of the mass of each molecule by the square of its velocity." "We shall not decide between the two preceding hypotheses [referring to the material theory]. Many phenomena appear favorable to the latter. Such is, for example, that of the heat which is produced in the friction of two solid bodies; but there are others which are applied more simply in the first." "Perhaps they both have place at the same time." Laplace afterward, however, in his discussions on heat, defended the material theory. The experiments of Rumford and of Davy in 1798 and 1799 upon the heat produced by friction served to demonstrate the failure of the *material* theory, and gave a new impetus to investigation.

The discoveries which led to the foundation of the science of thermodynamics were made between the years 1842 and 1849, and were due to the independent and separate investigations of Dr. Robert Mayer, a German physician, Prof. von Helmholtz, Mr. Colding, an engineer of Copenhagen, and Mr. Joule, of Manchester, England. An approximate determination of the *dynamic equivalent* of a unit of heat was first published by Mayer; while Joule was the first to give by exact experiments the determinations which established the principle, and placed the value of the dynamic equivalent beyond doubt. The final development of the science into a definite form, immediately following the determinations of Mayer, Helmholtz, and Joule, was principally due to the labors of R. J. E. Clausius, M. Rankine, and Sir William Thomson, their most important researches having been published in the years 1849 to 1851. To these illustrious philosophers and mathematicians we are principally indebted for the establishment of the science of thermodynamics.

Heat being no longer regarded as a material substance, but its phenomena being those of force, motion, and work, it is proper to explain the meaning of the term "quantity of heat," which is retained even in scientific discussions. For this purpose it will be necessary first to explain the signification of the term *temperature*. Degrees of temperature, as exhibited when the thermometer is brought in contact with a body, indicate, as is well known, various conditions of the body in regard to heat, and under the material theory it was rational to suppose that the lowering of temperature indicated by the thermometer when in contact with a body would indicate the quantity of heat which passed out of the body; or, in other words, variations in the thermometer might be taken to represent variations of quantities of heat in a given mass. Under the dynamic theory, however, a change of heat in a body indicated by the thermometer involves three effects, an increase or decrease of the energy due to the heat-motions, the work of the force of attraction of the molecules, due to the change if the body expands or contracts; and also the work of the external pressure upon the bounding surfaces. The variation of heat in the body is the resultant of these effects. If the body heated or cooled retains its form and dimensions, then the only effect of an external modifying force is to produce a change of molecular movement, provided no visible or sensible motion is communicated to it; and this increment of living force, or "heat," will be indicated by the thermometer, or become *sensible* through the thermometer. The *dynamic equivalent* of a certain quantity of heat will in such a case be the work of the exterior force which produces it. One mode of finding such an equivalent may be mentioned, especially, as that followed by Joule. He found by experiment the quantity of work expended in producing friction among particles of water, corresponding to the heating of one unit of weight, or 1 lb., one degree of the thermometer. The water was taken at its maximum density, so that the only effect of friction was the heating effect, no part of the external force being expended in producing expansion or in overcoming the attraction of the particles and the force of external pressure; or at least these effects were insensible. It was found that 772 foot-pounds of work correspond to an elevation of temperature in 1 lb. of water one degree F. This quantity of heat being represented by 1, the dynamic equivalent of a unit of heat in English measures is said to be 772 foot-pounds. This operation being merely a transformation of the energy of a force exerted into another form of energy, the energy of motion in a mass is necessarily invariable. To find the equivalent *thermal* effect in any other substance, it is only necessary to find experimentally the mass of such substance that will have its temperature changed one degree by the quantity of heat thus represented by unity. It is obvious that any other quantity of water might be taken, as, for instance, a kilogramme, and any other thermometer, the centigrade, for instance. This would give a different unit of heat, which would correspond, however, to a different quantity of work of the modifying force, but the relations of the two units and the quantities of work would be invariable. Thus a French unit of heat, a "calorie," is such a unit; it corresponds, nearly, to four British units, the exact ratio being 3·968, the quantity of work equivalent to a calorie being 423·55 kilogrammeters.

Various modes of determining the dynamic equivalent have been adopted, and laborious experiments and investigations with this view have been made by eminent physicists. These experiments include those in which heat is generated by friction of water, mercury, and iron; experiments with steam and air; with dynamo-electric machinery; and the shock of bodies, all leading substantially to the same result, small differences only occurring in the determinations arising from causes of loss of heat or work which could not be always experimentally ascertained, the accepted result being that stated above.

The determinations by Joule in 1843–45, which first gave to the dynamic equivalent a value worthy of confidence, may be said to have been the starting-point of modern progress in the science of heat. We are thus led to the enunciation of the fundamental principle of the dynamic theory of heat, sometimes called the principle of equivalence of heat and work—viz., *heat and dynamic energy are mutually convertible*; the law of this equivalence, stated with reference to British measures, being that *1 unit of heat corresponds to 772 foot-pounds of dynamic energy exerted.* A quantity of heat expressed in British units of heat may therefore be expressed as work by multiplying the number of units of heat by 772, the result being work in foot-pounds.

The general conclusions to be deduced from what pre-

cedes are as follows: (1) The word *heat* implies a condition of bodies in nature which is a condition of energy, or capacity for producing changes. (2) This capacity is indicated by the thermometer; and one kind of change effected between two bodies in different conditions through the action of heat is the *transfer of heat*, by which bodies are brought to the same degree of temperature, as indicated by the thermometer, through radiation or actual contact. (3) The changes of heat in a body are accompanied by corresponding changes of the density and elasticity, or by changes in volume and in pressure, upon the medium which envelops the bounding surfaces of the body. (4) Among the changes produced by a change of heat also may be enumerated chemical, electric, and magnetic changes. (5) Heat, considered as a source of energy, is identical with the kind of energy called *vis viva*, and may be regarded as a quantity capable of being measured by its dynamic effects; and in this respect it is subject, like other forms of energy, to the law of conservation. This law, as applied to heat, gives rise to the principle of equivalence, and its proof is the determination experimentally of the *dynamic equivalent* of heat.

In a complete study of heat two very different systems of investigation are necessary. One consists in the determination of the quantities of heat which are absorbed or disengaged by bodies when they pass from one condition of heat to another through intermediate states, in which the relations between the temperatures, volumes, and external pressures are considered. In this system of investigation the equivalence of heat and work is to be taken into account, and also the principles which form the basis of the science of thermodynamics. The phenomena of greatest interest to be considered are the changes of volume and of states of aggregation of bodies which accompany changes of heat; the performance of external work through the elastic force in the expansion of bodies; the applications of heat to electricity, magnetism, and chemistry. The investigations are prosecuted partly by experiment and observation, and partly by analytical investigation, the experimental investigations furnishing usually the constants or coefficients of the mathematical formulas.

The other class of investigations relates to the phenomena of heat as exhibited between bodies in which the interchange of temperatures is effected without any modifying external cause, and embraces the laws of the *propagation or transfer* of heat; the study of radiant heat in its relation to the wave-motions of the ethereal medium; and the action of bodies in reference to radiation and absorption. In these investigations the phenomena of heat and light are regarded as identical in character, or as resulting from the same physical agencies.

The first system of investigation mentioned will be first discussed. Let it be supposed that the exterior forces which act on a body are uniform normal pressures, such, for instance, as the pressure of the atmosphere upon the surfaces of solids and liquids, or the pressure, equal and opposite to the elastic forces, of the sides of vessels upon the gases or vapors which the vessels contain, the temperatures of the bodies being uniform throughout their whole extent. Then the condition of any body will be completely determined by the relations which exist at any instant between the three quantities, p, the pressure, v, the volume, and t, the temperature—a relation usually expressed mathematically in the form of an equation, $f(p,v,t)=0$, the expression $f(p,v,t)=0$ being read *function* of $(p,v,t)=0$. It is a common algebraic principle that in such an expression, *when the relations are known*, if any two of the quantities are known the third can be determined. If the volume and temperature be taken as independent variables the relation may be expressed $p=f(v,t)$; and if the pressure and temperature be taken as independent variables the volume would be expressed $v=f(p,t)$. $t=f(p,v)$ is another form of the same expression.

It is a matter of common observation that bodies assume different forms and conditions or states, which depend on their conditions in regard to heat. These states give rise to a classification of bodies under three general states, known as solid, liquid, and gaseous. A solid substance is one the molecules of which, though in a state of incessant vibration, nevertheless are retained in such a state of equilibrium between the attraction of the molecules for each other and the elastic force due to heat, that the body, as a whole, retains persistence of form as well as of volume. In the liquid state the molecules of the body move freely among themselves, but are not permanently attached to each other. In other words, a single molecule may transfer its contact from one set of molecules to another set, subject to the condition that the particles or aggregated molecules remain in mutual contact, like so many minute spheres or globules, rolling freely upon each other, but still retained in mass by the attractive forces which act through their point of contact. The term *gas* refers to that condition of substances in which the particles are in a state of tension. See Gas and Liquefaction of Gases.

The effect of a transfer of heat to all substances is similar in all three states of aggregation. The transfer of heat to a solid not only causes an increase of molecular vibration, exhibited by an increase of temperature, but an expansion, which consists in the separation of the particles from each other, or an increase of volume; but this expansion involves the overcoming of the external pressure of the air or other enveloping medium. In the case of liquids a transfer of heat to the liquid produces precisely the same effects as in the case of a solid—increase of molecular vibration, disintegration, involving expansion of volume and overcoming of the external pressure. In the case of perfect gases, the molecules having already become entirely separated, the effect of a transfer of heat is exhibited simply in increase of vibration of the particles, or increase of sensible heat (temperature), and capacity for overcoming the external pressure. When heat is abstracted from a body the effects described above are all reversed. The molecular oscillation is diminished, the volume contracts, and the external pressure, acting through the volume passed over by the contracting envelope, will perform work which appears in the heat abstracted.

These general laws may be illustrated or explained in a very simple manner, according to the fundamental theory of heat which has been enunciated, by the use of algebraic symbols. Suppose a definite quantity of any body, solid, liquid, and gaseous, to receive heat from some external source. Let the quantity of heat received, expressed in units of heat, be denoted by Q. The body will undergo the following changes: (1) an increase of molecular movement involving an increase of actual energy, which may be represented by W; (2) a certain amount of expansion or change of position of the particles, which involves a certain amount of work in overcoming the attractive forces of the body, which may be represented by R; (3) the change of volume involves the work of overcoming the external pressure to an amount which may be represented by S; and since Q is expressed in units of heat, and W, R, and S are supposed to be expressed in units of work—foot-pounds—we shall have, for the total effect of the heat transferred, $Q.E=W+R+S$; E representing the dynamic equivalent of a unit of heat. This expression is the enunciation, algebraically, of the principle of equivalence. The quantity W in the general expression represents a quantity of work equivalent to the change of *vis viva* of the mass of the body from the change of heat-motions of the molecules; the quantity R, the *work* of the forces of attraction of the molecules due to their change of position in reference to the centers of attraction; and S, the work of the external pressure. The two former are often combined in discussions under the head of *internal work*, while the latter is called *external work*, and the expression of equivalence then assumes the form $E.Q=U+S$; U designating the *internal* and S the *external* work, their sum being equivalent to the change of heat Q expressed in foot-pounds, or multiplied by E.

The principle of equivalence of heat and work is sometimes called the "first law of thermodynamics." Another law, called by some authors the "second law of thermodynamics," by others the "principle of Carnot," and by others, again, the principle of the "equivalence of transformations," depends upon the relation which exists between the quantity of work which a body can perform when undergoing an indefinitely small change of heat and the temperature of the body at the time of the change. The principle, as enunciated by Clausius, is that the capacity of a body for producing changes or performing such indefinitely small amount of work is proportional to the absolute temperature of the body, the *absolute temperature* being the temperature measured from a zero-point, at which any thermometer would stand if a substance to which it was applied were to be deprived of heat. This is a theoretical limit downward of all thermometers; and although it can not be realized in nature, yet its position on any scale may be determined. For Fahrenheit's scale it is at 459·4° below the ordinary zero, and for the centigrade scale 273°

below. It follows from the principle above enunciated that if an indefinitely small quantity of work, represented by a change in the pressure, volume, and temperature of a body, be represented by dz, expressed in thermal units, then dQ, or the corresponding change in the heat of the body, will be represented by $dQ = Tdz$; T being the absolute temperature. From this we get $\frac{dQ}{T} = dz$, $\frac{dQ}{T}$ being the transformation value of the work dz at the temperature T. When a body passes through a series of changes in regard to heat, and finally returns to its original state, the process is called a cycle, and if the operations are all reversible—that is, if the body undergoes expansions and contractions which with the pressures involved are reversible—the total work performed, both internal and external, will be zero, and we shall have $\int \frac{dQ}{T} = 0$. The expressions $f(t, v, p) = 0$, $EQ = W + R + S$, or $EdQ = dW + dR + dS$, and $\int \frac{dQ}{T} = 0$, are three expressions on which the mathematical theory of heat is based, and these, when developed and combined for all changes of a body, constitute the science of thermodynamics.

It will be impracticable in this very general account to do more than refer to some of the problems relating to the expansive action of heat in fluids as illustrations of such applications. The relations between the temperature, pressure, and volume of unit of weight of any particular substance being given, the principles of thermodynamics serve to *compute* the quantity of heat which will be absorbed or rejected by unit of weight of that substance under given circumstances—the computation, for instance, of the *real and apparent specific heat*, the *heating and cooling of gases and vapors by compression and expansion*, the *free expansion of gases*, the *flow of gases and vapors*, the *latent and total heat of evaporation*, the *latent heat of fusion*, and the *efficiency of heat-engines*. Most of these subjects have been treated also by experimental methods. It is by experiment alone that the relations between the pressure, volume, and temperature are first determined. The specific heats of substances, or the numbers which are found in tables of specific heats, represent the quantity of heat required to change the temperature of 1 lb. of the substance one degree of the thermometer under certain standard conditions as to pressure, volume, and temperature. The specific heat of water at the temperature of its maximum density, 39·1° F., is the *unit of heat*, represented in work by 772 foot-pounds. It will readily be observed that since the quantity of heat required to raise the temperature of 1 lb. of a substance one degree involves not only an increase of temperature, but a certain quantity of work if the body be allowed to expand, the specific heats will depend on the amount of expansion. The specific heats of solids and liquids, found in the ordinary tables of specific heats, are generally average values of the apparent specific heats, the true values increasing generally with the temperature.

It is difficult, if not quite impracticable in most cases, to determine the real specific heats of solids and liquids at constant volume experimentally, owing to the impossibility of retaining substances in these states at constant volume, except under very great pressures. For gases the specific heats are usually restricted to two particular cases—(1) those in which the volume is retained constant during a change of temperature, and (2) those in which the pressure maintained is constant. It is difficult also, in the case of gases and vapors, to determine the specific heat at constant volume, on account of the dissipation of heat through the sides of the vessel containing the substance. The specific heats at constant pressure are therefore determined experimentally, and the specific heat at constant volume computed. For a perfect gas the specific heat at constant pressure may be shown to be equal to the specific heat at constant volume, added to the thermal equivalent of the work performed by the gas in expanding, at constant pressure, an amount corresponding to one degree of temperature.

Numerous problems arise in physical and mechanical investigations in which the intermediate changes between the initial and final states are not the object of examination, but the initial and final states alone, and the total quantities of heat involved in the changes.

The specific heats of substances have been referred to as the quantities of heat in thermal units required to cause a change of temperature in one unit of weight of the substance one degree. To find the quantity of heat corresponding to any given change of temperature in a given quantity of any substance requires, then, three factors—the *number of pounds*, the *change of temperature in degrees*, and the *specific heat*; this last factor for water (at 39·1°, or maximum density) being unity, and for other substances the specific heats may be found from the tables. A quantity of heat represented by Q—that is, a change of heat equivalent to Q expressed in heat-units—may be expressed by symbols thus: $Q = W \times c \times t$, W being the weight of the body, c the specific heat, t the number of degrees of change of temperature. It is evident that if three of the above quantities are the known quantities in any problem, the fourth can be determined. This is a very simple but a very useful formula, which serves to solve a large class of problems which occur in every-day life, and requires only ordinary arithmetical or algebraic knowledge for its application. For instance, suppose we have a cubic foot of water, about 7½ gal., at the temperature 60° F., in a wooden vessel, and we wish to heat the water to the boiling-point by putting in heated stones; required the number of pounds of stones heated just to redness that will produce this effect. The water being at 60°, and being heated to 212°, the change of temperature of the water will be 152°, and the quantity of heat to be taken up by the water will be $Q = 62{\cdot}4$ lb. $\times 1 \times 152 = 9{,}484{\cdot}8$ units of heat. Suppose W to be the weight of stones required; the specific heat of stones is about ·22, and at a red heat the temperature of the stones may be estimated at 1,000° F. The quantity of heat lost by the stones when immersed in the water, if both are brought to 212°, will be $Q = W \times {\cdot}22 \times (1{,}000 - 212) = W173{\cdot}36$; and since this quantity of heat must be equal to that gained by the water, we have $W \times 173{\cdot}36 = 9{,}484{\cdot}8$.

$$W = \frac{9{,}484{\cdot}8}{173{\cdot}36} = 60{\cdot}5 \text{ lb.}$$

Similar applications might be made for liquids mixed with liquids, for the quantity of heat abstracted from gases by contact with solids, and for any change of heat of a substance when the weight, specific heat, and change of temperature are known.

Coefficient of Expansion.—The rate of expansion of a body is the increase of volume which takes place for equal increments of temperature, the volumes being referred in each case to the volume of the same body at a standard temperature. When a body exists in the form of a rod or bar, the length of which is to be determined under different degrees of heat, the increase of length is called the linear expansion. Very complete tables giving coefficients of expansion may be found in Landolt and Börnstein's *Physikalisch-chemische Tabellen* (ed. of 1893), and in many of the larger treatises on physics.

The following are the linear coefficients of some substances:

LINEAR COEFFICIENTS OF EXPANSION (MEAN COEFFICIENTS BETWEEN 0° AND 100° C., UNLESS OTHERWISE INDICATED).

Aluminium (40°)	0·00002313	Rhodium (40°)	0·00000858
Bismuth	1316	Selenium	6604
Cadmium	3159	Silver (40°)	1921
Copper	1718	Sulphur	0·00011800
Cobalt (40°)	1236	Tellurium	0·00003687
Carbon (diamond) (40°)	0118	Thallium (40°)	3021
" (graphite) (40°)	0786	Tin (40°)	2234
" (anthracite) (40°)	2078		
Gold	1470	Brass (71 Cu. + 29 Zn.)	0·00001906
Iron	1182	German silver	1836
Iridium (40°)	4170	Glass (white tubes)	0883
Magnesium (40°)	2694	Vulcanite (9°)	6360
Mercury (cubic)	0·00018092	Pine (lengthwise) (17°)	0355
Nickel (40°)	0·00001279	" (crosswise) (17°)	5840
Osmium (40°)	0657	Oak (lengthwise) (17°)	0492
Palladium (40°)	1176	" (crosswise) (17°)	5440
Phosphorus	1104	Ice (−10°)	0·00011250
" (50°) (liquid; cubic)	0·00052000	Calcite (55°)	0·00005734
		Quartz	3580
Platinum	0·00000884	Paraffin (15°)	0·00031985

Liquefaction, Melting, or Fusion.—The continuous transfer of heat to a solid, causing a continuous rise of temperature and an expansion of volume, produces ultimately a change of aggregation or change of state to the liquid form, called the fusion, melting, or liquefaction of the substance. This law is general for substances which do not change their composition in changing their state. For substances which do not change their composition the following phenomena occur: (1) "Each substance begins to melt at a certain temperature, which is constant for the same sub-

stance if the pressure be constant." (2) "The temperature of the solid remains at this constant point from the time when fusion commences till it is complete." (3) "If a substance expands in congelation, its melting-point is lowered by pressure; but if the substance contracts in congealing, its melting-point (or point of congelation) is raised by pressure." The laws which have been enunciated are subject to certain qualifications, such as slow process of cooling and variations of external pressure, which may lower the temperature of solidification, but under the same conditions they are invariable. The continuous application of heat to a solid at its melting-point does not raise its temperature as long as any portion remains solid; and, commonly, the abstraction of heat from a liquid at its point of solidification does not lower its temperature as long as any portion remains liquid. The change of state is also usually accompanied by a sudden change of volume. Some substances, however, pass from the solid to the liquid state without showing a definite melting-point, becoming plastic between these states. Glass and iron are examples, and instead of a definite melting-point a certain interval of temperature is required for the change.

Latent Heat of Fusion.—The increase of the specific heat of a solid as it approaches its melting-point appears to be connected with the increase of the coefficient of expansion, which also increases simultaneously. At the melting-point the whole of the heat applied to a body is apparently required to overcome those molecular attractions which keep the molecules in the state of proximity belonging to the solid condition. The *work* of the heat applied is thus absorbed or expended without producing increased molecular vibrations. Heat which would have become sensible heat in the pure solid or liquid disappears or is transformed into the work of overcoming these molecular attractions, and is said to become *latent*. The latent heats of fusion of a few substances, estimated in units of heat, have been determined experimentally.

The total change of volume from the lowest to the highest temperature consistent with the solid or liquid condition of any substance is very small compared with the actual volume of the body which undergoes such a change, and hence the influence of the external pressure upon the bounding surfaces is very slight during the change. In other words, the work performed by heat in expanding liquids and solids may be regarded as chiefly expended in producing change of temperature and change of aggregation, the external work in all ordinary cases, especially when the solid or liquid is exposed only to atmospheric pressure, being so small that it may be disregarded. In the case of bodies in the gaseous condition, however, this is different. Gaseous bodies can not exist in a fixed or determinate volume ordinarily, unless they are inclosed within bounding surfaces or envelopes. The force of cohesion among the particles of a gas no longer exists as in the solid and liquid states, and the heat condition of a perfect gas consists simply in the oscillation of the molecules (which is represented by the actual *temperature* of the gas), and the outward pressure or repellent action of these molecules, which must be resisted by the envelope. For a definite volume of a perfect gas thus confined there are thus but two conditions involved in changes of heat—the temperature and the pressure which it exerts against the bounding surfaces of the envelope. If such an envelope is perfectly elastic, and heat be transferred to the gas (the external pressure, such as the pressure of the atmosphere, remaining constant), the effect will be an expansion of volume. This expansion will be much greater than the expansion of liquids and solids for the same increase of heat.

The coefficient of expansion or increase of *volume* of the permanent gases in such circumstances, for an increase of temperature of one degree F., has been determined, through the well-known experiments of Regnault and others, to be 0·002035, or $\frac{1}{491{\cdot}4}$ of the volume of the gas at 32° F., and for one degree centigrade, 0·00366, or $\frac{1}{273}$ of the volume of the gas at 0° C. Thus one volume of a perfect gas at 0° C. or 32° F. will become $1 + 0{\cdot}00366$, or $1 + \frac{1}{273}$ volume at 1° C., or $1 + 0{\cdot}002035$, or $1 + \frac{1}{491.4}$ volume at 32° + 1° F. A slight difference in the coefficients was found by Regnault for the different gases, and also a slight difference at different external pressures, but for purposes of ordinary calculation the coefficients of all *permanent gases* may be regarded as the same.

We may conceive, however, that when heat is transferred to a gas inclosed within an envelope (for instance, within a cylinder which is closed at one end by a movable piston), the *volume* and the *external pressure* may change simultaneously, and thus the three quantities which determine the condition of the gas—viz., the volume, v, the pressure, p, and the temperature, t—may all be variable quantities. The relation between these quantities has been found, and is represented by what is well known as the law of Mariotte and Gay-Lussac. The following simple equation is the mathematical enunciation of this law: $PV = R(a + t)$ or $PV = RT$; R representing a constant for any particular gas, and T the absolute temperature; in which P is the external pressure upon unit of surface, V the volume of unit of weight, R a constant which depends on the specific gravity or density of the gas (the weight of this unit of volume), T the temperature, and A the number 273, centigrade degrees being employed, and 459·4 if Fahrenheit degrees be employed. The quantity P, defined as the external pressure upon a unit of surface, is evidently also the outward pressure or elastic force of the gas.

It is well known, from common observation, that many liquids, such as water, alcohol, and ether, if not confined in close vessels, become transformed into a condition resembling the gaseous condition at ordinary temperatures, and disappear *as liquids*, being diffused in the atmosphere as vapors. This transformation takes place in nearly all liquids more or less rapidly at ordinary temperatures, though for some no such transformation takes place at very low temperatures. It is considered probable, however, that this quiet change takes place in all liquids above certain fixed temperatures. Many solids, also—e. g. ice and camphor—pass to the state of vapor without passing through the intermediate liquid state, under certain conditions. If a *closed* vessel be partly filled with a liquid, the space above the liquid will thus ordinarily become filled with the vapor of the liquid, and the *elastic force* of the vapor will depend on the nature or *kind* of liquid, the *volume* of the inclosed space, and the *temperature*. If heat be applied to the liquid in this condition, the formation of vapor will continue, the vapor exerting a certain additional elastic force depending on the *temperature alone*, as long as there remains any liquid. Evaporation will cease when the application of heat is suspended, and, if the liquid be cooled, *condensation* will occur; so that the relative quantities of liquid and vapor, and the elastic force of the latter in a given space and for a given liquid, are dependent on the condition of heat or *temperature* solely. Similar phenomena will follow if the extent of the inclosed space be enlarged or contracted, the *temperature remaining the same*. If the space be enlarged, an additional quantity of the liquid will pass into the state of vapor; and if the space be contracted, a certain amount of the vapor will be reconverted into liquid. For every liquid in an inclosed space there is thus a certain tension or elastic force depending on the temperature (whatever be the relative volumes of the liquid and the free space above it) which is the greatest elastic force that the vapor can have at each particular temperature. If the vapor be compressed, liquid is formed by condensation, and if the space be enlarged, or the external pressure which confines the vapor be diminished, additional vapor will be formed, and the elastic force will remain thus constant for each constant temperature. A vapor in this condition in presence of its liquid is said to be *saturated*.

This law of vapors—viz., that the elastic force in a given volume depends solely on the temperature—is approximately true whether the space in which the vapor is formed be vacuous, or whether it contain air or any other permanent gas, provided that the liquid exerts no solvent or chemical action on the gas. The combined elastic forces, or the resultant pressure on the sides of the vessel, when a permanent gas is present which is not acted upon by the liquid, is nearly the sum of the elastic force of the gas and the maximum tension of the vapor at the given temperature. It was found by Regnault, in experiments on this subject, that liquids do not give off vapor of quite so great a tension in a space occupied by a permanent gas as they do in a vacuum, and that the difference increases as the temperature rises; but for technical applications under ordinary temperatures the law may be considered true. The only difference between evaporation in a vacuum and in a space occupied by a gas is that the formation of vapor

takes place more slowly if a gas be present—a fact of great importance in the economy of nature connected with the evaporation of water from the surface of the earth.

When heat is continuously applied to a liquid in a closed vessel, the space inclosed remaining constant, the temperature of the liquid and vapor will continually increase if there be no dissipation of heat through the sides of the vessel: the quantity of the liquid will diminish and the pressure will increase, the vapor remaining saturated as long as any liquid remains. After the last element of liquid shall have passed to the state of vapor, if heat be still applied, the vapor begins to assume the properties of the permanent gases. Under this condition, if the temperature could be indefinitely raised, or the volume of the space indefinitely increased, under a constant temperature, the vapor would finally arrive at a state corresponding to that of perfect gas, and would then follow strictly the laws of Mariotte and Gay-Lussac; and hence it may be said that the physical properties of vapors, when sufficiently expanded or at sufficiently high temperatures, and when they are not in contact with their liquids, are identical with those of perfect gases.

Complete Vaporization.—The temperature at which the complete evaporization of a liquid in a given space will occur depends on the relative volumes of the liquid and the space above it. With alcohol, the empty space being about equal to that occupied by the liquid, complete vaporization takes place at about 400° F. In the case of water, if the space occupied by the water be about one-fourth of the whole internal volume of the vessel, the liquid will be wholly converted into vapor, if the vessel be strong enough to resist the pressure, at about 680° F. (*Cagniard de la Tour.*) The elastic force of the vapors of *mixed liquids*, as determined by Regnault, is the sum of the tensions of the two vapors taken separately if the liquids have no solvent action on each other. With water and ether the tension of the vapor of the mixture is less than that of the sum of the tensions of the two liquids taken separately, being hardly equal to that of ether alone. When two liquids dissolve each other in all proportions—e. g. water and alcohol—the resultant tension is intermediate between the tensions of the separate liquids.

Boiling-points.—The *boiling-point* of a liquid is an expression which usually refers to a fixed or standard pressure upon the exterior surface, the pressure of the atmosphere, and it indicates the temperature at which the elastic force of the vapor is equal to such standard pressure. *Ebullition* is a phenomenon which takes place when heat is applied to the lower part of the mass of a liquid which has been heated to the boiling-point, and arises from the formation of bubbles of vapor at the point at which the heat is applied, the bubbles rising through the liquid and escaping at the free surface. The formation of such bubbles may occur before the whole mass of the liquid has been heated to the boiling-point, but in this case the bubbles are usually condensed before they reach the surface.

"*Boiling-point due to the pressure*" is an expression sometimes employed to designate the *temperature* corresponding to the pressure, whether that temperature be above or below the standard temperature for which the boiling-points of the tables are determined. The boiling-point of a liquid under any pressure is, properly speaking, the lowest temperature at which ebullition *can* occur, since there may be circumstances under which ebullition, or the formation of vapor, does not take place until the liquid has been heated many degrees above its tabulated boiling-point. If the free surface of a liquid be covered or surrounded by another which has a higher boiling-point, the bubbles of vapor of the interior liquid having no escape, this liquid may attain a temperature higher than its ordinary boiling-point. The boiling-points of liquids are also influenced by the nature of the vessel. Water has generally a higher boiling-point by several degrees, under atmospheric pressure, in glass vessels than in iron vessels. Liquids holding solid bodies in solution generally boil at higher temperatures than when the liquid is pure.

Nebulous or *vesicular* vapor is that which arises from the condensation of particles of a vapor in the atmosphere or in its own vapor, constituting cloud or mist. If heat be applied to vesicular vapor, the condensed globules evaporate and the vapor becomes transparent, though still saturated. If heat be abstracted, new particles are condensed; the globules coalesce and fall in drops.

Superheated Vapor.—When a vapor at the point of saturation is removed from contact with its liquid and heated, it is said to be *superheated*. A saturated vapor not in contact with its liquid may become superheated by the enlargement of the space which contains it, for it will then admit of compression without condensation, and will have a pressure, at the same temperature, inferior to that of saturated vapor, and also a temperature more elevated than that due to saturation for the same pressure.

Spheroidal State.—It is a matter of common observation that when water is sprinkled upon the horizontal flat surface of a hot stove the drops are not immediately converted into steam, but roll about on the heated surface, and gradually evaporate, retaining all the time the spherical or spheroidal (flattened sphere) form. This condition is not peculiar to water, but may be experimentally demonstrated with all volatile liquids, and is usually described as the *spheroidal state*. It arises from the fact that the rapid formation of vapor makes a layer or bed of vapor on which the drop rests, and which prevents actual contact between the drop and the surface. The phenomenon may occur also whether the heated surface be liquid or metallic, the condition being that the surface shall be heated to a point considerably above the boiling-point of the liquid drop. Experiments by Boutigny showed that the *lowest* temperature at which a metallic vessel will cause the spheroidal state is 289° F. for water, 273° F. for alcohol, and 141° F. for ether. The spheroidal condition, sometimes called "Leidenfrost's phenomenon," illustrates an important fact in regard to the transfer of heat which will be treated of subsequently. It shows that for the rapid transfer of heat to a liquid there must be actual liquid contact with the heated surface—the interposition of a thin film of gas acting as an obstruction to the passage of heat.

Humid Vapor.—The vapor of water which is usually employed in industrial operations usually contains particles of water mechanically suspended in the vapor. The steam is then not only saturated, but *wet*. When in the simple condition of saturated vapor it is called *dry steam*. *Steam-gas* is a term employed by some writers to superheated steam, or steam in the condition of a perfect gas.

Expansion of Dry Saturated Steam.—If dry saturated steam be inclosed in a vessel, and the volume be enlarged by extending the space in such a manner that the elastic force of the steam performs no *work*, the steam will become superheated—i. e. its temperature will be, at the end of the expansion, higher than that due to the boiling-point corresponding to the pressure, and it will remain transparent. If, however, the expansion takes place against a pressure, so that there is work performed by the elastic force, condensation of a portion of the steam will take place, and the mass of steam will present a cloudy appearance. This fact was first determined theoretically by Rankine and by Clausius, and experimentally by Hirn. It is supposed that no heat is communicated to, or abstracted from, the vapor during the expansion. This condensation does not take place in steam sufficiently *superheated*. From the experiments of Fairbairn and Tate on superheated vapors it appears that for an interval of about 18° F. above the temperature due to the pressure the coefficient of expansion of a superheated vapor is greater than that of perfect gases, but above this temperature the relation between the volume and pressure follows closely the law of Mariotte and Gay-Lussac.

The elastic force of saturated vapors may be illustrated experimentally by taking several barometer-tubes, filling them with mercury, and inverting them in a trough of mercury. The surface of the mercury in each tube will drop about 6 inches, leaving a vacuous space at the top of the tube. If now a small quantity of liquid water be passed up into this vacuous space in one tube, alcohol into another, and ether into another, the quantity of liquid being more than can be evaporated in each space at ordinary temperatures, it will be found that a portion of each liquid will be instantly evaporated, and the mercurial column will be depressed in each tube, but by different amounts. If each tube be now heated by surrounding it with warm water, the elastic force of each vapor will be increased, the mercury will descend in the tubes, and will finally press the mercurial column down to the level of the reservoir. At this point it is evident that the elastic force of each vapor is equal to that of the atmosphere, or *1 atmosphere*. But the temperature of the liquid and vapor in each tube will be different from that in the others. The temperature of the watery vapor will be found to be 212° F., the temperature of the alcohol 173°, and the temperature of the ether 95°.

These are the temperatures at which the elastic forces of these vapors are equal, respectively, to 1 atmosphere. At these temperatures the liquids will *boil* under the atmospheric pressure. If the temperatures be reduced below these points, the pressure remaining the same, a portion of the vapor in each tube will be liquefied; and, the temperatures remaining the same, if the pressure be increased above 1 atmosphere, a portion of each vapor will become liquefied. The tension or elastic force of 1 atmosphere is thus the *maximum tension* which the saturated vapors can bear at the temperatures given above. If the three tubes and the basin of mercury were inclosed in a chamber in which, by compression of the air, different pressures could be obtained higher than 1 atmosphere, it would be found that, for each of the substances named, the temperatures at which the mercury would be forced down to the level of the reservoir under each additional atmosphere of pressure would be increased. The elastic force of saturated vapors is thus *independent of the volume and proportion of liquid mixed with the vapor, and depends only on the temperature.*

It has been found impossible to determine, *theoretically*, the relation which the temperatures bear to the pressures, and reliance is placed mainly on the celebrated experiments of Regnault. These tables show that no *simple* relation exists between the maximum tension and the temperature. Different empirical formulas have been proposed, however, to express this relation with certain degrees of approximation.

The effects which follow the transferring of heat to a body, solid, liquid, or gaseous, have been described by employing the simple algebraic expression, $QE = W + R + S$. The quantity W represents a change which is exhibited by a change of sensible heat or change of *temperature*. That part of the whole heat transferred which produces the work R and the work S is expended in producing a change in the relative positions of the particles and in *external* work; and disappears as *sensible heat*—i. e. it is not afterward contained in the body or exhibited in the body as heat. These two quantities of heat, R and S, become *latent*. The term *latent heat* is a technical expression, designating a quantity of heat which has apparently disappeared, but which really has been employed in producing changes in the body, in the form of work, other than the change of velocity of molecular motion or change of *temperature*. By reversing the process by which heat is thus made to disappear, this latent heat may be reproduced.

The total heat necessary to transform 1 lb. of water from the liquid condition at the melting-point of ice to the condition of saturated vapor or steam at the temperature t is called the *total heat of vaporization*, and represents the sum of the heat which is required to heat the water from the temperature 32° to the temperature t, and the heat which disappears as latent heat. By algebraic symbols this sum is evidently expressed as follows: $Q = c\,(t-32) + L = q + L$: c being the mean specific heat of water between the limits of temperature, and L the latent heat of vaporization at the higher temperature.

The results of Regnault's experiments, already referred to, led him to the discovery that *the total heat of the vapor of water from the temperature of melting ice increases at a uniform rate as the temperature rises.* Regnault's formula by which this law is expressed is as follows: $Q = 606{\cdot}5 + 0{\cdot}305\,t$, Q being the total heat in calories, and t being expressed in centigrade degrees. The equivalent English formula is $Q = 1{,}091{\cdot}7 + 0{\cdot}305\,(t-32°)$. The expression for the total heat of vaporization is $Q = q + L$, from which we have $L = Q - q$; that is, the latent heat of vaporization is equal to the total heat, diminished by the quantity of heat necessary to raise the temperature of the liquid from the melting-point of ice to the final temperature of evaporation.

Density of Gases and Vapors.—The term density refers to the degree of approximation of the particles of a body to each other. It is specific when it refers to the number of particles or quantity of matter in a unit of volume of a given substance, this unit being a standard for all bodies. In English measures, 1 cubic foot is the standard unit of volume, and the weight of a cubic foot of a substance in any condition is the *specific weight* of that substance in that condition. It is usual to express specific weights in terms of the weight of a unit of volume of a standard substance, the latter weight being taken as unity. Water is the general standard for specific weights, but for gases and vapors air is also taken as a standard, the weight of 1 cubic foot of air being unity. The following table shows the relative densities at 32° F. and 1 atmosphere pressure of some of the gases commonly met with:

Relative Densities.

Air	1·00000	Water	1·0000000
Nitrogen	0·97137	Air	0·0012932
Hydrogen	0·06926	Nitrogen	0·0012562
Oxygen	1·10563	Hydrogen	0·0000896
Carbonic acid	1·52901	Oxygen	0·0014298
		Carbonic acid	0·0019774

The following are the *weights* of 1 cubic foot of each of the same substances in pounds avoirdupois under the same conditions—viz., at 32° F. and 1 atmosphere pressure—except for water, which is taken at 39·1° F.:

Weight in Pounds Avoirdupois of 1 Cubic Foot.

Water	62·425
Air	0·08073
Nitrogen	0·07860
Hydrogen	0·00559
Oxygen	0·08926
Carbonic acid	0·12344
Steam	0·502

The density of a perfect gas at any other pressure and temperature may be found from the law of Mariotte and Gay-Lussac, $PV = RT$, by substituting for V the volume of 1 lb., $\frac{1}{D}$, and for R its value for the gas under consideration. Fahrenheit's scale being used for T, the values of R are:

Air	$R = 53{\cdot}35$
Nitrogen	$R = 54{\cdot}93$
Oxygen	$R = 48{\cdot}26$
Superheated steam	$R = 85{\cdot}77$

The *specific volume* of a gas is the volume of unit of weight. In English measures *1 lb. avoirdupois* is the unit of weight, and to obtain the specific volume we have $V = \frac{1}{D}$, the reciprocal of the *specific weight*. *Specific volumes*, or *volumes of 1 lb. of each* of the *substances named, are given below* in cubic feet, for 32° F. and 1 atmosphere:

Air	12·3870
Nitrogen	12·7226
Hydrogen	178·8909
Oxygen	11·2032
Carbonic acid	8·1011
Steam, at 212°	26·4216
Steam theoretically, at 32°	19·9203

Chemical action, when accompanied by the development of light and heat, is usually called *combustion*. *Inflammation* denotes that kind of combustion in which the products are gaseous and flame is produced. *Ignition* is simply the incandescence of a body unattended by chemical change. The phenomena of heat being those of rapid molecular motions, the heat and light developed by combustion must indicate an increased molecular movement in the particles of bodies, when combustion takes place, proportional to the amount or force of the chemical attractions. The heat of combustion may therefore be rationally explained by saying that intense and violent increase of motion in the particles of the compound is produced by the chemical attractions. Ordinary combustion consists in the combination of oxygen with various substances, the temperature required being different for different substances, and varying for the same substance with the rapidity of the combustion. Phosphorus combines slowly with oxygen at 77° F.; charcoal burns *slowly*, but does not ignite below a red heat; sulphur burns in air at 550°. But most elementary substances require to be heated to redness before combustion in oxygen or the air takes place. According to Peclet, solids emit light or become dull red at about 950° F. Kennelly and Fessenden, as the results of observations upon a copper wire placed within the bulb of an air-thermometer and brought to incandescence by the action of the electric current, found visible radiation to begin at 493° C., the range of difference for various observers not exceeding three degrees (*Physical Review*, vol. i.). Most substances burn with great rapidity when in a finely divided state. Fine dust of many substances burns in this manner with a rapidity which in a closed space may give rise to such a degree of pressure from the expansion of the gases as to produce phenomena like

explosions. A single spark may thus produce instantaneous combustion in a space filled with fine dust.

Porous substances often absorb and condense air within their pores; oxidation begins, accompanied by an elevation of temperature, which accelerates the oxidation until the process produces spontaneous combustion. Charcoal-powder, masses of tow, cotton, or rags, saturated with oil, sawdust mixed with oil, moist hay, and other substances in similar conditions, have thus been known to burst into flame. Wood does not take fire in oxygen gas, according to Thénard, at temperatures below about 600° F., but if it be long exposed to a high temperature in air, it may become partially charred, and rendered so inflammable as to favor the conditions of spontaneous combustion. Under such conditions a single spark or accidental exposure of the substance to a higher degree of heat may cause it to take fire.

Ordinary combustion is accompanied usually by *incandescence* and flame. If a solid burns without flame, the heat evolved at the surface of contact of the air and the solid causes an elevation of temperature of the residual solid particles, which gives rise to a *glow* or *incandescence*, the color and intensity of the light being dependent on the temperature. Dull red indicates the lowest temperature at which light appears, and dazzling white the highest degrees of heat; between these extremes the light passes from dull red or cherry red to bright red, dull white, then to yellowish, and finally to a full or dazzling white. If the combustible is gaseous, the combination with oxygen may be instantaneous, producing an explosion by the violent concussion of the air; or it may be gradual. In order that the phenomenon of explosion may take place, the combustible gas must be mixed uniformly with air or oxygen in the proper proportions, and then heated to the burning-point. A similar effect takes place when a solid combustible, such as sulphur or charcoal, is mixed with a *nitrate* or other solid which gives up its oxygen readily. In both cases it is only necessary that the temperature be raised to ignition at one point by friction, percussion, or the contact of a hot body, the action being then propagated instantaneously throughout the whole mass. When the combustion is gradual, the contact of the combustible gas with oxygen or the air takes place usually at the bounding surface of the gas; as, for instance, when a jet of gas issues from an orifice or when a column of gas rises from the wick of a candle. The inner mass of the combustible gas does not ignite at first, and the ignited surface assumes the form of a hollow cylinder or cone. The brightness and color of such a flame depend not only on the degree of temperature, but upon the presence of solid incandescent particles in the flame. These solid particles arise sometimes from the compound produced by the combination, but in ordinary forms of combustion of fuel they are particles of carbon. Hydrogen gas, carbonic oxide, alcohol, and sometimes coal-gas, burn thus with a dull flame. A bright flame is produced by compounds which contain carbon, from which a portion of the carbon becomes separated by the heat produced, the separated particles being first heated to incandescence, and afterward burned by contact with the air. If the quantity of air supplied be not sufficient, these solid particles may become cooled and form soot. The visible part of smoke is this soot cooled below red heat. Marsh-gas, olefiant gas, ether, volatile oils, resins, fats, etc., when burned, give off carbon in this manner, and may form bright flames, or produce, if the separated particles are not all burned, soot or smoke. *A purely gaseous substance does not become luminous at any degree of temperature, however high, luminosity being caused by particles of incandescent solids in the gas.*

The combustible ingredients of ordinary fuel, and of the liquids and gases usually employed for the generation of heat, are *carbon* and *hydrogen*. These substances combine readily with oxygen, the former producing by the combination carbonic acid or carbonic oxide, and the latter water. The oxygen required is usually supplied by the atmosphere, which contains about one-fifth of its weight of this substance.

As a general rule, all chemical *combinations* produce heat, while chemical *decompositions* cause a disappearance of heat. In the combination of two simple isolated elements heat is evolved only, but where the combination is effected through the simultaneous decomposition of compound substances, the heat evolved is the resultant of that which is produced by the combination of the combustible elements and that which *disappears* through the decompositions. In compounds containing oxygen and hydrogen in the proper proportions to form water, the surplus hydrogen only contributes to the development of heat when combustion takes place.

An important consequence of the dynamic law of heat, and one which has been experimentally verified, is that all chemical changes are accompanied by corresponding changes of heat. *Chemical action and heat are mutually convertible*; and although the quantity of *heat* evolved or annihilated in any chemical change can only be experimentally determined, yet it has been established that the *combination of any two bodies, chemically, is attended by the evolution of a quantity of heat equal to that which disappears in their separation.* The quantities of heat evolved or disengaged in chemical combinations are found experimentally by means of *calorimeters*. These measures of heat are employed in various forms, and operate generally in such a manner as to exhibit the effects of the heat evolved in acting on a given substance, such as the melting of ice or the raising of the temperature of a given quantity of water, the quantities of heat being thus indirectly measured by being transferred to some body in which these effects can be estimated in units of heat. In this manner the heat evolved in the combination of both simple and compound bodies has been determined by many observers, especial authority being given to those of Favre and Silberman. In the chemical changes which compound bodies undergo it may be stated as a general law that the heat which appears or disappears is the resultant of the action of the simple elements; and where a compound consists of *combustible* elements only, like *carbon* and hydrogen, *the heat disengaged is the sum of the quantities of heat disengaged by the combustion of the elements separately.* This law, though not indisputably established, is considered sufficiently exact for all ordinary purposes. The *temperature* at which bodies combine, although affecting the rapidity or energy of chemical action, does not affect the *total* quantities of heat involved in the change.

The transfer of heat from a heated body to one that is at a lower temperature consists, according to the dynamic theory of heat, in the loss of living force, due to heat-motion, in the hotter body, and an equivalent gain of living force in the colder body. When the two bodies are quite distinct, or separated, and do not form part of one and the same body, this transfer takes place generally, as has been stated, through the intervening ethereal medium by the process of radiation. Through this medium there is a tendency to equilibrium of temperature or of living force, the relative exchange of heat being inversely proportional to the masses of the bodies. It is probable that the transfer of heat between two bodies is always thus accomplished by *radiation*, although, technically, a distinction is made between the transfer at appreciable distances, or *radiation*, and the transfer by actual *contact* of the two bodies. Heat may be transferred practically also by the actual change of position of the body in which it exists. In this mode of transfer, which is called *convection* or carrying, the transfer is a mechanical one, and is not in any way connected with the change of heat in the body carried. Although this mode of transferring heat is of great importance in the arts, and especially in connection with the generation of steam, involving as it does the question of circulation of heated fluids, yet after the convection of heat by the transfer of the body in which it exists, whether that body be solid, liquid, or gaseous, there still must take place the transfer from the heated body to another, by the process of radiation or contact, before the heat can be utilized *as heat*. Thus a heated gas or liquid may be carried through pipes, or may be mingled mechanically with other gases or liquids for the purpose of conveying heat, but the final process by which that heat is actually transferred from the heated gas or liquid to another body, *as heat*, must depend on the dynamic laws of heat. In adopting, therefore, the usual designations of the modes by which heat is transferred—viz., radiation, contact, convection—it is to be understood that the latter is a mechanical mode, and need be discussed only in connection with the carrying of bodies to the places or points at which it is desirable or necessary for them to impart their heat to other bodies.

The experiments of Melloni are usually quoted as giving the first direct proofs that radiant heat like light consists in vibrations of the ethereal medium. It is now a matter of almost universal popular knowledge that the white light of the sun is composed of rays of various colors, which may be produced at will by means of a prism. The rays are deviated in the well-known order from red to violet, the number of vibrations for the red rays being 481 billions per second, and

for the violet 764 billions. The greatest intensity of light, according to Fraunhofer, is in the yellow, and the least in the violet. This spectrum is also a *heat spectrum*, the heat spectrum extending over about four times the space occupied by the visible spectrum. In the heat spectrum the maximum of heating effect lies beyond the red, on the obscure part of the spectrum. The greatest calorific effect is thus produced by rays for which the ethereal vibrations present waves of greater length and greater duration than those of the red rays of the light spectrum. The heat-rays beyond the violet, although not visible, are known to influence chemical action, in certain bodies, in a remarkable manner. While the light spectrum is thus only a part of the total spectrum, the invisible rays possess the same general properties as the light rays, and it appears that the ethereal vibrations affect the eye only between certain limits. A heated particle of a substance communicates vibrations to the ethereal medium whether the particle be surrounded by air or whether it be in a vacuum. In ordinary language, the particle sends *rays* of heat in every direction; these rays or waves proceed indefinitely, without change in strength or character, and with the same velocity as light, until they are intercepted by some body in the paths of the rays. If such a particle be a *molecule* on the surface of a body, it is evident that it will send off rays of heat in every direction not intercepted by the body itself.

It is a common error to suppose that the intensity of *a ray* of heat diminishes as the distance between the body emitting and the body receiving the heat increases—i. e. inversely as the square of the distance. The law of the inverse squares of the distance is rather a geometrical than a physical law, and refers to the action of *one* body on *another*, whether the question be one of heat or gravitation. A body or collection of molecules possessing a certain amount of living force, due to heat, imparts this energy to the ethereal medium in all directions, and the quantity of energy *intercepted* by another body will depend on the distance between the two bodies—the quantity thus intercepted by the *same body* at *different distances* being inversely proportional to the squares of the distances.

The inclination of the surface which intercepts radiant heat determines, for similar reasons, the quantity of radiant heat received. Even if the rays be supposed parallel, as in the case of the radiant heat of the sun, it is apparent that all the heat conveyed by a beam of rays may be represented by the section of the beam perpendicular to its direction. If the beam falls upon a surface inclined to its direction, the amount of surface over which the beam will be distributed will be greater as the inclination of the surface is greater. If the surface be plane when it becomes parallel to the axis of the beam it will receive no heat. Hence in estimating the intensity of radiant heat by units of surface, the inclination of the receiving and absorbing surfaces must be considered. The regions of the earth's surface near the poles, from their approach to parallelism with the direction of the sun's beams, receive less heat on each square mile of surface than is received by a square mile at the tropics.

Many attempts have been made to determine the quantity of heat in units of heat emitted by any given surface at a given temperature, supposing the temperature of the absorbing surfaces to remain at constant temperature. Dulong and Petit, whose researches in this and other branches of physics are universally known, made numerous experiments on this subject, which resulted in the determination of certain general laws. The experiments were made to determine the rate of cooling of bodies in an inclosed space, the space being filled with different gases, and the inclosure being maintained at constant temperature. The results were enunciated as follows: (1) "The cooling of a body results from radiation and from contact of the fluid or gas which surrounds it. (2) The rate of cooling, from radiation alone, is the same for all bodies at the same temperature, but its absolute value depends on the nature of the surfaces. It is represented by the following formula, $Q = Ca(a^t - 1)$, in which Q represents the number of French units of heat emitted by one unit of surface in a unit of time; C, a constant depending on the nature of the surface of the radiant body; a, the number 1·0077; t, the temperature of the inclosure or absorbent; and t the *excess of temperature* of the radiating body over the absorbing body in degrees centigrade. (3) "The rate of cooling by *contact* of a fluid surrounding the heated body is also the same for all heated bodies, but its absolute value does not depend on the *nature of the surface*, and depends only on the form of the heated body."

For air under ordinary atmospheric pressure the law of cooling by contact is expressed by the formula $Q = C'.t^{1\cdot233}$, in which Q represents the quantity of heat in calories abstracted from one unit of surface by the air in a unit of time; C' a constant depending on the form of the surface; and t the excess of temperature of the body over that of the air surrounding it.

The *relative* radiating powers of different surfaces at 180° F., as determined by Leslie, are represented approximately in the following table:*

Lampblack	100	Mica	80
Paper	98	Graphite	75
Resin	96	Tarnished lead	45
Sealing-wax	95	Mercury	20
Crown-glass	90	Polished lead	19
India-ink	88	Polished iron	15
Ice	85	Tin plate	12
Red lead	80	Gold, silver, copper	12

It is stated by Magnus that the greater or lesser density of the surface has no influence on radiation from the surface. Platinum which has been strongly hammered possesses the same emissive power as platinum carefully annealed. But the same surface roughened with emery-paper has its emissive power greatly increased. As far as quantities of heat are concerned, it is doubtful whether anything further than such *relative* determinations can, in the present state of knowledge, be depended on, the actual or absolute quantities for different temperatures being still uncertain. The radiating powers of different bodies or different surfaces represent also their absorptive powers, and, as has been already stated, radiant heat does not affect the eye, or solids do not become luminous, until the temperature reaches about 500° C.

The radiation and absorption of gases, according to Prof. Tyndall, present very peculiar laws, and our knowledge of the action of gaseous bodies on radiant heat is still very slight. It has been demonstrated experimentally by Prof. Tyndall that a ray or beam of heat is wholly or almost wholly transmitted through moderate distances in air, oxygen, hydrogen, and nitrogen; and, conversely, no radiation takes place from the heated particles of these gases. The only mode, therefore, by which heat can be imparted to these gases, or by which they can impart heat to other bodies, is by actual contact. Some other gases possess remarkable powers in absorbing or intercepting *dark* radiant heat. The absorption of radiant heat by vapor of water diffused in air, under circumstances of average humidity, was shown by Prof. Tyndall to be seventy times greater than the absorption by dry air. As the quantity of watery vapor was increased, the amount of heat absorbed was increased.

Conduction of heat refers to the transmission of heat from one part of a continuous and homogeneous body to another part of the same body. When a body is heated at one point, the heat is transmitted with greater or less rapidity throughout the whole mass, depending on the nature of the body and the differences of temperature of the heated part and other parts of the body. If the body is terminated by two parallel surfaces which are each kept at a constant temperature, there will be a flow of heat, so to speak, at a constant rate from the hotter surface to the other by conduction. The *law of conduction* under these circumstances is that the quantity transmitted for a unit of area perpendicular to the direction of transmission, and per unit of time, is directly proportional to the difference of temperatures of the parallel surfaces, and inversely proportional to the thickness or distance which separates the two surfaces. If t_1 and t represent the temperatures of the two surfaces, and e the distance separating them, the quantity of heat transmitted will be represented algebraically by the formula $Q = \frac{c(t_1 - t)}{e}$. The coefficient c depends on the nature of the body. When the quantities of heat thus transmitted for different bodies across an interval 1 unit of length in thickness, and for 1 unit of area and time, are determined, these quantities of heat represent the *relative* conductibilities of the substances, and the numbers thus found, when referred to 1 as a standard, may be called the *conductivities* of the different substances.

The relative conductivities of metals, determined by experiments on bars of a given cross-section, the transmission of heat being determined by thermometers placed at different distances in holes drilled in the bars, have been determined by different investigators. The following table of

* Watts, *Dictionary of Chemistry*.

conductivities, from experiments made by Wiedemann and Franz, the temperatures along the bars being determined by a thermo-electric arrangement, is given by Balfour Stewart:

Relative Conductivities.

Name of metal.	In air.	In vacuo.
Silver	100·0	100·0
Copper	73·6	74·8
Gold	53·2	54·8
Brass	23·6	24·0
Tin	14·5	15·4
Iron	11·9	10·1
Steel	11·6	10·3
Lead	8·5	7·9
Platinum	8·4	7·4
Palladium	6·3	7·3
Bismuth	1·8	

The conducting power of liquids is greater at high temperatures than at low temperatures. And when there is no convection of heat in liquids by which heated particles are carried from one point to another, the conducting power of liquids is very small, the conducting power of water being, according to Depretz, only about $\frac{1}{70}$th that of copper.

Conduction by Gases.—Gases possess such a feeble power of conduction that they have been regarded as having no conducting power. Experiments by Magnus and theoretical deductions by Clausius, however, demonstrate that there is a slight power of conduction in perfect gases. Clausius estimates the conducting power of air to be about $\frac{1}{1400}$th that of lead.

The calorific *intensity* of combustion, or degree of temperature of the products of combustion, and of the solid incandescent combustible, seems to depend on the rapidity of combustion rather than the quantity of heat evolved. Nearly all writers on the subject have given a method for finding what may be called the theoretical temperature of combustion, by supposing that all the heat evolved is contained in the gaseous products, and calculating the temperature by means of the specific heats and the weights of the products of combustion and the heat evolved. Making use of formulas corresponding to that which has already been given $Q = W.C.t$; Q representing, in units of heat, the heat evolved; W the weight; C the specific heat of the gaseous products of combustion; and t the number of degrees rise of temperature. From this formula we have $t = \frac{Q}{C \times W}$. Such determinations, however, have but little practical value for solid combustibles, because the residual incandescent solid gives off rapidly, by radiation, heat which does not pass off with the gases.

The quantity of heat radiated from an incandescent combustible depends not only on the temperature of the combustible, but also on that of the absorbent and the nature of the surfaces. On this account there does not appear to be sufficient ground for ascertaining the temperatures of furnaces or of the escaping gases by this process. It is well known from common observation that the temperature in ordinary furnaces is greatly increased by a more rapid supply of air; so that the quantity of heat evolved in a given time, and the temperature, are thus increased. Chemical action is promoted by high temperatures, and the conditions for increase of temperature, increase of heat evolved in a given time, and rapidity of chemical action, are coincident.

Among the most important of the applications of the dynamic theory of heat in the physical sciences may be mentioned its applications to the constitution of bodies, to electrical phenomena, to chemistry, to physiology, to astronomy, and to geology. All of these sciences have felt the influence of the science of thermodynamics in a remarkable degree, the investigations of the present day in regard to heat being largely devoted to the development of these applications. In the practical sciences its applications to the theory of *heat-engines* are perhaps the most important; and these applications will be given in the articles STEAM-ENGINE and THERMODYNAMICS. Revised by E. L. NICHOLS.

Heath, WILLIAM: soldier; b. at Roxbury, Mass., Mar. 2, 1737; became captain of the Suffolk regiment; commandant of the Ancient and Honorable Artillery of Boston 1770; afterward a provincial colonel; was often in the Legislature; was in the Provincial Congress 1774–75; a brigadier, and then major-general, 1775; brigadier-general of the Continental forces 1775; major-general 1776; State Senator 1791–92; became judge of probate for Norfolk co., Mass., 1793; was elected Lieutenant-Governor in 1806, but declined to serve. Published *Memoirs of Major-General William Heath* (Boston, 1798). D. at Roxbury, Jan. 24, 1814.

Heath'cote, RALPH, D. D.: clerical writer; b. at Barrow-upon-Soar, Leicestershire, England, Dec. 19, 1721; educated at Jesus College, Cambridge; became vicar of Barkby 1749; assistant preacher of Lincoln's Inn 1753; vicar of Sileby 1765; rector of Sawtry-all-Saints 1766; a prebendary of Southwell 1768; vicar-general of Southwell church 1788. D. in Southwell, May 28, 1795. Author of *Historia astronomiæ* (Cambridge, 1746–47); *The Use of Reason in Matters of Religion* (London, 1755); *Discourse on the Being of God* (1763, a portion of his twenty-four Boyle sermons), besides a number of other works. He also assisted in the preparation of the *General Biographical Dictionary.*

Heath Family: the *Ericaceæ*; shrubby plants or small trees with regular gamopetalous flowers, a free compound ovary with a single style, stamens mostly ten, and opening by terminal pores. They are closely related to the Huckleberry family (*Vacciniaceæ*), which is often united with them. The heaths as here restricted number about 1,000 species, which are found in all parts of the world, and are especially abundant in South Africa, where there are several hundred species of *Erica*, one of the genera to which the name heath or heather has been especially applied. In England the common heath of the waste lands is *Calluna vulgaris*, a low evergreen shrub with small crowded leaves and clusters of rosy flowers. It occurs in a very few scattered localities in the eastern part of North America (including Massachusetts), where probably it has been introduced. Many species of *Erica* are cultivated in greenhouses. CHARLES E. BESSEY.

Heath-fowl: See BLACKCOCK.

Heat-stroke: See SUNSTROKE.

Heaven [M. Eng. *heven* > O. Eng. *heofon*, not connected with *heave*]: the blue vault apparently overarching the earth; also the subjacent region of clouds; also the unknown and idealized regions above the first. This natural division reappears in the later Jewish conception of *three* heavens, subtilized by the rabbis into *seven.*

Antiquity mostly conceived the azure vault as solid, not, as appears to us so obvious, as aërial, probably because the heavenly bodies were regarded as fastened in it and moved by it. The Hebrews shared this conception, but as their words for heaven signify elevated regions or expanse, and are thus elastic, they sometimes speak of it rather as a curtain, or tent, veiling the glory of Jehovah. When the conception of solidity prevails, the upper waters are viewed as massed above it, and poured out through windows or sluices occasionally opened and closed.

The undecaying identity and steadfast revolutions of the upper heavens, their brilliancy and purity, naturally suggested them to early mankind as peculiarly the divine habitation, especially as, by a natural instinct, physical elevation is the concomitant and symbol of eminent dignity and power, and as the great forces of fertility and destruction are so largely from above, the earth appearing rather passive than initially productive. Hence *Dyaus pater*, the Bright Father, contrasted with *Gē-* or *Dē-mētēr*, Earth-mother. The pagan fancy was wont to assist its conception of heaven as the abode of the gods by imagining some mountain as shooting up into the region above the clouds and sustaining the dwellings of the immortals. Hence the Homeric Olympus and the immeasurably high Mt. Meru of the Hindus. The Babylonians also, and Western Asiatics generally, conceived the earth as culminating at the north in a lofty mountain (Ezekiel xxviii. 14; Isaiah xvi. 13) on which the gods dwelt. The Israelites, on the other hand, coming to recognize the pure spirituality and incomparable power of God, have disengaged themselves from all such supports, and, while retaining the conception of heaven as especially God's dwelling-place, declare that "the heaven and the heaven of heavens can not contain him," thus recognizing his infinite transcendence, and his omnipresence alike in heaven, earth, and sheol. (See Psalm cxxxix.) In the later psalms and prophets these sublimer conceptions are peculiarly sustained and disengaged from the earlier crudeness. Thus the physical conception of heaven passes into that of the realm of existence, however viewed in its relations to space, in which God encounters nothing alien to the perfection of his own being, and within which all creature wills (whether by original creation, spiritual development, or redemption) are ab-

solutely at one with the Divine will. This is the foundation of the great address, "Our Father which art in heaven."

The Hebrews, apprehending heaven as created by God, and even in its purity as inadequate to his ideas ("The heavens are not clean in his sight, and his angels he charged with folly," Job xv. 15, with Job iv. 18), speak of them as destined to wax old and be folded up as an outworn garment, but only in order to give place to more exquisite divine creations, "new heavens and a new earth, wherein dwelleth righteousness."

Early mankind shrank from claiming a right, after death, of dwelling with the gods in heaven. Even the Old Testament believers, saving some bright flashes of anticipation in the later books, and the elevation of Enoch and Elijah without death into heaven, view the dead, bad and good alike, as descending rather to the center of the earth, into the joyless and strengthless realm of sheol. Very early, however, the Hindus began to believe that men, by virtue, asceticism, and ritual incantations, might merit long abodes in the myriad heavens of the gods, sometimes viewed as spiritual habitations, sometimes described with unspeakable grossness, all subject to the restless and endless round of elevation and depression, ever alternating, in incessant rebirths, between the heavens, the earth, and the hells. Exemption from this wheel of Ixion could be purchased, in Brahminism, only by surrendering individuality and sinking into the sleeping essence of Brahm; in Bûddhism by "being blown out" (Nirvana), as Bûddhism recognizes no God. In most tribes, especially the Greeks, certain heroes of divine descent, demigods, were supposed, after death, to have been raised to Olympus as full gods, but never the mass, even of heroes. Once in the *Odyssey* it is declared that Menelaus, as the son-in-law of Zeus, is to be transported, without death, to the Isles of the Blessed, a sort of "island-valley of Avilion" in the distant sea. The Elysian Fields, when developed in thought, are not usually placed in heaven, but are only a more favored region of Hades, appointed only for heroes and an occasional heroine, and, as we see in Vergil, subject to the remorseless doom of transmigration. The "happy hunting-grounds" of the North American Indians are the same thing in an aboriginal vesture. The Southern and Mexican tribes imagined the souls of heroes and heroines, and of those honored by being sacrificed to the gods, to accompany the sun in his course, or to become incarnate in the bodies of humming-birds. The doom of the multitudes seems to have received little or no attention. They were mostly supposed to become unhappy, tormenting ghosts or demons. The Assyrians also, though holding to a resurrection, were disposed to view it as occurring in the form of repulsive birds or beasts. Paganism generally is the state of those "who through fear of death are all their lifetime subject to bondage." The Persians, however, who can hardly be called pagans, cherished an animated hope of dwelling eternally in Ahura-mazda's bright kingdom of pure light. Persian influence is thought by many, with much reason, to have had an important share in developing the slumbering germs of a like faith among the Israelites.

The hope of immortality, gradually developing among the Jews, could not content itself with the joyless and shadowy existence of Sheol, but viewed the pious Israelites as to be recalled by Divine power in bodily subsistence, but glorified and undying, to dwell endlessly in the Messianic kingdom on the transfigured earth under the transfigured heaven.

Our Lord and the apostles freely clothe the faith and promise of eternal life in the conceptions of their people, thus emphasizing its substantial and embodied reality, and its citizenship in a kingdom of redeemed mankind, having its appropriate and eternal abode in a sphere of its own, which will thus be truly "a new earth." The relation of this to the planetary concretion on which we now dwell is not made a matter of curious detail, nor is the relation of transfigured, eternal being, to the present transient state, except that the disembodied spirit is declared to be not in its final condition, but to await a reinvestiture which, while substantial, shall be spiritual, serving, eternally, all the motions and impulses of the purified spirit. This final investiture is likened to a "house from heaven"; the reward of believers is declared to be "laid up in heaven"; the Saviour, in his glorified humanity, has ascended thither, and will come again to receive his people to himself; the souls of the martyrs and the spirits of just men made perfect are viewed in heaven; it is declared that Christ's people at his coming shall be caught up into the air to meet him. Our Lord himself declares that the state of the risen dead shall be eventually one with that of the angels. On the other hand, in the Revelation, and in that alone, the New Jerusalem, the eternal abode of the glorified, is described as coming down from heaven upon earth, here to abide, but pure, illustrious, incorruptible, heavenly.

The underlying doctrine of the New Testament appears thus to be that heaven, the realm of being in which God's will is perfectly done, and in which everything partakes of his eternity, shall ultimately extend its transfiguring power to this lower creation, and redeem it into essential identity with itself, the elements of caducity, corruptibleness, impurity, incongruity with eternal ends, inert grossness and heaviness, and above all of moral resistance to the Divine will and wisdom, being forever purged away, and the glorified and spiritualized, but truly substantial, not vaporous organism of redeemed mankind, while eternally maintaining its distinctiveness and its distinctive abodes in the Father's house, the consummate universe, nevertheless, by virtue of its spiritual perfection (*Spiritus omnis ales est*), shall, to use Frederick Robertson's admirable phrase, be "free of the universe." This is, in its perfect form, the kingdom of heaven, including alike, as the eternal home of redeemed man, the "new heavens and new earth, wherein dwelleth righteousness." CHARLES C. STARBUCK.

Heaves: same as BROKEN WIND (*q. v.*).

Heavy Spar: a popular name for the natural sulphate of baryta or barytes; has reference to the high specific gravity of that mineral. See BARYTA.

Hebbel, FRIEDRICH: dramatist; b. at Wesselburen, in Holstein, Mar. 18, 1813. He was a peasant-boy, and twenty-two years old before he acquired any systematic education. He studied for several years at the University of Munich, and in 1841 succeeded in attracting considerable attention by his tragedy of *Judith*. The King of Denmark gave him a stipend, and after traveling through France and Italy he settled at Vienna, where he married the actress Christine Engehausen. He was one of the most powerful dramatists of modern times, and not only showed perfect command of the technical requirements of the stage, but was also a deep thinker, and did not shrink from representing in his characters the utmost consequences of his thoughts. The most remarkable of his dramas are *Maria Magdalena* (1844); *Herodes und Mariamne* (1850); *Agnes Bernauer* (1855); and *Die Nibelungen* (1862). His complete works (12 vols.) were published at Hamburg in 1866–68, and his diaries (2 vols.) in Berlin, 1885–86. D. in Vienna, Dec. 13, 1863.

Revised by JULIUS GOEBEL.

He'be (in Gr. Ἥβη): in the Greek mythology, the goddess of youth and the cupbearer and attendant of the Olympian gods. She is usually represented as a tender maiden, lightly clad, with a cup in her hand. She was the daughter of Zeus and Hera, and became the wife of Hercules after the completion of his labors, his apotheosis, and the reconciliation of Hera. She bore Hercules two sons. After the rise of the myth of Ganymede she was also called Ganymede, and under this title and that of Dia she was worshiped in Phlius and Sicyon. In Rome, as Juventas, she personified not merely the young, but the perpetual youth of the state. The statue of Hebe by Canova is celebrated.

Revised by J. R. S. STERRETT.

He'bel, JOHANN PETER ("the German Burns"): b. at Basel, May 11, 1760; educated at Lörrach, Carlsruhe, and at Erlangen; became subdeacon and Professor of Ancient Languages in the Carlsruhe Gymnasium, and in 1798 Professor of Theology and Hebrew; church councilor 1805; director of the Lyceum 1808; in 1819 prelate of the Evangelical Church; was for some years editor of *Der Rheinländische Hausfreund*; author of *Biblische Geschichten* (1824), but is chiefly remembered for his *Allemannische Gedichte* (1803), which through Goethe's excellent review became justly celebrated. See also Längin, *Johann Peter Hebel* (in Lebensbild, 1874). D. at Schwetzingen, Sept. 22, 1826.

Revised by JULIUS GOEBEL.

He'ber, REGINALD: poet and second Bishop of Calcutta; b. of wealthy parents at Malpas, Cheshire, England, Apr. 21, 1783; was a half-brother of Richard Heber (1774–1833), noted as a collector of books. Reginald Heber was educated at Brasenose College, Oxford, and wrote the prize poem *Palestine* (1803; several times reprinted, e. g. London, 1865); became a fellow of All Souls' in 1805, and rec-

tor of Hodnet in 1807; was a prebendary of St. Asaph 1812; Bampton lecturer 1815 (his theme was *The Personality and Office of the Christian Comforter*, pub. 1816); in 1822 became preacher of Lincoln's Inn; and in 1823 was consecrated Bishop of Calcutta, and labored in India with zeal and wisdom until Apr. 3, 1826, when he was found dead in his bath at Trichinopoly. His works, besides those mentioned above, are *Narrative of a Journey through the Upper Provinces of India* [with] *an Account of a Journey to Madras and the Southern Provinces* (2 vols., 1828); a *Life*, etc., of Jeremy Taylor (1822), and some volumes of poetry; n. e. of his *Hymns* 1881. Heber was a man of saintly character, polished and dignified manners, and kindly and humble spirit. His hymn *From Greenland's Icy Mountains* (1819) is the most popular missionary hymn in the English language. See his *Life* by his widow, Amelia Heber (2 vols., 1830).

Revised by S. M. Jackson.

Hébert, ā'bār', Antoine Auguste Ernest: figure and portrait painter; b. at Grenoble, France, Nov. 3, 1817; pupil of Paul Delaroche and David d'Angers; Grand Prix de Rome 1839; first-class medals, Salon, 1851, and Paris Exposition, 1855; second-class, Paris Exposition, 1867; commander Legion of Honor 1874; member of the Institute 1874; medal of honor, Paris Exposition, 1889; director of the French Academy, Rome, 1866–73, and again in 1885; professor in the École des Beaux-Arts, Paris. His work is classical in its tendencies, and is not always exempt from the reproach of sentimentality, but he has considerable talent as a colorist. His celebrated pictures *La Malaria* (1850) and *The Kiss of Judas* (1853) are in the Luxembourg Gallery, Paris.

W. A. Coffin.

Hébert, Jacques René: revolutionist; b. at Alençon in 1755; nicknamed "Le Père Duchêne," from the ultra-radical paper published by him during the French Revolution. Previous to the Revolution, as he was uneducated, he led a miserable life as lackey and ticket-seller at the doors of the theaters. Immediately after the capture of the Bastile in 1789 he started his journal, *Le Père Duchêne*, the real patriotism, but also the extreme opinions, of which soon made Hébert extensively known, and caused him to be made attorney-general of the Paris Commune, and afterward a member of the National Convention. He was a member of the commission appointed to examine Marie Antoinette, whom he falsely accused of a scandalous offense. Hébert wielded a tremendous influence, especially among the worst elements of Parisian society, and was the chief promoter of public atheism; but Robespierre understood that the exaggerations of the Hébertist or ultra-radical party founded by Hébert discredited the cause of the Revolution, and the committee of public safety sent to the guillotine the "Père Duchêne" and his partisans.

Hebrew Language [*Hebrew* < M. Eng., from O. Fr. *hebreu*: Ital. *ebreo* < Lat. *Hebræ'us* = Gr. Ἑβραῖος, from Aramaic *chebrāyā* < Heb. *chibrī* (plur. *chibrīm*), a Hebrew]: the language of the Old Testament; the tongue spoken by the Israelitish people from the earliest known period of their history up to a century or two before the beginning of the Christian era. It is a member of the Semitic family of languages (see Semitic Languages), and exhibits all the peculiarities of that family (triliterality of the stems, the "construct state," timeless verb, modification of meaning of verb-stems by prefixes and infixes, aversion to compounds in verbs and nouns, except in proper names, paucity of conjunctions, parataxis), being thus sharply divided from the Indo-European family on the one side and from the agglutinating tongues on the other. It belongs to the northern branch of the Semitic family, having greater resemblance to Babylonian-Assyrian and Aramaic than to Arabic and Ethiopic. Within this branch its place is in the Canaanitish group, it being almost identical with Moabite (and probably with Ammonite, Edomite, and Philistine), and slightly less near to Phœnician. This group seems to be characterized by the possession of a definite article, of the nominal plural-ending *īm*, of a certain set of derived verb-stems (which includes two proper passive forms), and of the construction known as "Waw consecutive," by which is meant that in ordinary prose in a series of past actions the verbs are imperfects introduced by the connective *wa*, while in a series of future actions the verbs are perfects introduced by *we* (a diminished form of *wa*). The vocabulary of Hebrew preserved in the Old Testament and the Talmud is relatively scanty, and especially lacking in abstract terms (a lack which was probably a feature of all ancient Semitic speech). The language is unfitted for the expression of philosophical thought (for which the people showed no inclination), but, on the other hand, it is an admirable vehicle for hortatory and denunciatory discourse, for simple narration, and for poetry. From the nature of the Semitic speech (each triconsonantal stem expressing a definite meaning) it was unnecessary to write the vowels, the special sense being sufficiently indicated by the connection of thought (the vowels are, however, expressed in the Babylonian-Assyrian syllabary). Vowel-signs were, in fact, not devised for Hebrew till long after it had ceased to be a living language (about the seventh century A. D.), whence it results that we are left in some uncertainty as to the ancient pronunciation. Except in the few proper names preserved in Assyrian inscriptions and the cases in which the Septuagint transliterates Hebrew words, we are dependent on the vocalization of the Masoretes (given in our printed Bibles), and no one knows what changes may have taken place between their time and that of the Old Testament writers. There were some differences of pronunciation within the limits of the Israelitish territory, as is indicated in Judges xii. 6 (whether there were real dialects is uncertain). The alphabet consists of twenty-two consonants, and is especially rich in sibilants, concerning the nature of one of which (the *sin*) we have not exact information. The character anciently used in writing was that which is known as the Phœnician, the origin of which is unknown. As early indeed as the fifteenth century B. C. the Babylonian cuneiform script was employed in Canaan by the Egyptian governors of the cities, the Babylonian language having been at that time the medium of intercourse between the Tigris-Euphrates valley, Canaan, and Egypt; but the Israelitish tribes were not then in Canaan, and were hardly in condition to use this script—they were uncultivated nomads. It can not be supposed that they acquired the art of writing before their arrival in Canaan, about the thirteenth century B. C., and they then no doubt found the Phœnician character in general use. When they began to employ it for literary purposes can not be determined with certainty; it was probably not long before the time of David, in whose reign for the first time there is mention of official writing (2 Sam. viii. 16, 17—the account in 2 Sam. x. 25 is probably a later addition to the narrative). The earliest known Canaanitish writing in the Phœnician script is the inscription of the Moabite king Mesha, about 900 B. C. (the stone is now in the Louvre). This character continued to be used by the Israelites till toward the second century B. C., when it was abandoned for an Aramaic script, the same that is now found in our Bibles. No ancient Hebrew inscription, except a scrawl by a workman in the Siloam aqueduct about 700 B. C., has yet been discovered, but excavation may bring such writing to light. As far as the present evidence goes, there is no reason to suppose that we have any written remains of the time of Moses.

Inasmuch as the Canaanitish language was spoken, with slight variations, by various peoples in Canaan, the assumption is a natural one that that land was its birthplace, that it was there that a section of the Semitic race developed those linguistic peculiarities which difference their language from those of their neighbors (Aramæans and Babylonians). If this be so, then it was in Canaan that the Israelites acquired their language (which is called in Isa. xix. 18, "the tongue of Canaan"). How this came about, whether they were originally of that land, or gave up their own language and adopted this, it is impossible to say with certainty; but it is contrary to all that we know of ancient linguistic history to suppose that they brought this Canaanitish tongue with them from a non-Canaanitish region, from the district of the Euphrates, for example. The movements of the Israelitish tribes prior to their settlement in Canaan are involved in obscurity. With our present knowledge it is impossible to say what historical significance is to be attached to the tradition of the migration of an Abrahamic clan from the Euphrates. Abraham is represented in one passage (Gen. xi. 28) as coming from a Chaldean land, in another (Gen. xxiv. 4, 10) as claiming Aram as his country; in neither of these regions, as it seems, could Hebrew have been the vernacular. The term "Hebrew" (*Ibrī*) does not occur in the Old Testament as a designation of the language, which is called the "language of Canaan" (Isa. xix. 18) and the "language of Judah" (2 Kings. xviii. 26; Neh. xiii. 24). *Ibri* is a purely ethnic term, but its origin is uncertain. It may mean "the dweller on the other side" [of the river], but such a name would have been given by foreigners, and *Ibri* seems to be native. The ancestor

"Eber," to whom it is referred in Gen. x. 21, is a genealogical invention, and a comparison of the obviously geographical names in Gen. x. and xi. 10–26 suggests that this name also is geographical. We do not, however, know any place of that name, and the question of its origin must remain for the present unanswered.

Within the limits of the Old Testament the language shows no considerable internal phonetic, morphological, or syntactical changes. There are differences of style in individual writers, and variations in vocabulary according to subject-matter, but no marked development. At the moment when we first meet it (in the earliest narratives of the Pentateuch, about the ninth century B. C., and in the prophetic writings of the eighth century), Hebrew is already a well-developed language, exhibiting, moreover, great phonetic degradation as compared with classic Arabic (it is about at the same phonetic stage as Modern Arabic). The uniformity in the Old Testament is due perhaps in part to the comparative social isolation of the people, but largely, no doubt, also to the harmonizing procedure of the later scribes and editors, who permitted themselves to bring obsolete forms into agreement with their own usage; here and there words have survived which indicate that a steady process of change was going on. The present Hebrew text was fixed about three hundred years after the language had ceased to be spoken, and doubtless many old variations of form had then been expunged. In one direction, however, a definite modification of Old Testament Hebrew is discernible, namely, from the influence of the Aramaic or Syriac language. The Israelites were in contact with Aramaic-speaking peoples on the north and northeast from an early time, and Syriac appears to have been, even in the eighth century B. C., the medium of communication between the east and the west (2 Kings xviii. 26). After the exile Aramaic became more and more predominant in Western Asia (during the exile the Jews probably learned something of Babylonian), being the official tongue of the Persian government in that region (Ezra iv. 7), and finally expelled Hebrew entirely; from the third century B. C. the Jews largely spoke and wrote Aramaic, in which tongue considerable parts of the books of Ezra and Daniel now stand. Aramaic and Aramaizing words and expressions are found at first rarely (about the beginning of the exile), and grow more frequent in the later books, especially in Chronicles, Esther, and Ecclesiastes. On the later forms of Hebrew writing, see articles TALMUD and JEWISH LITERATURE.

The scientific study of Hebrew is of modern origin. The old Jewish biblical scholars were not interested in the subject, and of the early Christian writers only a few (especially Origen and Jerome) concerned themselves with Hebrew at all. It was under Arabian influence that the Jews began the investigation of their language, which was then carried on by a series of meritorious scholars, from the tenth to the sixteenth century; among the most famous of these are Saadia, Hayyug, Ibn Ganah, Aben Ezra, David Kimchi, and Elias Levita. The last named (1472–1549) was the chief agent in inducting Christian scholars into the knowledge of Hebrew, the scientific study of which then passed into Christian hands, and has since that time steadily advanced. In the latter part of the seventeenth century England was the center of Hebrew study, in the beginning of the eighteenth century Holland, and at the end of that century the leadership passed to Germany, where it has remained ever since, though the study is now pursued industriously all over the Christian world.

Grammars.—The best are: Gesenius, revised by Kautzsch (1878); Eng. transl. by Mitchell (Andover, 1880); Ewald, Eng. transl. of the *Syntax* by Kennedy (1879); Olshausen (Brunswick, 1861); Böttcher (Leipzig, 1866–68); Stade (Leipzig, 1879); König (Leipzig, 1881); Davidson (10th ed. Edinburgh, 1892); Driver, *Hebrew Tenses* (3d ed. Oxford, 1892). For comparison of Hebrew with other Semitic languages see Philippi, *Status constructus* (Weimar, 1871); Wright, *Comparative Grammar* (Cambridge, 1890); and also Land, Eng. transl. by Poole (London, 1876); and Bickell, Eng. transl. by Curtiss (Leipzig, 1877).

Lexicons.—Gesenius, *Thesaurus* (Leipzig, 1853), and *Handwörterbuch*, 11th ed. by Mühlau and Volck and D. H. Müller (Leipzig, 1892); Siegfried and Stade (Leipzig, 1893). A Hebrew-English dictionary by Driver, Briggs, and Brown is passing through the press (part i., Boston and New York, 1893). At present the lexicon of Siegfried and Stade is the most useful for general students. That of Fürst is not trustworthy.

Concordances.—Fürst (Leipzig, 1840); Wigram, *The Englishman's Hebrew and Chaldee Concordance* (3d ed. London, 1866); for the particles see Noldius (Jena, 1734).

History of the Language.—Gesenius, *Geschichte der hebräischen Sprache und Schrift* (Leipzig, 1815); Renan, *Histoire générale des langues sémitiques* (4th ed. Paris, 1863). On the study of the language: L. Geiger, *Das Studium der hebräischen Sprache in Deutschland vom Ende des XV. bis zur Mitte des XVI. Jahrhunderts* (Breslau, 1870).

C. H. TOY.

Hebrew Literature: See JEWISH LITERATURE.

Hebrews: See JEWS.

Hebrews, Epistle to the: an anonymous epistle of the New Testament; written by St. Paul, or, what is more probable, by one of his disciples and companions under his inspiration (Luke, or Barnabas, or Apollos), and addressed to the Christians of Hebrew descent in the East. Its object is to show the infinite superiority of Christ over Moses, and of Christianity over Judaism, and to warn its readers against apostasy. The writer makes the Old Testament itself prove the New, to which it pointed as its fulfillment. He sets forth the eternal priesthood and sacrifice of Christ, of which the Levitical worship was a significant symbol and type. The ninth chapter furnishes the key to the understanding of the tabernacle and the temple. The doctrinal expositions are interwoven with solemn warnings and rich consolations in view of the heavy persecutions to which the readers were exposed from the unconverted Jews. The eleventh chapter contains a most eloquent sketch of the ancient heroes of faith for the encouragement of timid believers, and forms a parallel to the seraphic description of love in the thirteenth chapter of First Corinthians. The epistle belongs to the Pauline type of doctrine, and mediates between it and the Christology of St. John. It shows the influence of the Alexandrian philosophy of Philo. It was written before the destruction of Jerusalem, when the temple worship was still in existence, probably in Italy during the first imprisonment of Paul in Rome, A. D. 63 or 64. See commentaries on the *Hebrews* by Bleek, the most learned of all (in 3 vols.), Tholuck, Delitzsch, de Wette, Ebrard, Alford, Lünemann (in Meyer's *Com.*), Moll (in Lange's *Com.*, Am. ed., with valuable additions by Kendrick), Kay (in *Speaker's Com.*, 1880), Moulton (in Ellicott's *Com.*, 1881), Angus (in Schaff's *Popul. Com.*, vol. iv., 1883), T. C. Edwards (1888; 3d ed. 1889); B. F. Westcott (1889; 2d ed. 1892); C. J. Vaughan (1890); also the able work of Riehm on the *Lehrbegriff des Hebräerbriefs* (Basel, 1859, 2 vols.; 2d ed. 1867), and the relevant sections in introductions to the New Testament.

PHILIP SCHAFF.

Heb'rides [Lat. *He'budes*; Gr. Ἑβουδαι], or **Western Islands**: the common name given to the large group of islands stretching along the western coast of Scotland, numbering about 490, of which, however, only 120 are inhabited. The islands are divided into the Outer Hebrides, among which the most remarkable are St. Kilda, Lewis, Harris, North and South Uist, Benbecula, and Barra; and the Inner Hebrides, the principal of which are Skye, Eigg, Mull, Iona, Staffa, Ulva, Lismore, and Kerrera. Their area is estimated at 3,000 sq. miles. Most of these islands are rocky and unproductive, but their mild and moist climate, due to the presence of the Gulf Stream, produces excellent pastures, and cattle and sheep are reared in great numbers. The construction of good roads and the establishment of several steamship lines in connection with Glasgow have contributed very much to the full development of all the resources of the islands. The large tracts of moorland, which often cover considerable portions of the islands, are let out to sportsmen at high rents, and great numbers of tourists visit the islands every year for the sake of the wild beauty of their natural scenery. The islands are mentioned by Ptolemy and Pliny under the name of *Hebudes*, which by a misprint became *Hebredes*. The Norwegians called them *Sudreyjar*, or Southern islands, which name, Latinized into *Sodorenses*, is still retained in the title of the Bishop of Sodor and Man. In the ninth century these islands were colonized by emigrants from Norway, who largely replaced the original Celtic population, but the Gaelic language even now is in general use. The islands in the following centuries were alternately under Norwegian and Scottish authority, or under "Lords of the Isles," who were often virtually independent, until in 1510 they were finally annexed to the Scotch crown by James V. Pop. about 100,000.

Hebron (Heb. *Cheb'rōn, Chab'rā*): a place in Palestine; about 20 (17½ geographical) miles a little W. of S. from Jerusalem; one of the oldest existing cities in the world (see map of Palestine, ref. 11–D). Its original name (Gen. xiii. 18), displaced for a time by *Kirjath-arba*, city of Arba (Josh. xxi. 11), was restored by Caleb (Josh. xiv. 13–15). The Arabs now call it *El-Khalil*, the friend (i. e. of God, meaning Abraham, whose home it was for many years). It was one of the cities of refuge (Josh. xxi. 11). David reigned there seven and a half years before getting possession of the whole kingdom of Israel (2 Sam. v. 5). The Maccabees recovered it from the Edomites, who had taken it after the Captivity. It was burned by an officer of Vespasian just before the destruction of Jerusalem. It was taken by the Arabs in 637, by the crusaders about 1100; became the seat of a Latin bishopric in 1167; and ever since 1187 has been in the hands of the Mohammedans. It is in a valley, generally supposed to be the "Eshcol" of the Mosaic period, about 3,000 (Conder says 3,040) feet above the level of the sea. This valley is exceedingly fertile, abounding in grapes, olives, figs, pomegranates, and the like. The great mosque of Hebron, on rising ground, is over the cave of Machpelah, in which Abraham, Isaac, and Jacob, with their wives, are buried. The cave itself no one is permitted to enter; and until 1862, when the Prince of Wales was the guest of the Government, no Christian was permitted to enter even the area of the mosque. The population is some 8,000 or 10,000, of whom some 400 or 500 are Jews, and the rest Mohammedans, noted for their bigotry and fanaticism. See Appendix I. to *Sermons in the East*, by Dean Stanley.

Revised by S. M. Jackson.

He'bron: town (founded 1871); capital of Thayer co., Neb. (for location of county, see map of Nebraska, ref. 7–J); on the Little Blue river, and the Burl. and Mo. River and Chi., R. Is. and Pac. Railways; 65 miles S. W. of Lincoln. It is in a fertile and well-watered section, the center of an important agricultural and stock-raising region, and has fine school-buildings, churches, and other public buildings, and three weekly newspapers. Pop. (1880) 466; (1890) 1,502; (1893) estimated, 2,000. Editor of "Journal."

Heb'rus [Lat. = Gr. Ἕβρος, the modern *Maritza*]: the chief river of Thrace, now the Maritza. The river-god Hebrus is found on the coins of Thracian cities. The river rises in the mountains Scomius and Rhodope, and drains nearly all of Roumelia. Small boats ascend as far as Philippopolis, and vessels of 200 tons as far as Adrianople, except in low water, when they stop at Demotica, 25 miles below. The river is 240 miles long, and flows into the Ægean Sea. See Drexler's article in Roscher's *Ausführliches Lexicon* under *Hebros*. J. R. S. Sterrett.

Hecatæ'us (Gr. Ἑκαταῖος): of Miletus; one of the earliest and most important of the chroniclers (*logographi*); the son of Hegesander; lived about B. C. 549 to 479, and wrote in his native Ionic dialect. From the prominent part he took in the affairs of his native city it would seem that he was a man of noble birth and high position. He opposed at the outset the attempt of Aristagoras to arouse the Ionians of Asia to free themselves from the Persian dominion; was instrumental subsequently in procuring more lenient treatment for his countrymen from the Persian satrap; visited many countries, and published the results of his travels in a work entitled Περίοδος γῆς or Περιήγησις, in two books, of which the first was devoted to Europe, the second to Asia and Egypt; wrote also Γενεαλογίαι or Ἱστορίαι, containing the mythological histories of the Greeks, in four books. His geographical work is the more important, as he described what he himself saw. He is one of the authorities of Herodotus, who treats him with a singular mixture of levity and respect. Some fragments remain, and are collected in *Hecatæi Fragmenta*, ed. Klausen (Berlin, 1831); *Fragm. Hist. Græc.* (ed. Müller, vol. i., pp. 1–31; iv., pp. 623–628). See Mure's *Hist. of Greek Lit.* (vol. iv., p. 140). Revised by B. L. Gildersleeve.

Hec'ate [Gr. ἑκάτη, femin. of ἕκατος, clip-form of ἑκατηβόλος, far shooting, epithet of Apollo, brother of Artemis]: a mysterious Greek goddess, who was usually declared to be a daughter of the Titan Perses and Asteria, though her parentage is given in different ways. She was the only one of the Titans who fought with Zeus, and so she escaped the doom of Tartarus. She was a moon-goddess, and was figured with a triform body or with three bodies, corresponding to the new, full, and waning moon. Because of this triform character she was worshiped at the forks of roads (in Lat. under the name of Trivia; in Gr. of Trioditis), and each of her three faces watched over one of the three roads. Those who travel at night have need of the help of the moon-goddess when they come to the forks of roads. She is also the guardian of roads in general and also of doors and gates. In Hesiod she is a most powerful goddess, not only in heaven, but also on earth and in the sea. She confers riches, power, and honor upon men; she gives victory in the athletic games, in battle, in the assembly of the people, and in the law courts. Inasmuch as the moon influences the monthly sickness of women, Hecate presides over childbirth; for a similar reason she is a goddess of marriage. In common with all *light* divinities she was addressed in expiatory sacrifices. Annual mysteries were held in her honor in the early morning of a spring day when the new moon rose. She could cure madness as well as send it, for *lunacy* has always been the moon disease. In later times Hecate is the goddess of hobgoblins; she can send or expel ghosts and all other terrors of the night, and on occasion she herself appears as a most terrifying hobgoblin, accompanied by thunder and howling spook-dogs. In view of this it is easy to see that she should preside over the rites of magic, the magic ring, and exorcism of every kind; she is the very mother of witches like Circe, and the protectress of magicians like Medea. As goddess of the night, she is naturally akin to the gods of the lower world, and she is one of the keepers of the door of Hades and guardian of the hell-hound Cerberus. She is said to appear about sunrise, because the new moon comes, as it were, from the lower world. As goddess of the lower world she can send up the ghosts of the dead, both because she is the patron of magicians and because in ancient times the dead were buried along the sides of roads over which she held sway. Hecate is often confounded with Diana and Persephone, as well as with all the divinities in any way connected with the moon or the lower world.

In the most archaic art she appears with a single body. In her triform character she appears in two ways—either with three bodies, three heads, and six arms, or with one body, three heads, and six arms. The most beautiful representation of Hecate in this second form is that on the Pergamon frieze.

Literature.—First of all, the learned articles by Steuding and Roscher in Roscher's *Ausführliches Lexicon* under *Hekate*; then Preller-Robert, *Griechische Mythologie* (Berlin, 1886), i., pp. 321–327. J. R. S. Sterrett.

Hec'atomb [from Lat. *hecatom'be* = Gr. ἑκατόμβη, hecatomb, liter., a hundred oxen; ἑκατόν, hundred + βοῦς, ox]: strictly, the offering of a hundred bullocks in a sacrifice to the gods; but most commonly the term designates the slaughter of a considerable number of animals of any kind. It was essential that the animals, besides being healthy and perfect specimens of their kind, must never have been subjected to the service of man; for this reason oxen were not offered in sacrifice. Male or female animals were sacrificed to male or female deities respectively, white animals being offered to the gods of heaven and dark ones to those of the lower world and of the sea. Sometimes the whole hecatomb, but more often the thighs, legs, and hides, were burned as a part of the ceremony, the flesh of the beasts being eaten by the worshipers. Revised by J. R. S. Sterrett.

Heck, Barbara: "the foundress of American Methodism"; b. in Ballygarry, County Limerick, Ireland, in a settlement of German emigrants from the Palatinate on the Rhine. These people came early under the influence of Wesley and his Irish itinerants, and formed some of the strongest Methodist societies of the island. In 1760 Philip Embury, Paul Heck, and Barbara his wife, with others of the settlement, sailed for New York. There the little company lapsed from their faith, or at least from their Wesleyan usages; but in 1766 Barbara Heck recalled Embury to his duty as a Methodist local preacher (in which capacity he had labored in Ireland). She gathered a little congregation at his house, and rested not till she saw the famous "Old John Street chapel" completed. Methodism was thus effectively introduced into the U. S. When Wesley's preachers arrived to take charge of the John Street society she removed with her family and that of Embury to Northern New York, where they founded Methodist societies. They finally settled in Upper Canada, and became the founders of their denomination there. Barbara Heck died there at the residence of her son, Samuel Heck, near Augusta, in 1804, aged seventy.

Heckeling: See Flax.

Heck'er, Isaac Thomas: founder of the congregation of Paulists; b. in New York city, Dec. 18, 1819. In 1843 he joined in the Brook Farm experiment, and afterward lived in a socialistic community at Fruitlands, Worcester co., Mass., and also lived with H. D. Thoreau in his hermitage for a while. In 1845 he became a Roman Catholic; in 1847 joined the Redemptorists in Belgium; was ordained a priest in 1849 by Cardinal Wiseman; returned to the U. S. in 1851; was released from the order of Redemptorists at Rome by the pope in 1857, and founded the congregation of St. Paul the Apostle in 1858, which has the peculiarities that "the members take no special vows, and any priest can leave the order when he chooses." In 1865 he established a periodical called *The Catholic World*; in 1869 was Bishop Rosecrans's procurator at the Vatican Council. Author of *Questions of the Soul* (New York, 1855); *Aspirations of Nature* (1857); *Catholicity in the United States* (1879); and *Catholics and Protestants Agreeing on the School Question* (1881), etc. D. in New York, Dec. 22, 1888.

Heck'ewelder, John Gottlieb Ernest: missionary; b. at Bedford, England, Mar. 12, 1743, of Moravian parents, with whom he came in 1754 to America; became in 1762 an Indian missionary, laboring in Ohio, Pennsylvania, and Michigan; became in 1788 missionary agent for the Moravians, serving at times as U. S. peace commissioner with the Indians; residing 1801–1810 at Gnadenhütten, O., and after that at Bethlehem, Pa., where he died Jan. 21, 1823. His chief works are *An Account of the History, etc., of the Indian Nations* (Philadelphia, 1818) and a *Narrative of the Mission of the United Brethren* (1820). Heckewelder's admiration for some traits of the Indian character exposed his books to severe criticism. See the *Life* by Edward Rondthaler (Philadelphia, 1847).

Hec'la, or **Hek'la**: a volcano of Iceland; situated in the southwestern part of the island, 20 miles from the coast. It is conical in shape, 5,110 feet high, covered with snow, and presents a dreary, desolate aspect. Fantastic groups of hills, craters, and lava, leading the eye to distant snow-covered jokuls, the mist rising from a waterfall, lakes encircled by bare, bleak mountains, an awful and profound stillness, and half-darkness produced by the lowering clouds, give to the whole region a character of desolation scarcely to be paralleled. Since 1104 A. D. eighteen eruptions of this volcano are on record. The last and most tremendous eruption was that of 1845–46, lasting seven months, pouring out a stream of lava a mile broad and 50 feet deep, and sending its clouds of dust 400 miles over the ocean, as far as the Orkney islands. The discharge of immense quantities of fine dust is a special feature of eruptions in Iceland, not only from Hecla, but from other parts of the island.

Hectic Fever [*hectic*, readapted from M. Eng. *etik*, from O. Fr. *etique* < Lat. *hecticus* (whence Germ. *hektisch*: Fr. *hectique*) = Gr. ἑκτικός, habitual, hectic, consumptive, deriv. of *ἕκτις, ἕξις, habit, deriv. of ἔχειν, hold, keep on]: a type of fever in which the temperature rises to a febrile point in the evening and sinks almost or quite to the normal in the morning. Patients having hectic fever usually present a bright flush of the cheeks and shiny eyes during the febrile period, and often sweat immoderately. Hectic fever indicates some infectious poison, usually that produced in suppurating areas, as, e. g., abscesses, cavities in the lungs in consumption, and the like. The occurrence of this type of fever is therefore of bad omen after surgical operations or in obscure cases in which a deep-seated trouble of doubtful nature is present.

William Pepper.

Argonauta argo, male, with the *Hectocotylus*-arm attached.

Hec'tocotyle [Gr. ἑκατόν, a hundred + κοτύλη, a small cup]: a name given to that "arm" of various Cephalopods (squid and cuttlefish) which becomes modified for reproductive purposes. At the time of reproduction one of the third pair of arms of the male becomes swollen and much larger than the rest, and this arm is charged with a packet of spermatozoa (spermatophore). During coitus this arm becomes separated from the male and attaches itself by means of its many suckers to the female, which then swims away. The spermatophore then discharges its contents, fertilizing the eggs. Before the return of the reproductive season the male grows a new arm to replace that which was lost. When first seen the hectocotyle was supposed to be a parasitic worm, and many years elapsed before the history was made out. Hectocotylization does not occur in all Cephalopods. Its extreme development is reached in the genera *Parasira* and *Argonauta* (the paper Nautilus). J. S. Kingsley.

Hec'tor (in Gr. Ἕκτωρ): the eldest son of Priam and Hecuba, the royal pair of Troy, the husband of Andromache and father of Astyanax or Scamandrios. For some reasons he may be considered the chief hero of the *Iliad*; he is the bravest, the wisest, and the best of the Trojans; he is an affectionate son and tender husband, whose farewell words to his loving wife will ever be famous. He knows that Troy must fall and that he himself must die; he knows even that his wife must be a slave, and yet at duty's call he boldly faces fate. He distinguishes himself in the defense of the wounded Sarpedon and in his fight with the Telamonian Ajax, after Achilles the best of all the Greeks. He forces the Greeks back to their ships and sets fire to the ships. At the urgent request of Patroclus, Achilles allows him at this juncture to don his arms and go out to oppose the man-slaying Hector. Patroclus is slain by Hector, and his death brings Achilles on the scene once more with his new and divine armor. The sight of Achilles strikes terror to the heart of Hector, who flees three times around the walls of Troy, pursued by Achilles mad for his blood. The sight saddens Zeus; the souls of Hector and Achilles are weighed, the scale of Hector sinks; Apollo abandons him and he is slain by Achilles, who casts the corpse in the dirt before the tomb of Patroclus, to be a prey to dogs and birds. But Aphrodite preserves the body from decay by anointing it with ambrosia. Achilles next drags the dead body behind his chariot three times around the tomb of Patroclus and thereafter three times around the walls of Troy, but during it all Apollo stands over the corpse and protects it from mutilation. The body is finally restored to Priam, at the command of Zeus, for a heavy ransom. Then, after lying in state in the court of the palace of Priam, it is finally burned, and thus ends the *Iliad*. J. R. S. Sterrett.

Hector, Annie (*French*): novelist; b. in Dublin about 1825; has written, under the pseudonym *Mrs. Alexander*, *The Wooing o't* (1873); *Ralph Wilton's Weird* (1875); *Her Dearest Foe* (1876); and many other popular novels.

H. A. B.

Hec'uba (in Gr. Ἑκάβη): daughter of the Phrygian Dymas, wife of Priam, the King of Troy, to whom she bore nineteen of his fifty sons. When pregnant with Paris she dreamed that she carried a torch in her womb, which meant, according to the interpreters, that the child would bring destruction to his family and fatherland. When born, Paris was exposed on Mt. Ida in order to forestall the threatened ill, though as the event proved the exposure was really the first step toward the fulfillment of the prophetic dream, and Paris, by the machinations of the gods, did ultimately become the cause of the destruction of Troy. Priam, foreseeing the fall of Troy, confided his youngest son and much treasure to the keeping of his guest-friend Polymestor, king in Thrace. After the fall of Troy, Hecuba became the slave of Ulysses and followed him to the Thracian Chersonese immediately after the sacrifice of her daughter Polyxena. By chance she found the dead body of Polydorus floating in the sea, into which it had been cast by Polymestor, who murdered Polydorus in order to get possession of the treasure of Priam. Hecuba put out the eyes of Polymestor after having killed his two children. She was then turned into a dog, which sprang into the sea and was drowned. The tomb of the dog marked the spot and served as a beacon for seafarers. J. R. S. Sterrett.

Hedberg, Frans Teodor: dramatist; b. in Stockholm, Sweden, Mar. 2, 1828. After entering upon a commercial career, Hedberg was later apprenticed to a wig-maker; then he tried his luck as an actor. Seeing that his success in that line did not come up to his expectations, he in 1854 left the stage in order to devote himself entirely to dramatic authorship. In 1861 he was appointed reader and teacher of recitation at the Royal theaters in Stockholm; in 1871 also intendant of the Grand theater; in 1881 director of the New theater, Gothenburg; and in 1883 he again took up his

residence in Stockholm, devoting his entire time to literary production. Hedberg is the author both of comedies and of historical plays. Most popular among them is the historical drama *Bröllloppet på Ulfåsa* (The Wedding at Ulfasa, 1865). Among his other plays may be mentioned *Min vän löjtnanten* (My Friend the Lieutenant, 1853); *När man inte har pängar* (When You Have no Money, 1854). Hedberg's first production in the way of historical drama was *Kung Märta* (King M., 1860), which was kindly received by the public; others of same *genre* are *Lejonet vaknar* (The Lion Wakes Up, 1868); *Vasaarfvet* (The Vasa Inheritance, 1868), etc. He has also written the opera texts *Hertig Magnus och sjöjungfrun* (Duke Magnus and the Mermaid, 1867); *Vikingarne* (The Vikings, 1877), etc. Hedberg, who has also adapted foreign plays for the Swedish stage, has generally been one of the most fertile of Swedish dramatic writers. He has, besides, occupied himself with the history of the Swedish stage, in which line he has written *Karaktäristiker och Porträtter af Svenska Skådespelare* (Characters and Portraits of Swedish Actors, 1884) and *Karaktäristiker och Porträtter af Svenska Operasångare* (Characters and Portraits of Swedish Operatic Singers). P. Groth.

Hed'dle, or **Heald**: in weaving cloth, the vertical thread or wire which raises or depresses a certain part of the threads, or every alternate thread, of the warp preparatory to the passage of the shuttle. There is a heddle attached to each warp-thread, and in every loom there are at least two, often several, more sets of heddles, according to the kind of weaving. Many improved styles have been introduced for special kinds of looms.

Hedge [O. Eng. *hecg*: Germ. *hecke*, akin to O. Eng. *haga* > Eng. *haw*]: a fence of growing shrubs set closely together. The setting of hedges is a matter of great importance in regions where timber and stone are scarce or expensive, as in Great Britain and many parts of the U. S. The thorns (*Cratægus*) are extensively employed in England, but in the U. S. they are peculiarly liable to the attacks of borers, and are therefore not much used. Buckthorn, barberry, beech, hornbeam, Japan quince, privet, arborvitæ, holly, honey-locust, the Cherokee rose, and especially the Osage orange or bois d'arc (*Maclura aurantiaca*) are used successfully in the U. S. Much depends upon the proper setting of the hedge-plants, and still more upon subsequent care and proper clipping. The Osage orange is undoubtedly the most satisfactory hedge-plant for the U. S. The Russian mulberry is used for hedges in the prairie States. Small ornamental hedges and borders are usually made of privet or box. Revised by L. H. Bailey.

Hedge, Frederic Henry, D. D.: minister and scholar; b. in Cambridge, Mass., Dec. 12, 1805. At the age of thirteen he went to Germany for study; returned in 1823, and entered Harvard College in the class of 1825; studied theology at the Cambridge Divinity School; was settled over the Unitarian church in West Cambridge 1829; in Bangor, Me., 1835; spent the year 1847–48 in Europe; took charge on his return (1850) of the Westminster church in Providence, R. I.; accepted a call to Brookline, Mass., 1856, and in 1872 took the office of Professor of German at Harvard College, where previously he had lectured on Church History. His greatest work, *Prose-writers of Germany* (1 vol. 8vo, Philadelphia, 1848), is a standard. Other volumes are *Reason in Religion* (Boston, 1865); *The Primeval World of Hebrew Tradition* (1870); *Atheism in Philosophy and other Essays* (1884); *Hours with German Classics* (1886); *Martin Luther and other Essays* (1888); and *Sermons* (posthumous 1891). In 1888 he published a volume of *Metrical Translations and Poems* jointly with Mrs. Annie Lee Wister. From 1857 to 1860 he edited *The Christian Examiner*; he was compiler of a book of hymns with Dr. (afterward Bishop) F. D. Huntington; composed hymns; translated poems from the German; prepared a brief form of liturgy for the Unitarian Church, and was in 1857 president of the Unitarian Association. He was eminent outside of his sect as a preacher and writer, for the vigor of his thought, the dignity of his presence, and the noble purity of his English style. Dr. Hedge was a Christian rationalist, combining intellectual independence with fidelity to ecclesiastical tradition. D. in Cambridge, Mass., Aug. 21, 1890.

Revised by J. W. Chadwick.

Hedgehog: any small insectivorous mammal of the genus *Erinaceus*, a group containing about a score of species; found in Europe, Africa, and the greater part of Asia. Hedgehogs resemble one another very closely in general appearance, having pointed heads and the upper part of the body and head clothed with sharp spines. By means of a complicated system of muscles lying just beneath the skin

The hedgehog.

these little animals can, when attacked, curl into a ball of bristling points. The food of hedgehogs consists principally of insects, but they also eat small reptiles and, to some extent, fruit, eggs, and young birds. The most familiar species, the European hedgehog (*Erinaceus europæus*), is about 9 inches long. The term hedgehog is popularly applied to various spine-clad mammals, and in the U. S. is one of the commonest names for the Canada porcupine (*Erethizon dorsatum*). F. A. Lucas.

Hedge-warbler, called also **Hedge-sparrow**, or **Hedge-accentor**: See Accentor.

Hedjaz, El, el'hej-aaz' [Arab., land of pilgrimage]: a partly sandy, partly stony region of Arabia, extending along the coast of the Red Sea from Yemen to the Syrian desert. As both Mecca and Medina, the two holy cities of the Mohammedans, are situated in this region, it is annually traversed by thousands of pilgrims. It is divided into a lowland (Tehama) and a highland region (Nejd); constitutes with Yemen a vilayet of the Turkish empire. Area about 96,500 sq. miles. Pop. (1885) estimated, 3,500,000.

Hedjirah: See Hejira.

Hed'onism [from Gr. ἡδονή, pleasure]: the doctrine that we perform all acts of will with happiness in view. In ethics the name Hedonists is given to a class of thinkers who hold that all morality can be reduced to the pursuit of happiness, either individual or general. Hedonists are distinguished from Eudæmonists only in that the latter recognize the more refined and ideal forms of happiness in opposition to lower or physical pleasures and pains. The basis of Hedonism as well as of opposed doctrines of the end in view in acts of will is psychological. It is said that happiness is the natural object of pursuit of organized beings; that it is the spontaneous choice of every one; that it is the general index of healthy life and of all the functions both of the body and of the mind, including the will; that it is through gratification that the end and growth of an organism are realized; and that all social theories and institutions are based upon the necessity of securing general happiness.

These arguments are met on psychological grounds by the distinction between subjective and objective ends, between the ethical end and the *summum bonum* or "highest good." The subjective end is that which the individual desires and aims at in his acts of will; the objective teleological end, the highest good, is that which expresses the outcome of the organic or mental processes at the end of their development. Now happiness may be an element in the teleological end—the arguments from biology and philosophy favor it—but still not the subjective moral end of our action. Abundant psychological facts prove this. The mental functions, like the physical functions, give pleasure in the result only as each acts upon its own appropriate object, and it loses both its effectiveness and its hedonic quality as soon as the pleasure which accompanies its exercise is turned into the object. This is peculiarly so of the will. This anti-Hedonistic view seems to get support also from the moral consciousness which sometimes enjoins acts which appear to minister to nobody's happiness. See Moral Philosophy.

References.—For Hedonism, Stephen, *Science of Ethics* (London, 1882); Bain, *Emotions and Will* (3d ed. London and New York, 1888); Alexander, *Moral Order and Progress* (2d ed. London, 1891); Höffding, *Outlines of Psychology* (London and New York, 1891); Sully, *The Human Mind*

(2 vols., London, 1892); Spencer, *Principles of Psychology* (2 vols., London and New York); against Hedonism, Martineau, *Types of Ethical Theory* (2 vols., Oxford and New York, 1886); Sidgwick, *Methods of Ethics* (3d ed. London and New York, 1890); James, *Principles of Psychology* (2 vols., London, 1890–91); Baldwin, *Handbook of Psychology* (2 vols.; 2d ed. New York and London, 1890–91).

J. Mark Baldwin.

Heer, hār, Oswald: Swiss phytopalæontologist; b. at Nieder-Utzwyl, Switzerland, Aug. 31, 1809; educated at the University of Halle; entered the ministry in 1831; privat docent in Botany in the University of Zurich (1834–52); afterward Professor of Botany in the university. Among his numerous publications are *Flora Tertiaria Helvetiæ* (1855–59); *Tertiary Climates in their Relation to Vegetation* (1860); *Flora Fossilis Helvetiæ* (1877); *Flora Fossilis Arctica* (1865–83). D. in Lausanne, Sept. 27, 1883.

Charles E. Bessey.

Heeren, hā'ren, Arnold Hermann Ludwig: historian and philologist; b. in Arbergen, near Bremen, Oct. 25, 1760; became Professor of History at Göttingen. Chiefly noted as the author of still valuable works entitled *Ideen über die Politik, den Verkehr und den Handel der vornehmsten Völker der alten Welt* (vol. x.–xv. of his collected historical writings), and *Handbuch der Geschichte der Staaten des Alterthums* (5th ed., 1828). His dissertations on the sources of Trogus Pompeius (Justinus), Plutarch's *Lives*, Strabo, and Ptolemæus are now superseded. He died at Göttingen, Mar. 6, 1842. Alfred Gudeman.

Hefele, hā'fe-le, Karl Joseph, von, D. D.: Roman Catholic Bishop of Rottenburg, Würtemberg; b. at Unterkochen, Mar. 15, 1809; studied at Tübingen; was privat docent in 1836; professor extraordinary 1837, and in 1840 Ordinary Professor of Church History, Archæology, and Patrology in the Roman Catholic faculty of Tübingen. In 1869 he was made bishop. His edition of the *Apostolic Fathers* (1839); *Review of Wessenberg's Church Councils* (1841); *History of the Christian Councils* (1855–74, 7 vols.; 2d ed. 1873–90); *Pope Honorius*, *Cardinal Ximenes* (1851; trans. into English by Dalton, 1860); *Contributions to Church History*, etc., gave him wide fame as a profound scholar. He was a member of the Vatican Council, and voted with the minority against papal infallibility, but afterward submitted. D. in Rottenburg, June 5, 1893. Revised by J. J. Keane.

Hegel, hā'gel, Georg Wilhelm Friedrich: philosopher; b. at Stuttgart, Aug. 27, 1770. He was descended from an old Suabian family which had migrated into Würtemberg from Carinthia shortly after the Lutheran Reformation, in order to secure religious freedom. His father was an officer under the ducal government. He entered the University of Tübingen in 1788 as a student of theology. He received the degree of master of philosophy in 1790, and on the occasion wrote a dissertation, *De limite officiorum humanorum sepositi animorum immortalitate*, evincing the fact that he had begun to ponder the question of the Kantian dualism. He had made some acquaintance with the Wolffian philosophy as early as his fifteenth year. In 1790 Schelling, then in his sixteenth year, entered the university, and his precocious intellect seems to have awakened in Hegel a new activity. Hegel had read Rousseau at an early age, and was influenced by him quite strongly, as, indeed, were Kant and most other German thinkers. The philosophy of Kant and his successors may be regarded as a speculative reaction against the tendencies that led to the French Revolution. Goethe's *Faust* portrays the same reaction in literature. In 1790 Young Germany looked for the social regeneration of Europe. "Liberty, equality, and fraternity" were the magic words of the time. Hegel took part in a political club formed for the dissemination of French ideas. In 1793 he left the university, and became a private tutor in a family in Berne. He passed this epoch of his life in a quiet and studious manner, gradually departing from the ideas he had received at Tübingen, and beginning seriously to grapple with the problem of human responsibility, and to feel distinctly the want of a fundamental principle that should subordinate both the theoretical and practical phases of life. He wrote a life of Christ; studied Kant more thoroughly; was charmed by the theories of Benjamin Constant; finally bent all his strength upon the mastery of Fichte's *Science of Knowledge*, which just then appeared. His correspondence with Schelling assisted him in gaining an insight into the subtle psychological analysis of Fichte. Schelling had been aroused by the *Science of Knowledge*, and he stormed, Titan-like, the subjective limits which Fichte in the spirit of Kant placed to the validity of his theoretical principles. The universal and necessary truths which, according to the critical system, demonstrated the subjectivity of all our knowledge, seemed to Schelling to establish its objectivity; for they are not universal and necessary unless they are the necessary conditions of the existence of objects in time and space. With this view he attempted to construe the world of nature *a priori* by means of transcendental ideas. Self-consciousness revealed the hidden laws and principles implicit in the ordinary knowing, and these laws and principles, drawn out of the unconscious activity of the mind, were identified with the moving forces of nature, and thus came to be attributed to an impersonal Reason, a Soul of the World. Schelling departed further and further in this direction during his first career, and developed a system in strong contrast to that of Fichte, which laid all stress on the conscious Ego and the free moral will. There was no necessary incongruity in the two systems, except what arose from one-sidedness, due to the intense emphasis given to the opposite poles of this philosophy; Fichte emphasizing the self-conscious Ego and the moral will, and subordinating all else as merely phenomenal and scarcely worthy of human investigation; while Schelling turned to nature and history as the unconscious realizations of spirit in time and space, and hence worthy of all study, as though charged with the fullness of divine incarnation. Fichte slighted time and space, and hence everything real and conventional—institutions, beliefs, systems; the world, in short. He was ascetic, subordinated the world to the soul, somewhat as did George Herbert or Thomas à Kempis. Schelling looked upon the world as the revelation of the Absolute, and held it sacred, while subjectivity became less and less important in his eyes, and as a consequence morality and practical aims and endeavors lost their interest for him.

Through the assistance of his friend Hölderlin, Hegel obtained a situation in 1797 as tutor in Frankfort, the birthplace of Goethe. His interest in philosophical studies increased. He studied Plato and Sextus Empiricus, and began to seize the objective dialectic into which he could translate the psychological process of Fichte. In 1799 his father died, leaving him some property, and in 1801 he removed to Jena, the center of literary activity at that time. Fichte had recently gone to Berlin, having been dismissed from Jena on account of complications arising from the charge of atheism made against him. Schelling was there as professor extraordinarius. Hegel lectured on logic and metaphysics, the philosophy of nature, and the philosophy of spirit. In 1805 he lectured on the history of philosophy, pure mathematics and natural rights; in 1806, on the unity of philosophical systems and the phenomenology of spirit. Up to this time he had been a follower of Schelling, with whom he had edited *The Critical Journal of Philosophy* four years before. His own system begins to reveal its outlines at this period: I. Logic or science of pure thought or Reason—universal ideas applying to nature and mind alike; II. Philosophy of nature, treating of the realization of Reason in time and space; III. Philosophy of man as finite spirit; rising through Religion to the Absolute or Pure Reason again, and thus completing the circle of philosophy. During this period his style evinced improvement, and his use of illustrations from Greek mythology gave to his abstractions a popular hold. He studied Goethe's philosophy of colors, and followed out the experiments indicated; reviewed Homer, and began to see the outlines of the process which includes the evolution of the world and as Providence guides human history. Schelling had removed to Würzburg in 1803. Hegel had for four years been clearing up in his mind the relation of his own results to the presuppositions of Schelling. The relation of Fichte, as subjective idealist, to Schelling, as objective idealist, he had already defined in *The Critical Journal of Philosophy*. He now was ready to define his own relation toward Schelling. In the *Phenomenology of Spirit*, published in 1807—a work which he called his "voyage of discovery"—he undertakes to trace the history of consciousness in its growth from the first stages of culture up to the theoretical and practical conviction which underlies modern civilization. In the preface to this work he attacks the "immediate intuition" of Schelling, and shows that thought or knowledge without mediation is entirely empty. He employs in this "voyage of discovery" a dialectic method as strict as that of Fichte, but used objectively—as the necessity of the object under consideration, rather than as a mere subjective necessity

of thought. Consciousness in the stage of simple sensuous knowing is proved to know nothing immediately. Its first perception is shown to be a meditated one, depending upon inference, which is made implicitly or unawares. Further analysis reveals the presupposition upon which the inference involved in perception is based; this inference is found to be not subjective alone, but to correspond to an objective activity of mediation, which is seen to be the necessity of the objective world, and is named *Force* by the consciousness. Herewith the reflective stage of consciousness begins, or the realm of understanding. The presupposition underlying Force is investigated; it is a unity in multiplicity, self-united in its utterance; force in expending itself manifests its unity in all its effects. This dualism (force and manifestation) involves further the dualism of each of its sides, and thus we have the internal duality as Law on the one hand, and the external duality as Phenomena on the other hand, containing force and manifestation. In natural law consciousness perceives an ideal type or form, which as internal and ideal measures and shapes the phenomenal world. Law is not abstract unity, but it includes in itself difference, multiplicity. The difference in the law is ideal and posited through the unity, which, again, is unity only as revealing itself in self-opposition—in other words, the ultimate presupposition of law is self-determination. Beyond self-determination analysis does not proceed, for no higher principle is presupposed; all its determinations (characteristics, properties, and attributes) are products of its own activity. Herein consciousness recognizes the image of itself; it has traced up the external world to its internal truth, self-determination (or "subject-objectivity," as Fichte named the Ego), an internal, essentially active, and self-opposed being; the Ego is such an activity as exists in self-opposition or as subject and object at the same time. Thus the objective has been traced back to an Ego, or spiritual personality (God) as its necessary essence, and in the contemplation of this essence of the world consciousness finds itself contemplating its own prototype, and becomes self-consciousness. It must be understood that the mind makes all this experience in its prehistoric stages of culture, contemporaneous with its formation of language, but in a naïve, unconscious manner, having no philosophic knowledge of its method. It comes to a scientific knowledge of the course it has trodden only after thousands of years. The result of human experience, wherein it arrives at self-consciousness, is only a conviction, not a scientific idea. Hegel proceeds in the remaining part of the *Phenomenology* to trace out the necessary stadia of history by which man realizes this conviction in institutions, beginning with the patriarchal one of slavery. In the subtlest manner he shows how the mind reflects upon an institution as soon as realized, and elevates itself to a new realization, making at each step its unconscious conviction more and more a conventional, universally recognized conscious principle, enunciated in its revealed religion, portrayed in its art and poetry, organized in its state, civil society, and family, and finally generalized in its science. Hegel's philosophy is all contained *in nuce* in the *Phenomenology*, and in some respects this work is the best example of his method of dialectical procedure. His entire system may be regarded as the philosophy of civilization, or as the demonstration of the personality of the Absolute and an exhibition of His revelation in the world of time and space.

The *Philosophy of Nature* attempts to exhibit the return from pure empty externality—time and space, or the pure form of God's Not-me—through the mechanical and dynamical phases of matter, up to organized life as a phenomenal appearance of self-determined being. The *Philosophy of Spirit* attempts to show the development from mere consciousness (which is *real* self-determining being, instead of the phenomenal appearance of it in the animal, which is nature's highest being) up to the realization of this subjective consciousness (which exists in the savage only as a mere possibility) in objective institutions, family, society, state, and church, with codes of laws and morals, ceremonials, and conventionalities, as well as in theoretical presentations in art, literature, and science.

To this vast undertaking he devoted the rest of his life. Closing his lectures at Jena, Sept. 18, 1806, on the occasion of the approach of the French, he repaired early in 1807 to Bamberg, where he edited a political newspaper until the autumn of 1808, when he took charge of a gymnasium at Nuremberg. Here he remained eight years; he was married Sept. 16, 1811, to Marie von Tucher. He elaborated and expounded his *Science of Logic* (1812–16) in three volumes, presenting in it the science of pure thought or the fundamental basis of his entire system. Its divisions are three: I. Being, or Immediateness; II. Essence, or Mediation; III. Idea, or Notion (*Begriff* and *Idee*), or Absolute Mediation. It may be called a search for the true first principle by an examination of the content of abstract ideas, commencing with the simplest and most empty—to wit, pure being, which is so abstract and inadequate as to be the same as nothing—and proceeding by the method of discovering presuppositions up to the highest idea, which he names *The Idea, par excellence*, as it is the thought of a self-subsistent personality, a self-object, a Creator who creates nature or the world as his Image. The outline of the philosophy of nature he presented in the *Encyclopædia of Philosophical Sciences* in 1817, at Heidelberg, whither he had gone in Oct., 1816, to assume a professorship in the university. The principle of evolution in nature is the inadequateness of externality to manifest personality. Each lower phase of nature presents us the phenomena of a struggle to reach the realization of the three constituent phases involved in personality. Each higher phase achieves what the next lower one was most deficient in. The vertebrate animal is the summit of nature. The generic appears in him *ideally* as instinct (but not as Ego), and *really* as the process of reproduction. But no individual animal, as such, is more than half a personality, so to speak, being either male or female, and becoming whole only in the generic act. With consciousness appears personality, as incarnated in the world, and a new world, that of spirit, begins. In the world of spirit each individual soul is a monad—the generic entering it as Ego, and thereby constituting an immortal individual. Where the generic is only instinct, as in the animal, there is born as yet no *self*. The species lives, but the individual dies. Human beings are, as animals, sexual and only half-persons, hence mortal. But as conscious Egos each is a totality and the possibility of the entire race. Hence the human being proceeds to realize this possibility through the creation of symbols and language, science and institutions—family, society, state, and church—in each of which he portrays for himself his generic nature, some phase or phases of the Absolute, so as to make it possible for the mere individual to participate in the life of the race, of the generic, of the Absolute. Culture or education is the name of the process of initiation of the individual into this heritage. The whole race is thus made to live vicariously for each man, and by theoretical participation each one avails himself of the life of the whole, without being obliged actually to suffer the penalties of living experience. This point is of the greatest importance as the transition from nature to spirit, and has been overlooked by countless students of Hegel, who have for this reason interpreted his doctrines pantheistically as a genial naturalism.

The *Philosophy of Spirit*, which is the third part of Hegel's system, attempts to trace out in its details this self-emancipation from nature and history, and is the labor of his Berlin period, which began Oct. 22, 1818. He was called to the chair of Fichte by the minister von Altenstein. In 1821 he published his *Philosophy of Rights*, containing the science of jurisprudence, morals, and politics. The constitutional monarchy is held by him to be the highest form of government. In the following years he wrote his *Æsthetics*, published after his death, in three volumes, treating of the three epochs of art—symbolic (Oriental), classic (Greek and Roman), and romantic (Christian)—as well as of the special arts, architecture, sculpture, painting, music, and poetry. The lectures on the philosophy of history were written in 1822–23, and delivered with modifications five times. According to Hegel, the history of the world narrates the progress of humanity into a consciousness of freedom. A series of lectures on the proof of the being of God were delivered by him in 1830. While engaged on a new edition of his complete *Logic*, having finished the revision of the first volume, he died of cholera, Nov. 14, 1831.

His complete works were edited, and in some cases compiled, from notes taken at his lectures, by his disciples Marheineke, Schulze, Gans, von Henning, Hotho, Michelet, Förster, and Boumann. They included the writings of the Schelling period (1 vol.), the *Phenomenology of Spirit* (1 vol.), *Science of Logic* (3 vols.), *Outlines of the Philosophy of Rights* (1 vol.), *Philosophy of History* (1 vol.), *Æsthetics* (3 vols.), *Philosophy of Religion* (2 vols.), *History of Philosophy* (3 vols.), miscellaneous writings (2 vols.). To these should be added the *Life* of Hegel by Rosenkranz. Access to Hegel's system through English translations and original

expositions is quite ample. A partial analysis and paraphrase of the first chapters of the third volume of the *Science of Logic* was published in London (1855), under the title of *The Subjective Logic of Hegel*, translated by H. Sloman, Dr., and J. Wallon; *Lectures on the Philosophy of History*, translated from the third Germ. ed. by J. Sibree (Bohn's Library, London, 1857); *The Logic of Hegel*, with prolegomena, by William Wallace (Oxford, 1874; containing vol. i. of the *Encyc. Phil. Sci.*); *The Secret of Hegel, being the Hegelian System in Origin, Principle, Form, and Matter*, by James Hutchison Stirling (2 vols., London, 1865; contains a translation of a portion of the first volume of the *Logic*, with full commentary); *General Principles of the Philosophy of Nature, with an Outline of some of its Recent Developments among the Germans, embracing the Philosophical Systems of Schelling and Hegel, and Oken's System of Nature*, by J. B. Stallo (Boston, 1848; contains a concise but genial exposition of Hegel's entire system); *The Science of Thought, a System of Logic*, by Charles Carroll Everett (Boston, 1869; contains an original exposition and justification of a system substantially identical with Hegel's *Logic*); *The Nation: the Foundations of Civil Order and Political Life in the United States*, by E. Mulford (New York, 1870; contains an original exposition and discussion of positions substantially agreeing with Hegel's *Philosophy of Rights*); *The Logic of Hegel, a Critical Exposition*, by W. T. Harris (Chicago, 1890), attempts to show the genesis of the categories of the mind according to Hegel; *The Philosophy of Religion*, by John Caird, is a valuable introduction to his thought; *Hegel*, by Edward Caird, expounds his doctrines and gives a sketch of his life. *The Ethics of Hegel*, by J. Macbride Sterrett, contains the *Philosophy of Rights*, partly translated, partly in analysis. In *The Journal of Speculative Philosophy* (St. Louis and New York, 1867–94) have appeared translations of Bénard's *Analysis of Hegel's Æsthetics*; of chapters from the *Phenomenology of Spirit*, with analysis and commentary; of the *Philosophical Propædeutic* (written at Nuremberg) *on Rights, Morals, and Religion*, the outlines of *Logic* and the *Phenomenology*; of the chapters in the *History of Philosophy* on Plato and Aristotle; of the chapter on *Chivalry* from the *Æsthetics*; of the greater part of Rosenkranz's *Hegel as the National Philosopher of Germany* (written in 1869 for the centennial anniversary of Hegel's birthday); of Trendelenburg *On the Logical Question in Hegel's System*; of Michelet and von Hartmann on *Hegel's Dialectic*; besides original articles on different phases of Hegel's system, and in particular an extended *Introduction to the Speculative Philosophy and Logic*, by A. Vera (an attempt at popular presentation of Hegel's point of view, of Hegel's *Philosophy of Religion*). The best history of the Hegelian school is to be found in Erdmann's *Grundriss der Geschichte der Philosophie*. See articles on PHILOSOPHY, FICHTE, SCHELLING, and KANT.

WM. T. HARRIS.

Hegelund, hā'ge-loond, PEDER JENSEN: dramatist; b. in Ribe, Jutland, Denmark, June 9, 1542. After studying at the University of Copenhagen, he spent several years in Germany, taking the master's degree at Wittenberg. In 1569 he became rector of the school at Ribe; 1580, lector in theology; 1588, dean of the cathedral; and 1595, bishop. While rector he undertook the translation of Latin dramas, to be performed by his scholars. In 1576 his translation of Xystus Betulejus's *Susanna* was acted in Ribe, and published the following year, together with an original poem entitled *Calumnia seu Diabola personata*, one of the earliest allegorical works in Danish literature. The translation contains a number of additions, mostly humorous, by Hegelund. His other dramas are lost. D. Feb. 18, 1614.

D. K. DODGE.

Hege'sias (Gr. Ἡγησίας): Greek orator; b. at Magnesia, Mt. Sipylus; flourished about 280 B.C. Hegesias was the founder of the Asiatic school of oratory, characterized by short sentences without periodic structure, by unnatural position of words, and by far-fetched and high-flown phraseology. Boeckh thinks that PAUSANIAS THE PERIEGETE (*q. v.*) represents this school. B. L. GILDERSLEEVE.

Hegesip'pus: a name sometimes given as that of the author of a Latin revision of Josephus's *History of the Jews*, but it is probably only a manuscript corruption of the name Josephus itself ("Ex-Josippo" misread Egesippus), and the version is probably the work of Ambrose, Bishop of Milan, in the latter half of the fourth century. See Weber and Cæsar, *Hegesippus qui dicitur de bello Judaico* (Marburg, 1864), and Rönsch, *Die lexicalischen Eigenthümlichkeiten der Latinität des sogen. Hegesippus* (1882). M. WARREN.

Hegesippus: the "father of Church history"; an ecclesiastical writer of the second century. Only fragments of his works have been preserved (trans. in vol. viii. of the *Ante-Nicene Fathers*, New York). Probably he was a Palestinian Jewish convert.

Hegira: See HEJIRA.

Heiberg, hī'bārch, JOHAN LUDVIG: writer; son of Peter Andreas Heiberg; b. at Copenhagen, Dec. 14, 1791. After his mother's second marriage he lived with her till her death. On graduating he studied medicine for two years, but abandoned it for *belles-lettres*, and in 1817 took the degree of doctor of philosophy; was uncertain what profession to follow until in 1819 he received a traveling stipend, and spent over two years in Paris with his father, studying literature, especially the French drama, and music. In 1822 was appointed Professor of the Danish Language and Literature at the University of Kiel, where, in spite of his dislike of the place, he remained till 1825, when he settled in Copenhagen. During this period he became acquainted with Hegel's philosophy, which he vainly attempted to popularize in Denmark. He was the author of the first work on the subject published in Danish, *Om den menneskelige Frihed* (Concerning Human Freedom, 1824). His greatest service to Danish literature, however, was the introduction of the French vaudeville. His first attempt, *Kong Salomon og Jörgen Hattemager* (King Solomon and Jörgen the Hatter, 1825), was enormously successful, and this was followed by a number of others, of which *Aprilsnarrene* (April Fools, 1826) is still one of the most popular plays in Denmark. In 1828 Heiberg wrote *Elverhöi* (The Elves' Hill), the music by Kuhlau, a national romantic drama. The following year he was appointed poet and translator at the Royal theater, and in 1849 sole director. In 1831 he married the actress Johanne Louise Pætges, whose memoirs, published in 1892, shortly after her death, give much valuable information about Heiberg's private life. In addition to his plays and poems, Heiberg wrote many critical essays, of which the most important is *Om Vaudevillen som dramatisk Digtart* (Concerning the Vaudeville as a Branch of Dramatic Art, 1827). He also engaged in the Oehlenschläger-Baggesen discussion. (See OEHLENSCHLÄGER.) From 1827, when he established *Köbenhavns flyvende Post* (Copenhagen's Flying Post), he exercised a great influence on Danish literary taste. As a critic his judgment is keen, his style finished, his wit refined and piercing. As a poet he is as original and national, though not as rugged, as Holbay himself. D. near Ringsted, Seeland, Aug. 25, 1860.

BIBLIOGRAPHY.—*Poetiske Skrifter* (Poetical Works, 11 vols., Copenhagen, 1862); *Prosaiske Skrifter* (Prose Works, 11 vols., Copenhagen, 1861–62). D. K. DODGE.

Heiberg, PETER ANDREAS: political writer and dramatist; b. at Vordingborg, island of Seeland, Denmark, Nov. 16, 1758; studied at the University of Copenhagen, in which city he afterward lived as a translator. He played a very conspicuous part in literary, social, and political life, but his liberal ideas were blended with a kind of revolutionary passion, and the scourging satire with which he attacked any kind of abuse was often mixed with scandal. In 1799 he was exiled, and went to Paris; received a position in the ministry of foreign affairs, and frequently was employed by Talleyrand in diplomatic negotiations. In 1817 he was pensioned, and spent the last years of his life in retirement; he was blind, and his beautiful and accomplished wife (afterward the Baroness Gyllembourg-Ehrensvärd) had not followed him in his banishment. His comedies, of which one, *Heckingborn*, has been translated into English, were much admired. Some of his songs and prose-writings, as, for instance, *The Life of a Dollar-bill*, are still interesting. D. in Paris, Apr. 30, 1841.

Heidelberg, hī'del-bārch: town; in the grand duchy of Baden, on the Neckar; 54 miles S. of Frankfort-on-the-Main (see map of German Empire, ref. 6–D); has one of the oldest and most celebrated universities of Germany (founded 1356; 1893, 1,282 students; library, 500,000 volumes; zoölogical museum, botanical garden, observatory). The old castle, built in the twelfth century, enlarged in the fourteenth and fifteenth, much injured by the French in 1688, and nearly destroyed by fire in 1764, forms a very interesting and picturesque ruin. In the cellar is the famous "Heidelberg cask," which holds 236,000 bottles. The manufactures of Heidel-

berg are very varied, comprising tobacco, madder, ultramarine, and other dyestuffs, optical, surgical, and musical instruments, paper, Portland cement, and leather; and its trade, especially in wine, is extensive. At an early period the city was a fief of the Bishop of Worms, till Count Otho of Wittelsbach (1228–53) made it the capital of the Palatinate, which it continued to be for nearly five centuries. It was in 1720 that Charles Philip removed his court to Mannheim. Pop. (1890) 31,739. The location of the city is most beautiful. Revised by C. H. Therber.

Heidenhain, hī'den-hīn, Rudolf Peter Heinrich, M. D.: physiologist; b. in Marienwerder, Prussia, Jan. 29, 1834; educated at Universities of Königsberg, Halle, and Berlin; professor in Breslau since 1859. He has published *Physiologie der Absonderungsvorgänge* (1880); *Der sogen. tierische Magnetismus* (1880); *Vivisection* (2d ed. 1884); *Histologie und Physiologie der Dünndarmschleimhaut* (1888); and other works. C. H. T.

Heights, Measurement of: See Hypsometry.

Heilbronn, hīl-brōn': town of Würtemberg, Germany; on the Neckar; 33 miles by rail N. of Stuttgart (see map of German Empire, ref. 7–D). It is a curious old place, with narrow and crooked streets, and high, quaintly ornamented houses. Among its public buildings the Church of St. Kilian (built 1013–1529), the city-hall, and the tower in which Götz von Berlichingen was imprisoned in 1529, are the most remarkable. Its trade is brisk, and it has manufactures of chemicals, woolen cloth, gold and silver ware, cutlery, and musical and scientific instruments. Pop. (1890) 29,941.

Heilbuth, hīl'boot, Ferdinand: genre-painter; b. in Hamburg, Germany; naturalized in France; awarded second-class medals, Salons of 1857, 1859, and 1861; became officer Legion of Honor 1881. His pictures, both in oil and water color, are delightful in color, and those of his later years depict generally scenes in modern society in France, the background for the personages being usually landscape motives. One of his earlier pictures, *Mont-de-Piété* (1861), is in the Luxembourg Gallery, Paris; *On Monte Pincio* is in the Corcoran Gallery, Washington. D. in Paris in 1889. W. A. C.

Heim, *hăn*, François Joseph: historical painter; b. at Belfort, France, Jan. 15, 1787; pupil of Vincent; awarded Grand Prix de Rome 1807; first-class medal, Salon, 1812; became member of the Institute 1829; officer Legion of Honor 1855; awarded medal of honor, Paris Exposition, 1855. He was prominent among the Classicists in their struggle with the Romantic school of 1830. Examples of his works are ceilings in the Louvre; *Charles X. Distributing Recompenses at the Salon of 1824*, in the Louvre; and several important paintings in the Versailles Museum. D. in Paris, Oct. 20, 1865. W. A. C.

Heim'dall, or **Heimdallr**: the watchman of the Asas, or Scandinavian gods; son of Odin by a mother of the Jotun race. He has golden teeth, rides a horse with a golden mane, can see by night as well as by day, and beholds everything within a hundred leagues. He can hear the growing of the grass, and even that of the wool on sheep. He dwells in the bright Himinbjorg, at the place where the rainbow-bridge enters heaven. When danger approaches he blows the great trumpet Gjallar-horn so loudly that the whole universe can hear. See Scandinavian Mythology.
Revised by Rasmus B. Anderson.

Hei'ne, Heinrich: poet and wit; b. at Düsseldorf, of Jewish parentage, Dec. 12, 1799; was early sent to Hamburg to his uncle, the banker, Salomon Heine, to prepare himself for commercial pursuits; but as he utterly disliked business, he went in 1819, with his uncle's consent and support, to Bonn to study law. After a short stay in that city, during which he became quite intimately acquainted with A. W. Schlegel, he proceeded to Berlin, where Schlegel's letters introduced him to the celebrated literary circle which gathered around Rahel Levin, and which was frequented by Hegel, Chamisso, Grabbe, and others. Here he studied literature and philosophy, and published his first book, a volume of poems, in 1822. The poems were hardly noticed, however, and the young poet, disappointed and disgusted, left Berlin for Göttingen, where, after two years' unwearied study, he took his degree in law in 1825. Once more he returned to Berlin, and published his two tragedies, *Almanzor* and *Radcliff*, but this second attempt was still more unsuccessful than the first had been, though his peculiar talent can already be detected in these early attempts. It was his *Reisebilder*, published in Hamburg in four volumes, from 1826 to 1831, which first attracted public attention. They made quite a sensation at their first appearance. The audacity with which the author ridiculed the weaknesses of the social, political, and literary life of his time, the malice, wickedness, and deviltry of the book, amazed people, at the same time that they were charmed by its vivacity, sprightliness, elegance, and brilliant wit. But while the contents of the book were rather sensational at the time, its literary form was only a continuation of the type of Sterne's *Sentimental Journey*, and it certainly can not be classed among the works of art. As a clever bit of journalism it has, however, not failed to exert a great influence upon journalistic literature in Germany. Next year he published *Das Buch der Lieder*, in which he inserted the greatest part of his earlier poems from 1822; and this book made him at once the most widely read author in Germany. There was a new sense of beauty in these poems, and in consequence people became almost intoxicated, and seemed to forget how much of his success Heine owed to a studied and most clever imitation of popular songs, such as he found in *Des Knaben Wunderhorn*. From 1827 to 1831 Heine resided partly in Munich, where he edited *Politische Annalen* with Lindner; partly in Berlin, where he fell out with Platen and enriched the German literature with a piece of polemics to which no other literature has an equal, either in scandal or in wit; and partly in Hamburg. The revolution of July put him in a sort of democratic frenzy; and as it perhaps was not very safe for him to live in Germany after the publication of *Kahldorf über den Adel, in Briefen an den Grafen M. von Moltke* (Hamburg, 1831), he removed in that year to Paris, where he resided with some short interruptions for the rest of his life; he died there Feb. 17, 1856. From 1836 to the fall of the cabinet of Guizot in 1848 he received an annual pension from the French Government of 4,000 francs. In Paris he also married or rather bought his "common-law" wife, Mathilde, for 3,000 francs. From 1847 he was for the most time bedridden, suffering from a disease of the spine, which also affected his eyes. During the first part of his residence in Paris he developed a great literary activity. But all that he wrote was only a repetition of the two original types with which he began—*Buch der Lieder* and *Reisebilder*—and he who knows those two books knows Heine. The principal books written in Paris were *Neue Gedichte* (1844); *Atta Troll* (1847); *Romanzero* (1854); *Beiträge zur Geschichte der neuern schönen Litteratur in Deutschland* (1833); *Französische Zustände* (1833); *Der Salon* (1834–40); *Die Romantische Schule* (1835); *Ueber Börne* (1840); *Vermischte Schriften* (1854). While Heine was certainly a writer of remarkable talent, his poetical genius has frequently been overestimated. As a satirist without an equal in German literature, the German nation doubtless owes him very much as a fearless and merciless fighter for freedom in a mentally narrow and politically oppressed time. His influence on German poetry, however, must be considered anything but wholesome. Though he is able to express the most tender feelings of the human heart, he more frequently mocks in a frivolous manner at the most sacred of our emotions, and displays a want of and disregard for moral and artistic convictions.

See Strodtmann, *H. Heines Leben und Werke* (1884); Proelss, *H. Heine* (1886); Brandes, *H. Heine in Litteratur des 19. Jahrh.* (Band vi.); Matthew Arnold, *Essays in Criticism.* Revised by Julius Goebel.

Hein'sius, Antonius: grand pensionary of the Netherlands; member of an old family of Leyden, Holland; b. in that city Dec. 22, 1641. When William of Orange ascended the English throne, Heinsius became the real governor of Holland, and he acted in this position with great success and in perfect harmony with his royal master. He was, if not the creator, a most energetic promoter, of the grand alliance between Great Britain, Holland, Hanover, Denmark, Prussia, Austria, and Savoy against Louis XIV., and it was to him, as the real soul of the alliance, that Louis XIV. made overtures of peace in 1708, 1709, and 1710. But the negotiations were every time broken off on account of the enormous and humiliating sacrifices which Heinsius demanded of France, and to which he clung most doggedly. A caprice of Queen Anne, however, changed the whole situation, and as at the same time the French became successful once more in the field, the Peace of Utrecht was concluded Apr. 11, 1713. Heinsius signed it, but he was the last to do it. D. at The Hague, Aug. 3, 1720. See *Het Archief van den raad-pensionaris Antonius Heinsius* (Haag, 1867).

Heinsius, Daniel: classical scholar; the favorite disciple of Joseph Scaliger; b. at Ghent, June 9, 1580; became professor at Leyden 1605. Himself a Latin poet of distinction, he edited a great number of the classic poets, e. g. Hesiod, Theocritos, Horace, Vergil, Terence, and Ovid, which are distinguished by a profound knowledge of poetic diction and the critical acumen therein displayed. D. Feb. 25, 1655.—His son, Niklaas (b. July 20, 1620; d. Oct. 7, 1681), inherited his father's critical talent, and edited Ovid (his best work), Claudianus, Silius Italicus, Valerius Flaccus, Prudentius, Petronius, Velleius, Curtius, and Tacitus. He never occupied any academic chair, but spent most of his life as a diplomat, being for many years in the service of Christine of Sweden. See L. Müller, *Geschichte der class. Philologie in den Niederlanden*, p. 38 f., 51–54.

Alfred Gudeman.

Heint'zelman, Samuel Peter: soldier; b. in Manheim, Lancaster co., Pa., Sept. 30, 1805; graduated at West Point, and became second lieutenant of infantry July, 1826. For twenty years he served principally on the northern frontier and in the Florida war. In 1847–48, a captain, he served in the Mexican war, and was breveted a major Oct. 9, 1847, for gallantry at Huamantla. He attained a majority in 1855, and as brigadier-general of volunteers commanded the forces which captured Alexandria, Va., May 24, and took part in the first battle of Bull Run, July 21, 1861, where he was wounded. In the Virginia Peninsular campaign of 1862 he commanded the Third Army-corps before Yorktown, April–May, and at the battle of Williamsburg May 5. Promoted to be major-general of volunteers from the date of the latter battle, he commanded the Third Corps at Fair Oaks May 31, June 1, and in the "Seven Days'" fight. At the second battle of Bull Run (Aug., 1862) he was engaged; also present at Chantilly Sept. 1. From Sept. 9, 1862, to Feb. 2, 1863, he was in command of the defenses of Washington, and the Twenty-second Army-corps Feb. 2 to Oct. 13, 1863; and from Jan. to Oct., 1864, commanded the northern department, embracing the States of Ohio, Michigan, Indiana, and Illinois; subsequently on court-martial duty till Aug., 1865, when he was mustered out. Brevet brigadier-general and major-general U. S. army for gallant conduct in battle. In Feb., 1869, he was retired from active service with the full rank of major-general. D. in Washington, D. C., May 1, 1880.

Revised by James Mercur.

Heir [M. Eng. *heire*, from O. Fr. *heir*, *hoir* > Fr. *hoir*: Ital. *erede* < Lat. *hēres*, heir]: at the common law, one who is entitled by law to succeed to the real estate of a deceased person who dies without a will, or who leaves property undisposed of by his will. The name is only strictly applicable after the ancestor's death; still, it is sometimes used in a secondary sense, to designate specified persons, during the ancestor's life. Personal estate does not pass primarily to an heir, but is received by the administrator, to be distributed among the next of kin, according to definite rules of apportionment, after the satisfaction of debts and other proper charges. (See Administration.) But the rights of heirs appertain to all forms of real estate, tangible or intangible, in possession or in expectancy, and are vested in them immediately upon the occurrence of death, without any formality of transfer or acceptance. Hence it is a legal principle that no man can make another his heir, since heirship exists independently of any individual creation, and depends solely upon the ties of nature and established rules of law. Property passing to an heir is said to be acquired by descent, while all other modes of obtaining title to land are denominated, in law, acquisitions by purchase. An ancestor is under no obligation to refrain from disposing of his real estate in order that his heir may not be deprived of his prospective interest therein, but may, if he desires, devise it entirely to third persons in his will. This rule, however, is sometimes modified by statute. When the heir is vested with the real estate, he does not take it absolutely, discharged of all the claims of creditors, but subject to their right to levy upon it, as if the ancestor were living, in case the avails of the personal property are not sufficient for the payment of debts. The question as to what relatives shall constitute the heirs of an intestate is determined upon different principles in England and the U. S. It is the policy of the law of Great Britain to keep landed estates undivided, and inheritance is therefore governed by the law of Primogeniture (*q. v.*). The eldest son and his descendants have the superior claim to the property, and in default of these the second son and his descendants receive the title, and so on with the other sons if there be any in the family. If there be only daughters, they all inherit equally by virtue of the doctrine of coparcenary. In the U. S. no preferential claim is given to any one of the children above the others, and all share the inheritance equally, being generally considered tenants in common. If there be no children living or their descendants, the other blood-relatives who are nearest in degree inherit the property according to rules prescribed by statute. (See Descent.) When there are no heirs of the deceased the property escheats to the State.

An *heir-apparent* is one whose right of succession is indefeasible in case he survive his ancestor; as, for example, the eldest son under the English law of inheritance. An *heir-presumptive* is one who would succeed if the ancestor were to die immediately, but whose right may be displaced, if the ancestor live, by the coming into existence of another as heir. Thus in England an only daughter would be heir-presumptive until a son were born. So a brother would be an heir-presumptive until the birth of a child.

The necessity of using the word "heirs" in conveyances of land is considered under the topic Fee. In Scottish law the term *heir* includes those who succeed to the personalty as well as those who succeed to the realty. For the difference between *heir* at common law and *hæres* or *heir* in works on the Roman and civil law, see Hæres.

Revised by F. Sturges Allen.

Heir'looms [liter., instruments or implements handed down to an heir; *heir* + *loom* < M. Eng. *lome* < O. Eng. *gelōma*, implement, tool]: personal chattels which go, by force of a special custom, to the heir, along with the inheritance, and not to the executor or administrator of the former owner, as the usual laws for the disposition of personal property would require, such as charters and deeds evidencing the title to the land, together with the receptacles in which they are deposited. The term "heirloom" is frequently employed in English law as applying to pictures, plate, or other articles of property which have been directed by deed of settlement or conveyance in trust to pass, subject to the same limitations as some mansion-house or estate thereby conveyed. These, however, are not heirlooms in the strict sense of that term, for they belong absolutely to the first person who takes a vested estate of inheritance in the real estate with which they pass, and if he dies intestate pass to his personal representatives and not to his heirs. Heirlooms proper and these quasi heirlooms (so long as they remain subject to the limitations) are governed by the same rules of descent as the land to which they are attached. The law concerning heirlooms is confined to English jurisprudence.

Revised by F. Sturges Allen.

Hej'ira, **Hedjirah**, or, less properly, **Hegirah** [from Turk. *hejra*, from Arab. *hejira*, separation, departure; deriv. of *hajara*, quit, leave]: the term applied to the prophet Mohammed's secret escape from Mecca to Yatreb. Yatreb zealously adopted his faith (Islam), and changed its name to Medinet-el-nabi (city of the prophet). In 635 A. D., under the Caliph Omar, an assembly of the principal companions of Mohammed determined to adopt the year in which the Hejira occurred as year 1 of Mussulman chronology. They did not, however, begin the year from the day of the flight (Sept. 13, 622), but from Moharrem 1 (July 15, 622), the first day of the old Arabic year. The pagan Arabs had employed a lunar year of 354 days 8 hours 48 seconds, divided into 12 months of alternate 29 and 30 days, but with the addition every third year of a supplemental month (*naci*, delay, arrears), so that their time might somewhat agree with that of the Greeks and Syrians. Mohammed had suppressed this *naci*, though he retained the ancient names of the months. There is now consequently an annual difference of about 10 days 21 hours 48 minutes between the Christian and Mussulman years, and exact reduction of Christian to Mussulman dates, or *vice versa*, is a complicated matter. Where absolute exactness is not required, thirty-three Christian may be considered equivalent to thirty-four Mussulman years.

Edwin A. Grosvenor.

Hel [Icel., the abode of the dead, hell, hence, by personification, the goddess of the lower world. See Hell]: the Norse goddess of the dead; the daughter of Loke and Angerboda. She dwelt in Niflheim, under one of the roots of Ygdrasil, the mystic ash-tree. She rules over nine worlds in Niflheim. Her home is called Helheim, and the way thither, Hel-way, is long. Hermod traveled it in nine days and nine nights. Its course is always downward and northward. Odin visited Hel's domain when he rode down to

consult the vala in regard to the fate of Baldur. See Scandinavian Mythology. Revised by Rasmus B. Anderson.

Hel'amys [Mod. Lat.; Gr. ἑλλός, fawn + μῦς, mouse]: a name sometimes given to *Pedetes capensis*, a South African rodent of the family *Pedetida*, also called jumping hare and grand jerboa. It is over a foot long, and can leap like a kangaroo—over 30 feet. It is nocturnal, can rapidly hide itself in the ground, and is exceedingly timid.

Helbig, hel'bich, Wolfgang: archæologist; b. in Dresden, Germany, Feb. 2, 1839; studied philology and archæology at Dresden, Göttingen, Bonn, and Berlin, and was secretary of the Institute for Archæological Correspondence from 1866 till 1887. His published works are *Wandgemälde der vom Vesuv Verschütteten Städte Kampaniens* (Leipzig, 1868); *Untersuchungen über die Kampanische Wandmalerei* (*ibid.*, 1873); *Die Italiker in der Poebene* (*ibid.*, 1879); *Das homerische Epos, aus den Denkmälern erläutert* (*ibid.*, 1884; 2d ed. 1887); *Führer durch die öffentlichen Sammlungen klassischer Alterthümer in Rom* (*ibid.*, 1891); *La Collection Barracco, etc.* (Munich, 1893).

Hel'der, The: a fortified town of the Netherlands; in the province of North Holland, on the Mars-Diep, which separates the mainland from the island of Texel, and at the northern terminus of the North Holland Canal; 51 miles by rail N. N. W. of Amsterdam (see map of Holland and Belgium, ref. 3–E). The great dike of the Helder, built of Norwegian granite and Belgian limestone, forms for 5 miles an artificial coast-barrier. The Helder, previously little more than a fishing-village, was strongly fortified in 1811, and made a naval station by Napoleon I., who called it his northern Gibraltar. The Government of Holland maintains here a naval establishment, with dry docks, etc. The difficulties of navigation of the Zuyder Zee caused the construction in 1820 of the North Holland Canal, from the Y at Amsterdam to the Helder. The naval victory of the Dutch under de Ruyter over the English was won here Aug. 21, 1673. Pop. (1890) 22,737.

Hel'en (in Gr. Ἑλένη): a daughter of Leda, who, being pregnant by her husband, Tyndareos, King of Sparta, was visited by Zeus in the shape of a swan. Leda laid two eggs, from one of which came Helen and Pollux (the children of Zeus), and from the other Castor (the son of Tyndareos). Helen was the most beautiful woman in all Greece. While still young her reputed parents took her with them to Delphi to consult the oracle as to whom she should marry. While there Theseus chanced to see her dancing and kidnaped and carried her to Athens, where he consigned her to the keeping of Æthra, his mother. Afterward she was rescued by Castor and Pollux while Theseus was in Hades, but, according to some, not before she had borne to him a daughter (Iphigenia or Hermione; accounts vary). Upon her return to Sparta she was sought in marriage by all the young men of rank in Greece, but Tyndareos finally gave her to Menelaus, who thus became King of Sparta. She bore to Menelaus a daughter, Hermione, and, according to some, also a son, Nicostratus. In pursuance of a decree of the gods, Paris went to Greece to get the wife promised him by Aphrodite in return for the apple of discord. Arrived in Sparta, Paris was introduced to Helen by Menelaus himself, who then went away on urgent business, leaving Paris in his palace as a friendly and trusted guest. But during his absence Paris seduced Helen, and sailed away to Troy with her and much treasure. This brought about the Trojan war, because all the suitors of Helen had entered into an agreement to defend Menelaus against any one who should injure him in his marital relations. Helen was in Troy throughout the war as the wife of Paris, and after his death she became the wife of Deiphobus, his brother. She assisted the Greeks in the capture of Troy, and returned with Menelaus as his wife to Sparta, which they reached only after eight years of wandering. According to one story it was only the phantom of Helen that Paris took with him to Troy, for the ship of Paris was driven by winds and waves to Egypt, where King Proteus, upon learning the facts of the case, detained both Helen and her treasure, and restored them both to Menelaus after the Trojan war. After the death of Menelaus Helen was banished from Sparta by her stepsons (although the throne and kingdom belonged to her and not to Menelaus), and fled to Rhodes, where she was hanged by her former friend Polyxo, because in causing the Trojan war Helen had brought about the death of Tlepolemus, Polyxo's husband. After her death Helen was married to Achilles in the island of Leuce and bore to him a son, Euphorion. Helen was always beautiful and young in spite of time and years, and inspired passion in the breasts of all without feeling it herself, and though possessed by many men she always retained fresh and unsullied her mysterious virginity. Throughout antiquity it was dangerous to attack the character of Helen, for beauty redeemed and sanctified her, because among the Greeks "beauty was a holy thing." In the Middle Ages Helen reappears in the myth of Dr. Faustus, who raises her from the dead and possesses her. In modern poetry she is the ideal beauty of the ancient Greeks.

Literature.—A. Lang, *Helen of Troy*; Landor, *Menelaus and Helen*; Marlowe, *Faustus*; J. A. Symonds's chapter on the *Women of Homer* in his *Greek Poets*, vol. i., chap. iv.; the learned article by R. Engelmann in Roscher's *Lexicon* under *Helena*. J. R. S. Sterrett.

Hel'ena: city (founded 1833); capital of Phillips co., Ark. (for location of county, see map of Arkansas, ref. 4–E); on the Mississippi river, and the Ark., Mid., the St. L., Iron Mt. and So., and the Yazoo and Miss. Val. Railways; 90 miles S. by W. of Memphis. It contains 9 churches, 2 public and 2 private schools, U. S. post-office and court-house (cost $75,000), and 5 periodicals, and has 3 sawmills, 2 cotton-compressers, 2 cottonseed-oil mills, 2 foundries, gas and electric lights, and street railways. Pop. (1880) 3,652; (1890) 5,189; (1893) with suburbs, 6,850. Editor of "World."

Helena: city (settled as a mining-camp in 1864); capital of the State of Montana and of Lewis and Clarke County (for location of county, see map of Montana, ref. 5–E); in Prickly Pear valley, 15 miles W. of the Missouri river, and on the Gt. North. and the U. Pac. Railways; 99 miles S. by W. of Great Falls, 450 miles N. of Ogden, Utah, 1,133 miles W. of Duluth. It is surrounded by rich agricultural valleys, productive mines of gold, silver, and iron, and fields of rubies and sapphires. It has 6 national and 2 private banks, with aggregate capital of $1,500,000, 9 churches, 7 public schools, 2 foundries, 4 machine-shops, 5 planing-mills, and carriage, harness, and other factories, and 2 daily and 8 weekly newspapers. It is within 15 miles of the summit of the Rocky Mountains, is the site of the famous Last Chance Gulch mine, and has a large trade by railway. Pop. (1880) 3,624; (1890) 13,834. Editor of "Journal."

State Capitol, Helena, Mont.

Helena, Saint: mother of Constantine the Great; said to have been the daughter of an innkeeper; b. according to some accounts in Bithynia, according to others in Britain, about 248. She was married to the Emperor Constantius Chlorus, who for reasons of state divorced her in 292; but her son, Constantine the Great, on succeeding to the throne in 306, treated her with great honor, and conferred upon her the title of Augusta. After her conversion to the Christian faith she made a pilgrimage to Jerusalem, where, with almost miraculous success, if the legend is credible, she succeeded in identifying all the remarkable objects and places connected with our Saviour's history; more especially his sepulcher and the real wood of the cross on which he suffered. She also discovered the burial-place of the Magi.

D. about 328. For her many virtues and charities she was subsequently canonized by the Church. Her festival is observed on Aug. 18.

Hel'enus (in Gr. Ἕλενος): (1) a son of Priam and Hecuba, twin-brother of Cassandra, and like her endowed with prophetic powers. After the death of Paris, Helenus and Deiphobus both sought the hand of Helen. Deiphobus won her and Helenus deserted to the Greeks, being enraged because Deiphobus was chosen before him. Another story has it that he retired to Mt. Ida, where, by Calchas's advice, he was captured. He was of great service to the Greeks, as he told them that Troy could not be taken without Neoptolemus and the arrows of Hercules, which were in the possession of Philoctetes, on the island of Lemnos. He suggested that the Palladium be stolen, and that the wooden horse be built. After the fall of Troy, Helenus became the slave of Neoptolemus, to whom he rendered invaluable services as seer; he prevented Neoptolemus from sailing with the rest of the Greeks, and induced him to settle in Epirus. After Neoptolemus had been killed by Orestes, Helenus became king of a portion of Epirus, which he called Chaonia after his brother Chaon, whom he had accidentally killed. He married Andromache, Hector's widow, and begat Cestrinus. He left his kingdom, which was patterned after Troy, to Molossus, the son of Neoptolemus by Andromache. Olympias, the mother of Alexander the Great, claimed descent from Helenus. (2) A son of Pyrrhus, King of Epirus, accompanied his father on his expedition to Italy in 280 B. C. After the defeat at Beneventum, in 275 B. C., and the return of Pyrrhus to Epirus, Helenus was left in Tarentum with a small garrison of Epirotes. He was soon recalled, however, and took part in the attack on Argos, in which Pyrrhus was killed. He was taken prisoner himself, but Antigonus Gonatas treated him with great regard, and allowed him to return to Epirus with the remains of his father.

J. R. S. Sterrett.

Héliade, Jean (or, more properly, **Eliade Rădulescu**, Ioan): Roumanian writer; b. in 1802 at Tergovist in Wallachia; d. in May, 1872. He was educated at Bucharest, in a college or school established by Lazăr, and at the age of twenty became one of its professors. In 1828 appeared his *Gramatica românească*, the first systematic work on Roumanian grammar published in Wallachia, in which he paved the way for the introduction of the Latin alphabet by omitting a considerable number of superfluous letters from the Cyrillic alphabet then in use. In 1829 he began *Curierul românesc* (*The Roumanian Courier*), the earliest of the Roumanian literary periodicals. He showed great activity as a translator, especially from Italian, making versions from Dante, Ariosto, Tasso, besides others from Molière, Lamartine, Byron, etc. After 1840, indeed, his writings show an excessive influence of Italian. In 1848 he mingled in political affairs, becoming a member of the revolutionary government, and, as a consequence, he was obliged to go into exile in September of that year. He went to Paris, then to the island of Chio; but in 1854 he was able to return to Bucharest. During his exile he had written in French *Mémoires sur l'histoire de la régénération roumaine* (Paris, 1851) and also *Souvenirs et impressions d'un proscrit* (Paris, 1850). Among other forms of literary activity, Eliade tried his hand at poetry, and his poem on Michael the Brave, the national hero of Wallachia, has some repute. In 1868 began to appear his *Curs de poesie generală* (3 vols.). Mention should also be made of his *Nuvele istorice* (3d ed. 1867). In conclusion, it may be said that in spite of his activity, Eliade's importance in Roumanian literary history lies rather in the incentive he gave to the literary development of his race than in the merit of his own works. E. S. Sheldon.

Helian'thus: See Sunflower.

Hel'icoid [from Gr. ἑλικοειδής, spiral-shaped; ἕλιξ, ἕλικος, a spiral + εἶδος, shape, form]: a warped surface that may be generated by a straight line moving so that each of its points shall advance uniformly in the direction of a given straight line, and at the same time have a uniform angular motion around it. The fixed line is called the *axis* of the surface, the moving line is called the *directrix*, and any position of the directrix is called an *element*. The conditions imposed require that the same point of the generatrix shall remain continually on the axis, and that the angle between the directrix and axis shall be constant. When this angle is a right angle, the helicoid is *right*; otherwise it is *oblique*. The curve generated by any point of the directrix is called a *helix*. Revised by S. Newcomb.

Hel'icon, Mount (in Gr. Ἑλικών): a mountain of Greece, in Bœotia; between the Gulf of Corinth and Lake Copais. It is strictly a range of mountains, a continuation eastward of Parnassus. Its highest point is a cone 5,000 feet high. Its eastern side is fertile and abounds in springs. Helicon was sacred to Apollo and the Muses, probably because Hesiod the poet lived at Ascra, near its eastern foot. Near Ascra was Aganippe, the fountain of the Muses. Higher up was the grove of the Muses. Still higher up was the well Hippocrene and the fountain of Narcissus. These points are identified. Revised by J. R. S. Sterrett.

Hel'igoland, or **Hel'goland** [Germ.; cf. O. H. Germ. *heiligo*, saint + land, i. e. saint's land or island]: a small island in the North Sea; opposite to and about 40 miles from the mouth of the Elbe, in lat. 54° 11′ N. and lon. 7° 53′ E. It is about a mile long from north to south, one-third of a mile wide, and about 3 miles in circumference. The island is divided into two parts—the low ground and the rock; the latter, a red sandstone, rises to a height of 200 feet above the sea. There are several excellent roadsteads. Although much has been said of the gradual washing away of the island by the sea, the probable rate is very small. The village is built on the low ground and the portion of the rock adjacent to it; the two parts are connected by a flight of 190 steps. The inhabitants are mainly of Frisian descent, engaged in fishing and piloting, though many have turned their attention to accommodating visitors who resort here for the fine sea-bathing. They are remarkably free from poverty, disease, and crime. The island is fortified, and has a lighthouse. In ancient times it was inhabited by Frisii, and it is said that on this island the temple of the Frisic god Fosete stood, before the introduction of Christianity in the eighth century, when it was destroyed. Heligoland was captured from Denmark by Great Britain in 1807, and was ceded to Germany in 1890. Pop. about 2,000.

Heliodo'rus (in Gr. Ἡλιόδωρος): Greek writer of romance; b. at Emesa in Syria; flourished toward the end of the fourth century A. D.; wrote *Æthiopica* in ten books, describing the loves of Theagenes, a Thessalian youth, and Chariclea, daughter of a king of Æthiopia. This was for centuries an exceedingly popular romance, vivid in details, interesting in narrative. The situation of the leading characters is strained, and the style exotic and hyperrhetorical, but the *Æthiopica* is the greatest work of the *Scriptores Erotici Græci*. Heliodorus calls himself a priest of the sun, and the identification with Heliodorus, Bishop of Tricca, is disputed by Rohde, *Der griechische Roman* (p. 432). Editions by Mitscherlich in the *Scriptores Erotici Græci* (1798), by Coraës (1805), and by Hirschig (Paris, 1856). Translated into English by R. Smith, in the Bohn Classical Library.

B. L. Gildersleeve.

Heliogabalus: See Elagabalus.

Heliography: a method of signaling between distant points by means of a movable mirror. See Heliotrope and Signal Service.

Heliom'eter [from Gr. ἥλιος, sun + μέτρον, a measure]: an instrument first invented to measure the diameter of the sun in seconds and parts of seconds, but now employed to measure small arcs generally upon the celestial sphere. It consists of an ordinary telescope equatorially mounted, the object glass of which is cut into two equal semicircles, which slide along the diameter of section by the revolutions of a very fine screw. Each half of the objective forms a separate image of any object at which the telescope is pointed. If there are two objects the screw and telescope may be turned until one image of one object coincides with the opposite image of the other. The amount of motion to produce the coincidence determines the angle between the objects. S. Newcomb.

Heliopolis (of Syria): See Baalbec.

Heliop'olis [Gr.; ἥλιος, sun + πόλις, city; in Egyptian *An*, Hebrew *On*, now *Matariyeh*]: a sacred city of Egypt, located near the apex of the Delta region, 5 miles N. E. of Cairo. According to Manetho it existed in the second dynasty. In the period previous to the twelfth dynasty it is seldom mentioned, but at that time Usertasen I. signified the completion of a temple of Ra by erecting obelisks before it. Only one of these is still *in situ*, the sole remaining memorial (cf. Jer. xliii. 13). Other Pharaohs, especially Thothmes III., Seti I., Ramses II., III., Psammetichus, and Nectanebo, added new buildings or restored old. Four obe-

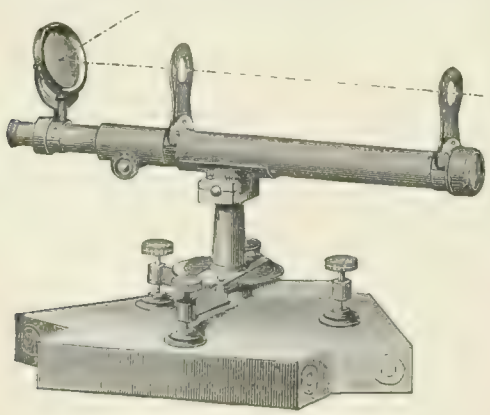
lisks erected by Thothmes III. are now in Constantinople, Rome, London, and New York. The city was most flourishing under Ramses III., when the temple is said to have had 12,913 attendants. Herodotus recalls the reputed wisdom of the priests, while Strabo found it practically deserted. The final destruction came in the Arabian period, and late excavations have brought little to light. The site is covered with cultivated fields, the temple area being 6 feet below the level of the surrounding country, and 114 feet below high Nile. Heliopolis was one of the holiest of Egyptian cities, and the oldest chapters of the RITUAL OF THE DEAD (*q. v.*) are said to have been written there. The earliest records indicate that it was at first the seat of the worship of the Mnevis bull (second dynasty). Previous to the twelfth dynasty it was sacred to Tum, and afterward it was the special seat of the sun-worship—i. e. of Ra under various forms and names: *Ra*, the sun in general; *Ra-Harmachis*, the rising sun; *Tum*, the setting sun; and *Aten*, the sun-disk.

CHARLES R. GILLETT.

Helios: See HELIUS.

He'liostat [from Gr. ἥλιος, sun + στατός, placed, deriv. of ἱστάναι, set up]: a mirror carried by a clockwork mechanism, so contrived as to reflect a beam of solar light in an unvarying direction, notwithstanding the apparent change of place of the sun in its diurnal motion. The heliostat has long been in use in physical investigations and experiments, without possessing a high degree of precision. More recently it has been employed in aid of astronomical observation, for which purpose it has been greatly improved. The expeditions sent out from the U. S. to observe the transit of Venus of 1874 (and also the French) made use of the heliostat in photographing the successive aspects of that phenomenon by means of telescopes of long focus (40 feet), instruments which without it could not have been employed at all. A nearly or quite perfect form of heliostatic apparatus, as it respects precision of movement, was one of the latest inventions of the ingenious Foucault, and was called by him the *siderostat* (Lat. *sidus*, a star or constellation + Gr. στατός, fixed), being designed for use in all the ordinary observations of astronomy, for the purpose of enabling the observer to occupy constantly the same and the most convenient position.

He'liotrope [Gr. ἥλιος, the sun + τροπός, turning]: an instrument employed in geodesy to reflect the sun's rays from one signal-station to another in order to facilitate observation; the reflecting surface presenting to the distant observer the appearance of a brilliantly luminous point or star. There are several varieties, the most common being that represented in the figure, where a mirror, movable



in any direction, is seen mounted near the eye-end of a telescope. The telescope, being first pointed at the distant station, the mirror is turned so as to reflect the sun's light through the two openings in the sights, which will occur when the shadow of the rear one is seen on the front one. An attendant turns the mirror constantly so as to maintain the proper direction of the rays. As the sun subtends an angle of about half a degree, the reflected rays, in passing off the mirror, are contained within a cone having the same angle at the vertex. Hence it is only necessary to point the instrument within a quarter of a degree of an object in order that the light may reach it. The heliotrope was invented in 1821 by Gauss, who used it as a signal upon which to observe in the measurement of angles. Its use for this purpose is now universal on long lines. For lines as short as 20 miles it is used when the atmosphere is hazy, so that poles and targets can not be seen. The longest line of a geodetic triangle thus far observed is one in California of 192 miles in length; for this line a mirror having 77 sq. inches area was used. The common heliotropes, used on lines less than 50 miles long, have mirrors about 2 sq. inches in area, and the effective area is often made smaller by the holes in the sights. The heliotrope requires clear weather, and its light is often unsteady, owing to disturbances in the atmosphere. The best time for measuring angles between heliotropic signals, or indeed between any kind of signals, is during the hour preceding sunset. By interposing and removing an object in front of the mirror, long and short flashes of light are made by which telegraphic messages can be sent from one station to another.

MANSFIELD MERRIMAN.

Heliotrope [from Lat. *heliotropium* = Gr. ἡλιοτρόπιον, dimin. of ἡλιοτρόπος, heliotrope; ἥλιος, sun + -τροπός, turning, deriv. of τρέπειν, turn; the flowers were once believed to turn with the sun]: a genus (*Heliotropium*) of herbs and shrubs of the family *Boraginaceæ*. The *H. peruvianum* and its hybrids are greenhouse shrubs, having flowers of delightful fragrance. The flowers are extensively used by perfumers. *H. curassavicum*, *H. convolvulaceum*, and several others are natives of the U. S., where also the common heliotrope (*H. europæum*) is naturalized.

Heliotrope, or **Bloodstone**: a variety of JASPER (*q. v.*); much used for seals and seal rings; presenting bright-red spots upon a deep-green ground.

Heliotropism: See PHYSIOLOGY (*Vegetable*).

He'liotype [liter., sun-print; Gr. ἥλιος, sun + τῦπος, blow, impression]: generally any process of reproducing pictures obtained by the actinic power of the sun's rays on a prepared surface, by printing in fatty inks, but more especially the process invented by Poitevin in 1855, and afterward developed and completed by Edwards. Poitevin discovered that on a plate covered with bichromated gelatin, and exposed to light under a negative, some pores of the gelatin would become completely, others only partially, closed, while others, again, would remain entirely unchanged. If, now, this plate be steeped in water and rubbed over with grease, the grease will speedily attach itself to those places of the gelatin sheet where the light has closed the pores, while it will not touch those places where the pores have remained open, and consequently become filled with water. Thus if the grease employed be lithographic ink, which is simply grease to which coloring-matter has been added, the light-produced image will at once be revealed. The development which this process received from Edwards consisted principally in the production of a movable film. He discovered that gelatin, without losing its property of being acted upon by light in presence of a bichromate, and of receiving and refusing greasy ink, might be converted into a tough, insoluble substance, like leather or parchment, by the addition of alum or chrome alum. The gelatin, with a sufficient quantity of bichromate of potash to make it sensitive to light, and of alum to make it hard and durable, is poured on a level plate, and dried in the dark by means of heat. When dry or required for use, the sheet of gelatin is stripped from the plate and printed under a photographic negative, which should be reversed as regards right and left.

Revised by W. C. GREENOUGH.

Heliozo'a [Mod. Lat. pl., fr. Gr. ἥλιος, the sun + ζῷον, animal]: the sun animalcules, the name being given in allusion to the rays extending from the central mass. They form a sub-class of the Rhizopod PROTOZOA (*q. v.*); characterized by having radiating pseudopodia (the rays referred to), and frequently a chitinous capsule into which all may be retracted. *Actinophrys* and *Actinosphærium* are the best known. All forms occur in fresh water.

J. S. K.

He'lius (in Gr. Ἥλιος): the charioteer of the sun; son of Hyperion (the Titan deity of light) by his sister Theia, who also bore him the moon (Selene) and the dawn (Eos). Both the root of the word *Zeus* (διF) and tradition prove that Zeus, the bright and shining one, included in his many-sided nature the functions of the sun-god, functions which were afterward delegated to Apollo; but when Apollo began to represent the spiritual, healing, creative, and death-dealing manifestations of the sun, the physical functions of the sun were assumed by Helius. Helius was originally re-

garded as a ball of fire, or as a wheel, or disk, then as an eye (the eye of heaven), as a winged being of light because of his rapid journey across the vault of heaven, while the conception of the horses and chariot of the sun arose from the same rapid journey. The power of Helius was evinced by the heat which was produced by his piercing rays, those same rays which, in the hands of Apollo, became death-dealing arrows. These arrows made Helius an invincible hero who wars victoriously against the powers of darkness. Homer dwells upon the fiery splendor of Helius; owing to this splendor he is portrayed in art and literature as in the full vigor of early and beautiful manhood, with large, open eyes and rich, wavy, golden or auburn hair, which stood for the rays of the sun. In art he wears a rayed crown to which is sometimes added a nimbus or halo; his long flowing robes flutter in the wind behind him as his fiery, snow-white horses cause his chariot to spin along athwart the heavens. The chariot is golden, and in early vase-paintings the horses are winged. The moment of time usually chosen to represent Helius in works of art is sunrise; Aurora (Ἠώς) precedes him in her chariot and scatters roses in his way. The different stages in the daily course of Helius are well defined in Homer; he rises in the farthest east out of the gently flowing, deep stream of Oceanus, Thetis herself removing the bars that restrained the horses during the night. He ascends the heavens, reaching at noon the center of the vault, when he descends, and about the time for unyoking oxen again reaches the stream of Oceanus in the far distant west, thus producing night. He bathes his own "immortal body and his tired horses in a warm bath of soft water." The resting-place of Helius and Aurora is in Ethiopia; there is his palace or his cave; the Nereides and the Hours take from him the reins and his rayed crown, unhitch the horses, and conduct them to pasture. His rest is short; he is pursued by the darkness of night, from which he must escape, and he drives his chariot into a golden bowl, the handiwork of Hephæstus, and in it both chariot and driver are borne, while they sleep, upon the stream of Oceanus, past Red island (Erytheia), to the point of rising in the farthest east. His wife Perse (the Shining One), a daughter of Oceanus, bore him Circe and Æetes, sorcerers both (cf. Medea). Homer knows only of his children by Neæra, viz., Phæthusa and Lampetia, who guarded the herds of Helius on the island of Thrinacia (Sicily), Phæthusa herding the sheep and Lampetia the cattle. Helius sees all the actions of gods and men; he was consequently invoked as a witness to all compacts, oaths, and treaties; he is the revealer of all things both good and bad. He is the cause of life and growth in the vegetable world; death-dealing qualities are rarely ascribed to him as to Apollo. He gives health to the body; he restores sight to the blind (Orion); he is the measurer of time, the originator of the year and the seasons; in the Roman period he is even the father of time and the ruler of the universe. Lysippus fashioned in bronze a group representing Helius with his chariot and four, and Chares executed in bronze the celebrated Colossus of Rhodes (280 feet high, one of the Seven Wonders of the world), which was overturned by an earthquake in 222 B. C.

LITERATURE.—Rapp's learned article in Roscher's *Ausführliches Lexicon*; Roscher, *Die Gorgonen* (Leipzig, 1879) and *Nektar und Ambrosia* (Leipzig, 1883); Sonne, in Kuhn's *Zeitschrift*, 10, 166. J. R. S. STERRETT.

Helix: See PULMONATA.

Helix [= Gr. ἕλιξ, a spiral, anything of a spiral shape, deriv. of ἑλίσσειν, turn around, roll]: a curve having the form of a cork-screw, generated by the motion of a point which moves uniformly around a cylinder and at the same time moves along its axis. S. N.

Hell [from M. Eng. *helle* < O. Eng. *hell*; O. H. Germ. *hella* (> Mod. Germ. *hölle*, properly *helle*, the Teutonic goddess of the dead); Goth. *halja*: Icel. *hel*]: originally, the state of the dead, viewed without distinction of character or destiny; called *Sheol* by the Hebrews, and *Hades* by the Greeks. The body being regarded as that which gave strength and energy to existence, while there was yet a consciousness of something in man distinct from it, and capable of surviving it, this immaterial residuum was, among the Greeks and Hebrews, and many other peoples of antiquity, regarded as a shadowy, half-conscious somewhat, which, even if like Achilles it enjoyed a form of royal honor below, would gladly exchange this for the lot of a hireling laborer on earth. The associations of burial, the sinking sensation accompanying the failure of strength, and the ideas of gloom connected with the state of the dead, combined to suggest the interior of the earth as their dwelling-place. Hence the Romans call the dead *Inferi*, the subterranean ones. From this joyless region only a few favored spirits (mostly children or grandchildren of Zeus) were exempted by deification, and even to them, as to Hercules in the *Odyssey*, there was sometimes assigned a visionary *idolon* in the shades. The Germanic tribes in the north of Europe held similar views, except that the realm of Hela was even more dismal than Hades, a region both of darkness and frost. In the north, however (though with some waverings of idea), the whole body of heroes and heroines were exempted from this, and gathered to the feastings and tournaments of Walhalla. From Hades it was supposed possible, by powerful incantations, to evoke temporarily the departed shades, who, notwithstanding the general unsubstantiality of their being, seem to have been viewed as knowing the future. Against this practice of necromancy (illustrated in the evocation of Samuel) the Old Testament directs the severest prohibitions, as futile, diverting the mind from the substantial interests of life, and from trust in the living God. In Homer the shades thus evoked are described as gaining a temporary renewal of life by drinking the blood of the necromantic sacrifices.

In the Old Testament there appears no distinct conception of an award of good or ill in Hades or Sheol, according to character. For all the dead it is a land of confusion, emptiness, darkness, and dreamy inactivity. (See Job x. 21, 22.) Negatively, to the oppressed it is a relief. (Job iii. 17–19.) An approach to the idea of retribution finds place in Isaiah xiv. 9, 10, where the haughty King of Babylon is described as received in Sheol with scornful jeers. Among the Greeks, as early as Homer, peculiarly flagrant offenders are described as suffering various torments in Tartarus, the dungeon of Hades, in which are also confined, though without torment, Kronos and various dethroned gods. The antiquity of the Nekyia of the *Odyssey*, however, is doubtful.

Old Testament believers, conscious of an indissoluble tie of faith and hope with the living God, and of a covenant relation with him, began gradually to anticipate a deliverance from Sheol to some form of glorified and substantial life. (See Psalms xlix. 15, lxxiii. 24, xvi. 10, 11, xvii. 15; Job xix. 25–27.) In the more definite form of a resurrection, in a glorified body, to dwell forever upon the transfigured earth in the Messianic kingdom, this deliverance from Hades seems to be at least intimated in Isaiah xxvi. 19 and Ezekiel xxxvii., and is distinctly taught in Daniel xii. 2, 3. There also appears a retribution of evil to the evil in a resurrection to "shame and everlasting contempt." A distinction of final destiny, resting upon a distinction of character, being thus developed in religious consciousness among the Jews, which yet is not to be realized in its fullness until a day of final judgment, Hades, or Sheol, becomes an expectant state, into which is reflected back a measure of the same distinction of doom. This assigns to the righteous dead a special compartment of Hades, bright and blessed, known to the Jews as Abraham's bosom, or paradise (see Luke xvi. 19–31, xxiii., 43), which must not be confounded with the heavenly paradise mentioned in 2 Corinthians xii. 2, 4. The rest of Hades becomes thereby the abode of the unrighteous dead, passing over into the idea of hell in our present use of it. (See Luke xvi. 19–31, as above.) Whether the "Gehenna of fire," repeatedly mentioned by our Saviour, includes this anticipatory place of doom, or whether it denotes only the "eternal fire" into which the incurably selfish are consigned with the devil and his angels (Matthew xxv. 41), is matter of debate, the general opinion of the Church holding them identical in kind, though differing in degree. Yet see Revelation xx. 14.

When the Authorized Version was made in 1611, the English use of hell still retained its original indeterminateness, precisely equivalent to Hades or Sheol, as denoting the state of the unglorified or unrisen dead, without respect of character or condition. It is in this sense that, in the Apostles' Creed, Christ is said to have "descended into hell," not as implying a descent into the place of torment. Use having, however, gradually confined "hell" to this latter application, it has become necessary to distinguish in translation. Accordingly, the revisers commonly transfer Sheol in the Old Testament, and invariably transfer Hades in the New Testament, wherever, in the corrected text, it occurs in the Greek, namely, Matthew xi. 23, xvi. 18; Luke x., 15, xvi., 23; Acts ii. 27, 31; Revelation i. 18, vi. 8; xx. 13, 14, reserving hell to translate "Gehenna"; Matthew v.

22, 29, 30, x. 28, xviii. 9, xxiii. 15, 33; Mark ix. 43, 45, 47; Luke xii. 5; James iii. 6, and once to translate Tartarus (implied in a participle), 2 Peter ii. 4. The charge, therefore, brought against the revisers by a noted writer, of having "covered up" the grimness of Bible teaching "under classic flowers," is not only false, but is the reverse of the truth. They have brought out distinctions of the original which the elder version has neglected.

The question whether the Bible teaches that the sufferings of the wicked in hell after the day of judgment are to be absolutely endless, or whether, from the disintegrating processes of a being at discord with itself, these issue in ultimate extinction, or whether the Scriptures open glimpses of hope, implying a possible restoration of all the lapsed men and angels to holiness and unity with God, has commonly, in the Church, been answered in the first sense, although not merely Origen, but at least two great theologians and canonized saints, Gregory of Nazianzus and Gregory of Nyssa, favor the hope of universal restoration. In the time of Augustine, as he says, most Christians entertained this hope, and although he himself does not, he declares that it is no sign of rebellion against Scripture, but of a compassionateness which shrinks from giving this its full severity. As a compromise, he suggests the possibility of periodical remissions or mitigations of penal suffering. Modern theology in large measure is disposed to be less peremptory than was once thought requisite in pronouncing upon the precise interpretation of the Scriptural declarations concerning this awful mystery. Universalists sometimes use sterner, and orthodox writers milder, language than would once have been tolerated on either side. The use of *aionios*, eternal, is not decisive, as this is also applied to objects, like mountains, of indeterminate duration. On the other hand, such declarations as those of the compassionate Redeemer himself, in Matthew xii. 31, 32, xxvi. 24, are confessedly very hard to reconcile with the doctrine of a universal restoration.

Roman Catholic theology, whose doctrine of future things is peculiarly determinate, includes in hell all regions of the spiritual world which are not within the range of the beatific vision, comprising in it, therefore, the *limbus infantum* for unbaptized children, even when conceived as a place of "perfect natural beatitude," including the natural knowledge and love of God. Nor does it seem indisposed to admit purgatory as a part of hell, though destined to disappear after the judgment, as being occupied only by elect souls, whose admission to heaven can not be deferred beyond that point.

The Elysian Fields of the ancients may be regarded almost indifferently as heaven, hell, or paradise, being variously placed in the air, in Hades, or in the western ocean. The notion of unhappy spirits as roaming the earth, and even of holy souls as expiating their arrears of guilt in various localities on earth, appears to serve as transition to the apprehension of heaven and hell as depending less upon place than upon character. The thesis

> The mind is its own place, and in itself
> Can make a heaven of hell, a hell of heaven,

has never been condemned as heretical by any branch of the Church. According to Swedenborg, in the spiritual body mental affinity or alienation involves local contiguity or removal. As Christianity accounts that sphere of being as heaven in which God's will is perfectly *done*, so it accounts as hell that sphere of being in which God's will is absolutely *opposed*. An approach to either state is, respectively, an approach to heaven or hell.

For notices of the Brahminist and Buddhist doctrines of the state of the dead, and of the fancies of the North American Indians, as well as of the distincter doctrines of Zoroastrianism, see HEAVEN. The Egyptians had very vivid, if not very spiritual, conceptions of the state of the dead, both for good and evil, although these do not seem to have had much influence on the development of Jewish doctrine. See HADES and SHEOL. CHARLES C. STARBUCK.

Hell, MAXIMILIAN: astronomer; b. at Schemnitz, Hungary, May 13, 1720; was the principal astronomer at Vienna, where he issued the well-known annual *Ephemerides Vindobonenses*. In 1769 he went to the North Cape to observe the transit of Venus. The station was among the most important of those occupied by astronomers; the publication of his observations was therefore looked for with the greatest interest. Shortly after they appeared doubts began to be expressed of their genuineness, but Hell disdained to make any formal reply to such insinuations. Little attention was given to the question thus raised until 1835, when Littrow, astronomer at Vienna, published a book giving a description of Hell's original journal, which had been preserved at the Vienna Observatory, with a facsimile of the observations, showing, as Littrow claimed, that the records had been falsified by Hell, and that the observations were to a greater or less extent spurious. This view was generally accepted until 1883, when Simon Newcomb, the American astronomer, visited Vienna to examine the manuscripts, and reached an opposite conclusion, showing that Littrow was entirely mistaken in his conclusions, owing to his being partially color-blind. Hell died in Vienna, Apr. 14, 1792.

Hellani'cus (in Gr. Ἑλλάνικος): a distinguished logographer (see LOGOGRAPHERS), preceding Herodotus; a native of Mytilene in Lesbos; b., according to Pamphila, B. C. 496, died about 411; but these dates are much questioned. Like Hecatæus and Herodotus, he visited the countries he describes, though scarcely any particulars of his life are known. He wrote a number of works (some state thirty), but probably parts of works are quoted by distinct titles. They related chiefly to early Greek and Persian history. His principal writings are *Deucalionea*, in two books; *Phoronis*, in two books; *Atlantis*, in two books; *Troica*, in two books; *Atthis*, in four books; *Æolica*, in two books; *Persica*, in two books; and a chronological work, *ἱέρειαι αἱ ἐν Ἄργει* (a list of the priestesses of Juno at Argos), in three books. Of his writings, fragments are left, collected by Sturz, *Hellanici Lesbii Fragm.* (1826); and by Müller, *Fragm. Hist. Grac.*, vol. i., pp. 45–69, vol. iv., pp. 629–37. See Müre's *Hist. Greek Lit.*, vol. iv. Revised by B. L. GILDERSLEEVE.

Hellas: See GREECE.

Hellbender: a tailed batrachian (*Cryptobranchus alleghaniensis*) peculiar to the fresh waters of North America, intermediate between the perennibranchiate amphibians and the salamander. It has a large and flat head; two concentric series of minute teeth in the upper jaw, and one series in the under jaw; a branchial orifice on each side; rudimentary branchiæ; four limbs, the anterior having four and

The Alleghany hellbender.

the posterior five short palmated toes; and a loose skin folded on the sides of the body. It attains a length of 2 feet, has a slaty-gray color with dark spots, feeds chiefly on fish, worms, and mollusks, is fierce and voracious, and is erroneously regarded as poisonous. The hellbender abounds in the waters of the Ohio and its tributaries, and is known also by the names mud-devil, ground-puppy, and mud-puppy. See MUD-PUPPY. Revised by D. S. JORDAN.

Hell-diver: See GREBE.

Hel'le (in Gr. Ἕλλη): a daughter of Athamas and Nephele, the royal pair of Orchomenus in Bœotia. Athamas divorced Nephele in order to marry Ino, a daughter of Cadmus, the founder and King of Thebes. Ino was a bad stepmother and determined to get rid of Phrixus and Helle; she caused a famine by parching the seed corn, and she bribed the messengers who had been sent to consult the oracle as to the cause of the famine to bring back word that Phrixus and Helle were enemies of the gods, and must be offered up in sacrifice. When the king, Athamas, in his character of high priest, was about to sacrifice them, their mother Nephele (the name means *Cloud*) descended from

heaven and placed her children on the back of Chrysomallus, the ram with the GOLDEN FLEECE (*q. v.*), who went with them through the air; but Helle fell off and was drowned in the Hellespont, which was named from her.

Revised by J. R. S. STERRETT.

Hel'lebore [readapted from O. Fr. *ellebore* < Lat. *helle'borus* = Gr. ἑλλέβορος, hellebore]: a remedy used especially by the ancients in cases of insanity. The best grew at Anticyra. It was the root of *Helleborus orientalis*, an herb of the family *Ranunculaceæ*. The black hellebore of modern pharmacy is chiefly the product of *H. niger* (which produces the flower called Christmas rose). Its properties are shared by *H. viridis* and *fœtidus*. These are all Old World species, and have violent cathartic properties. In overdoses they are active irritant poisons. Hellebore is not much used in medicine, except as an emmenagogue. For white hellebore, see VERATRUM. Revised by CHARLES E. BESSEY.

Hel'len (in Gr. Ἕλλην): a son of Deucalion and Pyrrha, and the progenitor of the whole *Hellenic* nation, though Hesiod and Archilochus were the first to call the Greeks *Hellenes*. Hellen had three sons, Dorus, Æolus, and Xuthus. He was succeeded in the kingdom of Phthia by Æolus, whose descendants were the Æolians. Dorus settled in Doris on the slopes of Parnassus, and his descendants emigrated to the Peloponnesus. Xuthus settled in Attica, and by his sons Ion and Achæus became the progenitor of the Ionians and Achæans. J. R. S. STERRETT.

Hel'lenes: See GREECE.

Hel'lenist [from Gr. Ἑλληνιστής, Hellenist, deriv. of ἑλληνίζειν, to speak Greek, deriv. of Ἕλλην, a Greek]: among the Jews of Palestine and other countries in the Roman period, and among the Jewish Christians of the same times, a name applied to the proselytes to Judaism of Greek or other foreign ancestry, and also to Jews living outside of Palestine who had adopted Greek, usually in some dialectical form, for their common tongue (whereas Aramaic was the Jews' language in Palestine), and had also more or less yielded to Greek civilization, which implied that in many respects they had ceased to be strict Jews. The latter class when living outside of Palestine were known as the "Jews of the Dispersion." After the time of Alexander the Great the Hellenizing of foreign nations began to assume enormous dimensions. His successors, the Seleucidæ and the Ptolemies, favored the tendency, and often found a much stronger support for their thrones in that movement than in their armies. The Hellenistic spirit did much in preparing the way for the spread of Christianity. In the Revised Version the term "Hellenist" is in the margin for Grecian Jews in Acts vi. 1, ix. 29.

Revised by SAMUEL MACAULEY JACKSON.

Hellenistic Greek [*Hellenistic* is from Gr. Ἑλληνιστικός, pertaining to the *Hellenists* (Gr. Ἑλληνισταί), or foreigners who spoke Greek]: the Greek language as it appears in the Septuagint (283–185 B. C.), the New Testament, the writings of Josephus and Philo, and those of some of the early Christians. It abounds in Hebrew and Aramaic forms, idioms, and even words. See GREEK LANGUAGE.

Hellenop'olis [originally *Drepanum* or *Drepane*]: a Bithynian city on the Propontis (Sea of Marmora), near the river Draco. It was named Hellenopolis by the Emperor Constantine the Great, probably because it was the birthplace of Helena, his mother. Constantine did much to build up the town, and so did Justinian in later days, but the place seems never to have been very important. Constantine lived much in this place on account of its mineral springs. It is now called *Hersek*.

Hel'lespont [from Lat. *Hellespon'tus* = Gr. Ἑλλήσποντος; Ἕλλης, genit. of Ἕλλη, Helle + πόντος, sea]: the ancient name of the DARDANELLES (*q. v.*), the strait which connects the Propontis and the Ægæan; named from the old legend of HELLE (*q. v.*), according to the ancients. It was the scene of many events conspicuous in the history and mythology of antiquity. Being the highway to Constantinople, it is strongly fortified, and the men-of-war of European nations are not allowed to enter it, even in time of peace.

Revised by J. R. S. STERRETT.

Hell Gate: a narrow part of East river, New York, so called because of the reefs that long encroached upon its channels, and the violent currents caused by them. The East river receives the tide at its two extremities—at the eastern, the Sound tide, and at the western, the Sandy Hook tide. The times as well as heights of these tides are different, and by such want of uniformity strong velocities are imparted to the currents.

To distinguish more clearly the positions and designations of the reefs, the Gridiron, Flood Rock, Hen and Chickens, and Negro Head, all of which constitute parts of one reef, will in this article be called by the name of the Middle Reef, between which and the reef whose visible projections are called Great and Little Mill Rocks, the Middle Channel is situated. The Eastern Channel is included between the Middle Reef and Hallet's Point. The main South or Ship Channel lies to the W. of Great and Little Mill Rocks, and between them and New York.

On the subject of an improved naval defense of Long Island Sound and of the harbor of New York, Lieut.-Commanding Davis, U. S. navy, wrote: "But a still more serious consideration is that of the increased facilities for naval de-

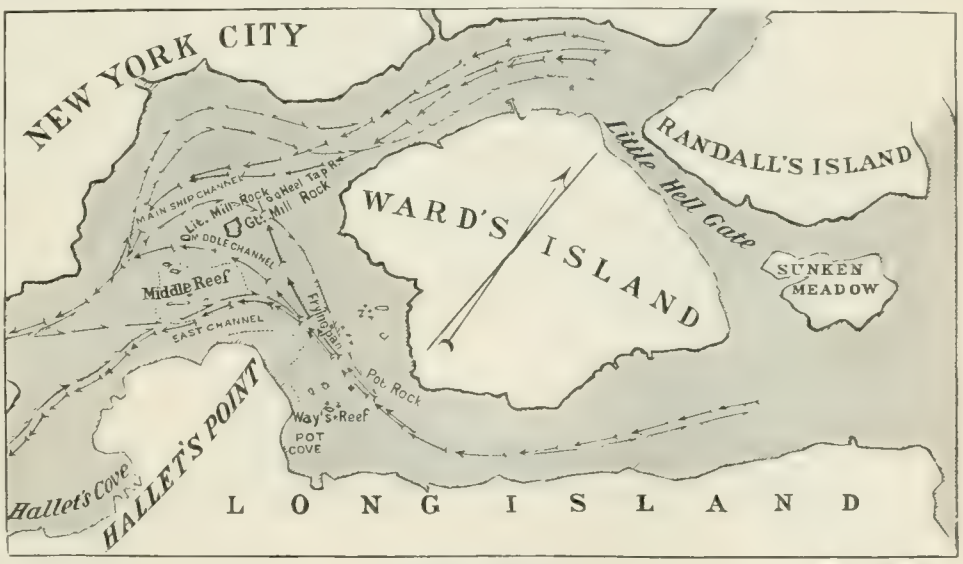


FIG. 1.—Map of Hell Gate.
Scale 1 : 25,000.

fense which this improvement would afford." In the event of a rupture with a superior naval power, Long Island Sound and its shores would not, as before, be at the mercy of the enemy.

The necessity of doing something to diminish the dangers to navigation was urgent, for, according to some reports, one sailing vessel out of every fifty sustained more or less damage from being forced by the violent currents upon the rocks and shoals; while, according to others, fifty vessels went on shore in two months. Notwithstanding, nothing was attempted until 1851, when the process of surface-blasting introduced by M. Maillefert was applied by him. This process was very simple, and consisted in placing upon the rock a charge of gunpowder, usually 125 lb., contained in

a tin canister, and exploding it by means of the voltaic current. The weight of the water resting upon the charge served to tamp it and to increase the effects of the explosion. The services of divers were not called into requisition, but the charges were simply let down from a boat by means of an iron rod. No means were provided of removing the broken rock after the blasts, it having been taken for granted that the force of the explosion would be sufficient to project the *débris* into deep water. This assumption was a manifest error, and the consequence was that, in default of mechanical means of removing the broken rock, it was broken fine and powdered by the successive charges until it was small enough to be carried away into deep water by the tidal currents.

The rock in Hell Gate, so far as it has been examined, is a gneiss, stratified in thin layers, the direction being about N. 52° E., and the dip a few degrees from the perpendicular. The different layers, differing in composition, hardness, and durability under exposure to abrading influences, would necessarily be unequally worn, whether exposed to the action of the air or to rapid currents of water, and this unequal action has been tested by observation. The surfaces of the reefs are consequently very uneven. Sheets of rock or clusters of sheets, composed of the more durable materials, are continually found projecting many feet above the general surface. Pot Rock had 8 feet over it at low water, deepening quickly to 14 feet on two sides, and suddenly to 24 feet on the other two. Its form was quite pointed, and essentially that of a truncated pyramid, down to a depth of 18 feet, where the surface became flattened and of considerable development in every direction. Frying Pan on the top was 16 feet long and only 6 inches wide, and had over it a depth of 9 feet at low water. Way's Reef on the top was conical, and had a depth over it of 5 feet at low water. Bald-headed Billy was described as a single rock about 6 feet by 6, and capable of being easily blown into deep water.

Whenever the rock was of small area, projecting above the general level of the bed-rock, of a conical or columnar shape, or when it presented itself in narrow sheets, the process became very effective, and was in fact generally cheaper than any other. On the contrary, when the rock was in large mass, with flattened surface—which was the condition to which the rocks were generally brought after the projecting parts had been broken off—then the process became very slow and inefficient.

The duty of an examination of Hell Gate was committed in 1866 to Brevet Maj.-Gen. John Newton, U. S. Engineers, who was instructed by the engineer department to prepare a project with a view to its improvement for the purposes of navigation, and sufficiently in detail to present a plan and estimate for the necessary operations. This officer submitted his report in Jan., 1867, in which the estimate was based upon removing the reefs by blasting, after drilling the surface from a fixed platform.

From the considerations which were presented the construction and working features of the steam-drilling cupola scow, the invention of Gen. Newton, resulted. This machine consists of two parts—a large float or scow, having a well-hole in it of a diameter of 32 feet. It is built very heavy and strong, and is provided with an overhang or guard around it, faced with iron, and has proved itself capable of withstanding violent collisions with other vessels. Besides affording this security, it serves also to transport the caisson or dome from place to place, and is a working platform from which the drilling-engines are operated. The caisson or dome is a hemisphere of the diameter of 30 feet, composed of a strong iron frame covered with boiler iron. The dome is open at bottom and at top, and is provided at the bottom with legs to support and level it, which are arranged to be let go altogether after the dome is lowered. Owing to the hemispherical shape of the caisson, the pressures of the moving mass of water which are normal to the surface necessarily pass through the center, and there is consequently no tendency to an overthrow by the action of horizontal currents, but, on the contrary, an additional downward pressure favorable to stability is produced. This would not necessarily be the result if the dome was of small diameter, for in this case, when on the bottom, it might lie entirely within the region of vertical eddies produced by the uneven character of the rock, and these forces acting within the interior of the dome would tend to an overthrow. When the dome is large, a small portion comparatively lies within the area of these abnormal currents, while the outer surface acted upon by the horizontal currents gives rise to normal forces which tend to an equilibrium.

The caisson or dome is simply a framework, affording a fixed support to twenty-one drill-tubes through which the drills operate. The dome is connected with the scow by four chains communicating with four hoisting-engines, by which it is lowered or raised. A framework is built upon the scow around the well-hole, to support the carriage holding the drill-engines, which by these means may be placed directly over the drill-tubes. The engines simply raise the drill-rods, and allow them to fall by their weight upon the rock, the vertical play being 18 inches. The drill and drill-rods together are about 10 feet long, and weigh from 600 to 700 lb. The cutting edges are in the form of a cross, and are 5½ inches long.

The scow, having the dome swung by chains, is first anchored over the rock to be operated upon, so that the bow and aft moorings pull against the direct currents of the ebb and flood tides; but as these may vary somewhat in direction from one tide to another, as well as during the course of the same tide, it becomes necessary, in order to steady the scow, to have side anchors also. The diver descends to ascertain whether the location is well suited to placing the dome on the bottom, and if not to select a better. The required change in the position of the scow is made by lengthening and shortening the mooring-chains with capstans, which are arranged to be worked, at will, with steam or man power. The dome is then lowered, and when it touches or approaches near the bottom the legs are let go by the run, and, being held by self-acting cams, support the weight of the dome. The chains are now unslung from the dome, which is thereby without connection with the scow. The diver, if practicable, descends to ascertain which of the drill-tubes it is necessary to use to break up the rock within the dome, and how the surface offers itself to each particular

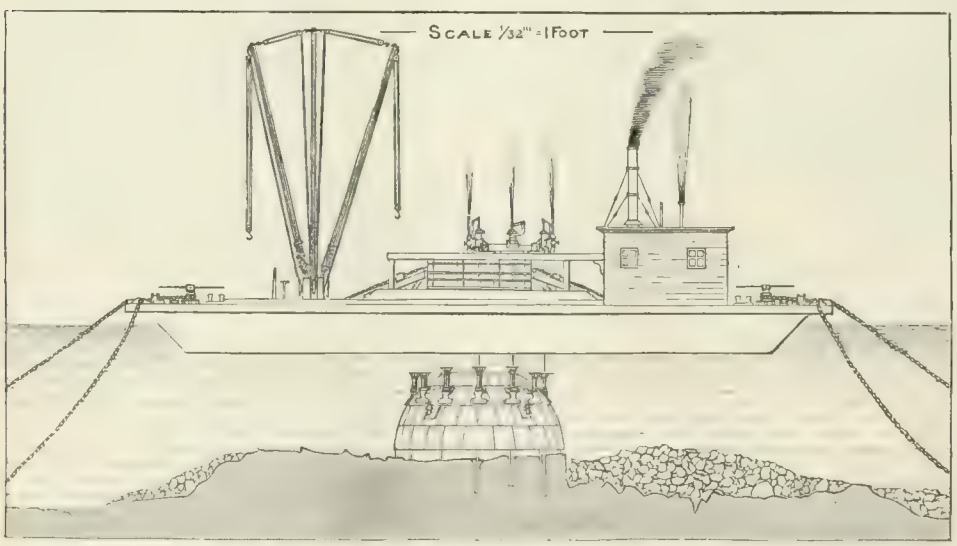


FIG. 2.—Submarine drilling scow.

drill. The drill-rods being introduced within the drill-tubes —which is easily effected during the most violent currents— a rope or other flexible connection is now made between the top of the drill-rod and the piston-rod of the drilling-engines. A flexible connection is necessary to the act of drilling, as in this machine, the dome remaining fixed upon the bottom in one position, while the scow holding the drill-engines swings for short distances from changes in the directions and strength of the currents, no rigid connection between the engines and drills would be practicable. The length of the rope-attachment is regulated by a feed-gear for the rise and fall of the tides and continual changes of water-level.

The drilling being completed, preparations are made for charging the holes with nitroglycerin or other explosive. The chains are hooked on the dome, which is then raised from the bottom, and the scow swung off from the spot to a safe distance, without casting loose the moorings. This distance will depend upon the proposed amount of charge of nitroglycerin, and will vary from 175 to 350 feet. The nitroglycerin and tin cases, of different lengths to suit the varying depths of the drill-holes, are carried to the spot upon a small scow, from which the diver descends to the first hole to be charged. He is guided to this by a line. Withdrawing the plug, he introduces into the hole the tin cartridge, which has been filled by the men on the scow and passed down to him. Each cartridge is attached, before it is sent down, to the wires. The diver then passes on to the second hole, guided by the plug-line which connects the stoppers of the adjacent holes, and in this way the whole circuit of holes is visited and charged. The leading wires are connected with the battery when the small scow has been withdrawn, and then explosion is made.

After the rock broken by the explosion covers the greater part of the reef, its removal is commenced. This is effected by means of the steam-grapple. Operations of the steam-drilling scow were the removal of Coenties Reef, Ways Reef, Diamond Reef, Pilgrim Rock — a reef 450 feet N. E. of Diamond Reef— and of others.

Hallet's Point Reef.—This reef was in shape an irregular semi-ellipse, the longer axis, which lay next to the shore, being 720 feet in length, and the shorter semi-axis projected about 300 feet straight into the channel. It was equally in the way of small and large vessels, especially when coming down with ebb, in the effort to hug the Astoria side, and so avoid being thrown upon the Middle Reef. The area operated upon, which included all that portion within the contour-line of 26 feet below mean low water, contained about 3 acres. This space was perforated with 41 radial tunnels, long and short, and with 11 transverse galleries, leaving as supports to the roof 172 piers of the natural rock. The aggregate length of tunnels and galleries was 7,426 feet, and the amount of rock excavated from these and deposited in dump-piles on the land was about 35,000 cubic yards. The work of excavation was begun in the latter part of Oct., 1869, and terminated in June, 1875; deducting the time lost by suspension of work due to exhaustion of current appropriations, the actual period consumed in this work was four years and four months.

As soon as the excavation was finished the work of drilling holes in the roof and piers, to be afterward charged with explosives, was begun. At the completion, Mar. 25, 1876, there had been drilled in the roof 5,375 3-inch, and in the piers 1,080 3-inch and 286 2-inch, holes, the total length of holes drilled being 56,548 feet of 3-inch and 1,897 feet of 2-inch holes. Capt. William H. Heuer, of the Corps of Engineers, was on duty as superintendent from June, 1872, to May, 1876, and his services were very valuable. Capt. James Mercur, Corps of Engineers, relieved him. Capt. Mercur's services were very valuable in the preparation for the explosion and afterward in the tunneling of Flood Rock.

The proximity of the reef to the habitations at Astoria and Ward's and Blackwell's islands made it necessary to devise a system of explosion which, effecting the work of demolition, would at the same time do no damage to life and property.

The cubic contents of the roof and piers were 63,135 cubic yards, and the amount of explosives as follows:

	Pounds.
Rend-rock	$9{,}127\frac{8}{16}$
Vulcan powder	$11{,}852\frac{12}{16}$
Dynamite, No. 1	$28{,}935\frac{4}{16}$
Total	$49{,}915\frac{9}{16}$

The explosives were packed at the respective places of manufacture in the cartridge-cases furnished by the Government. The number of holes charged was 4,427, and the number of tins used 13,596, 87 per cent. being 22 inches and the remainder 11 inches in length. One end of each tin case was fitted with a screw-cap with rubber washers to exclude water, the other end being arranged with four short lengths of brass wire soldered on the perimeter of the bottom and spread out. When the cartridge was pushed home, the wires, by their elasticity pressing against the surface of

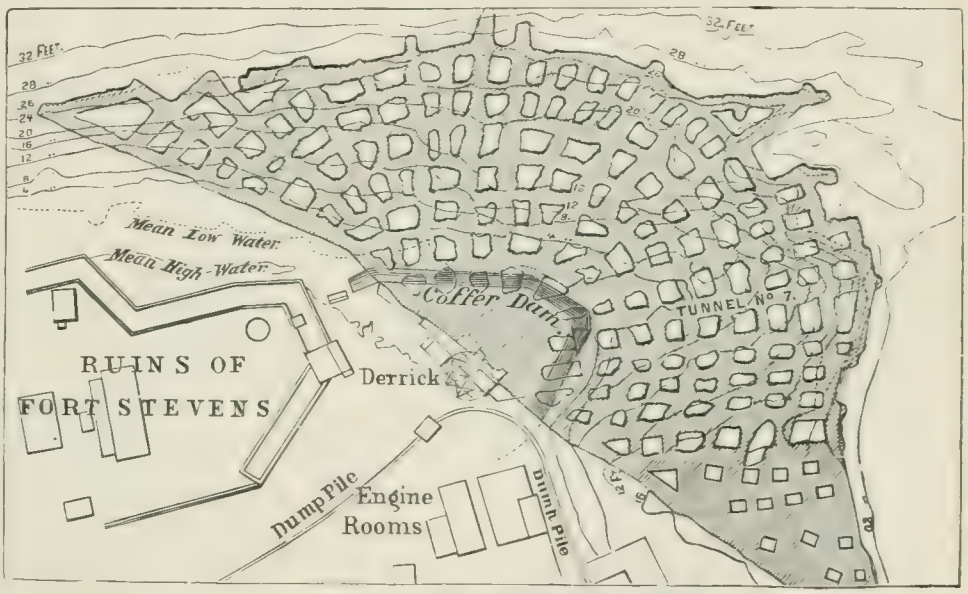


FIG. 3 Plan of excavations: scale, 1 : 1,500.

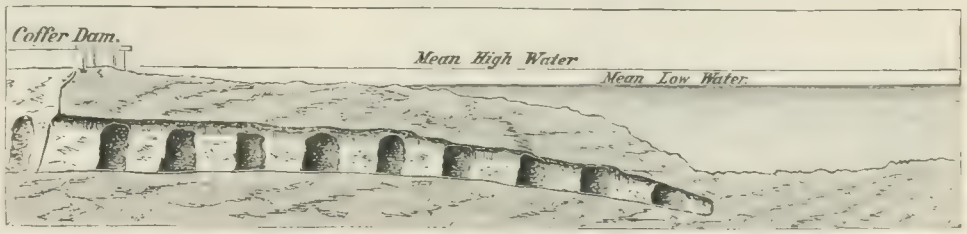


FIG. 4.—Longitudinal section through tunnel No. 7: scale, 1 : 750

the hole, prevented a falling out. After charging the holes the next operation was to insert the priming charges, three-quarters of a pound each of dynamite, contained in a brass tube, in which was inserted a fuse as a detonator, containing 20 grains of fulminate of mercury.

Resistance of lead wire, per 100 feet	0·157	ohms.
Resistance of connecting-wire, per 100 feet	0·68	"
Resistance of fuses, cold	1·90	"
Resistance of fuses at moment of explosion	2·01	"
Resistance of battery, per cell	0·15	"
Electro-motive force of battery, per cell	1·95	volts.
Current required to explode fuses in series	0·675	webers.

The resistance of the wires and of the battery and its electro-motive force was revised by Gen. Abbot at the Engineer Torpedo School, and he also furnished the resistance of the fuses at the moment of explosion and the amount of current required to explode fuses in series.

The general formula is

$$C = \frac{E}{R + r_1},$$

which with the substitution of the values of the electro-motive force and the resistances enabled the relations of the batteries and the number and grouping of the charges to be determined.

The quantity of actual water raised by the explosion was trifling, as made evident by the almost total absence of a propagated wave. The explosive effect in the air was not perceptible, the window-glass in buildings close to the shaft, and of one in particular along the edge of the shaft, not having been in a single instance broken. The underground shock was trifling, but perceptibly felt, it is said, in New York and Brooklyn.

The broken rock from the explosion has since been grappled and removed, making the depth over the reef at Hallet's Point 26 feet at mean low water. The removal of the *débris* demonstrated the fact that all of the cartridges were exploded, including 822 without electrical connections, which therefore went off by sympathy.

Flood Rock.—The Middle Reef—commonly known as Flood Rock—1,200 feet long and 600 feet in extreme width, was in the middle of Hell Gate, and separated the east and middle channels. It constituted the largest and most formidable obstruction, and its removal more than doubles the navigable capacity of these waters. Work was begun June 7, 1875, and was continued until May, 1876, resulting in sinking two shafts 65 feet apart, one 51 feet and the other 23 feet deep, and in driving 229 feet of tunnels. The work of excavation was recommenced Oct. 7, 1876, and was stopped Dec. 31. The excavation was resumed Aug. 1, 1878, and continued, with interruptions—in all, of several months—until May 31, 1883, when work was suspended for want of funds. But for this need the reef would have been blown up in Oct., 1883. In the spring and summer seasons it would have been hazardous, because of the electrical condition of the atmosphere, to attempt the explosion; in the winter the explosives, in the form in which these had to be used in the work, would freeze and prove difficult and uncertain of detonating; so that practically the season was limited to about two months in the autumn. The next appropriation, $360,000, was made July 5, 1884, and was limited in its application to "removing the reef at Hell Gate." The whole amount was applied to the removal of Middle Reef (Flood Rock). Work was resumed in Aug., 1884. About 9 acres of reef were operated upon, and 21,670 feet of tunneling, in galleries whose floors lay from 50 to 64 feet below mean low tide, with walls from 10 to 24 feet thick between them, and supported by 467 columns of rock, each 15 feet square, were charged with 240,399 lb. of rack-a-rock (a substance formed by mixing 79 parts of finely ground chlorate of potash and 21 parts of dinitrobenzole) and 42,331 lb. of dynamite. There were 11,789 drill-holes in the roof and 772 in the pillars, and their total length was 113,102 feet, or more than 20 miles. The tunnels were filled with water prior to the explosion by means of siphons discharging into the lowest level of the excavation. The explosion was effected by electricity Oct. 10, 1885. The whole area of the reef was shattered. The water rose some 150 feet, and rock from 40 to 50 feet. The underground shock was small, but was perceptible for many miles around. When the rock is removed the channel will be fully 1,200 feet in width. The actual oversight of the preparations for this explosion fell upon Lieut. G. McC. Derby, of the Corps of Engineers, Gen. Newton being confined for the most part, as chief of engineers, to his station in Washington, and his assistant, Col. Walter McFarland, being frequently called away by duties connected with the numerous works in his charge.

Unlike the explosion at Hallet's Point, but few of the 12,561 separate charges fired were ignited by electric discharge—the explosion being effected by the electric ignition of 591 primary charges, placed 25 feet apart, each composed of 10 lb. of dynamite No. 1, and by the sympathetic explosion of the rest. Gen. Newton in 1876 directed Mr. Striedinger, just prior to the explosion at Hallet's Point, to test the fact of the reported sympathetic explosion of charges of dynamite immersed in water, and the fact was verified, but the time was too short to do more than that. In 1885 Col. McFarland and Lieut. Derby were directed by Gen. Newton to make exhaustive experiments upon sympathetic explosions in water suited to the conditions at Flood Rock, and the results obtained were that dynamite charges encased in tubes of sheet copper 0·005 of an inch thick could certainly be fired by the explosion of 10 lb. of dynamite at a distance of 27 feet. And this carefully found result enabled the engineers to dispense with electric connections, except for a very limited number of the charges fired.

Gen. Newton gave up the charge of Hell Gate Dec. 31, 1885, and the removal of the broken reef is not finished, owing, it is believed, to inadequate appropriations.

JOHN NEWTON.

Hellgramite-fly: See ENTOMOLOGY.

Hellin, hel-yeen': town; in the province of Albacete, Spain, on the Menedo; beautifully situated on the slope of the Sierra de Segura; 69 miles by rail N. N. W. of Murcia (see map of Spain, ref. 17–H). It is well built and contains interesting remains of a Roman castle. In its vicinity are rich sulphur mines and sulphurous springs used for bathing. Pop. (1887) 13,679.

Hellmann, JOHANN GEORG GUSTAV, Ph. D.: meteorologist and bibliographer; b. in Loewen, Silesia, July 3, 1854; educated at the gymnasium at Brieg, and in the Universities of Breslau, Berlin, and Göttingen; after completing his education spent two years in Spain making hypsometrial observations in the Sierra Nevada, and studying the climatological conditions of the subtropical zone. He then made an official study of the Government meteorological services, and spent a year at St. Petersburg with Dr. Wild, director of the Russian service. In 1879 he took part in the International Meteorological Congress at Rome, where he proposed the international meteorological tables and the bibliography of meteorology. In the autumn of 1880 he entered the Royal Prussian Meteorological Institute as assistant, and is now the first officer. He is one of the editors of the *Deutsche Meteorologische Zeitschrift*, and is a prolific writer, the most extensive of his works being the *Repertorium der Deutschen Meteorologie* (Leipzig, 1884). MARK W. HARRINGTON.

Hellmuth, hel'moot, ISAAC, D. D.: Anglican bishop; by birth a Polish Jew; became in 1856 an Anglican minister of Canada; founded Huron College (1863) and Hellmuth College (1865), London, Ontario, and Hellmuth Ladies' College (1869); was successively archdeacon and dean of Huron; became in 1870 suffragan Bishop of Norfolk and coadjutor of Huron, and in 1871 succeeded Dr. Cronyn as Lord Bishop of Huron. Dr. Hellmuth resigned his see in 1883 to become assistant to the Lord Bishop of Ripon, England. On the death of Bishop Bickersteth, of Ripon, Dr. Hellmuth became rural dean of Bridlington, England (1885), and perpetual curate of Bessingby, diocese of York (1888).

Revised by W. S. PERRY.

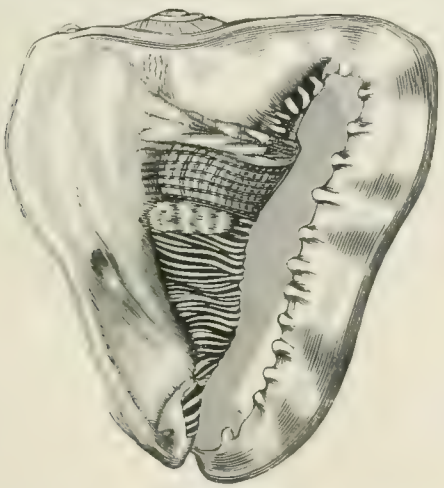
Hellquist, CARL GUSTAF: historical painter; b. in Kongsör, in Vestmanland, Sweden, in 1851. He has painted a number of scenes from Swedish history, and has received many medals. Hellquist is professor in the Berlin School of Arts, and since he became a resident of Germany he has produced several pictures from German history, among them *Luther's Arrival at Wartburg*. R. B. A.

Helm [M. Eng. *helme* < O. Eng. *helma*: M. H. Germ. *helm* > Mod. Germ. *Helm*, handle, rudder. See HALBERD]: on shipboard, the steering apparatus, including wheel, tiller, and rudder. To *put down the helm* is to bring the ship's head to the wind; to *put up the helm* is the reverse. By means of the wheel the rudder is inclined to an angle varying from the ship's course, until by the action of the water upon the rudder the ship's direction is properly modified.

Helmet [from O. Fr. **helmet, elmet*, dimin. of **healme, heaume*, from O. H. Germ. *helm*, helmet > Mod. Germ. *helm*]: a piece of armor for the head. This is the general term applied to defensive head-coverings of all epochs and of all materials and shapes. Leather caps and caps stuffed and lined with felt, etc., and also caps of skin with the hair left on, are always worn before the skill of the iron-workers is sufficient to enable them to make iron head-gear. Bronze helmets are sometimes worn by peoples well advanced in certain arts, but still unskilled in iron-work. Thus the helmets of early Greek peoples were often of bronze, very finely manufactured. These Greek helmets sometimes left the face exposed; sometimes a *nasal* or nose-piece and two side-pieces covering the cheeks came so near to meeting one another that only the eyes and parts of the cheeks were left uncovered; sometimes also the cheek-pieces were hinged to the cap, and intended to be tied together under the chin. In a similar manner, and even more generally, the helmets of the Romans left the face uncovered. In fact the shield was expected to protect the face and throat, the helmet being rather calculated to resist blows from behind and from above. It was left for the nobles and gentlemen of the Middle Ages to cover their heads with completely closed helmets, those of the time of Richard I. of England being the first. The *heaume* was always a closed head-piece, sometimes made with an adjustable vizor, or with two movable pieces, the *vizor* and the *beaver*. As the heaume grew heavier and larger in the competition between weapons of offense and armor of defense, lighter head-pieces, such as the bassinet, were used, and in the thirteenth and fourteenth centuries some such lighter head-piece was worn in war, and at the moment of going into battle the great heaume was put on outside of it, covering the neck and often resting on the shoulders. This was so oppressive that the *salade* was introduced, a solid and strong cap for the top and sides of the head, the neck and throat being protected by other parts of the armor; and finally the *armet* was invented, a perfect piece of armor, but very elaborate and very costly. Very soon after this last invention, complete armor began to disappear, and the *morion*, a kind of steel hat with a brim, replaced all other head-pieces, except that the armet continued to be the head-piece of ceremony and of state, and as such is represented in portraits of men of very high rank, down to the reign of Louis XIV. and of James I. of Great Britain.

RUSSELL STURGIS.

Helmet-shell: the large shell of gasteropods of the genus *Cassis* of which there are some thirty-five living and as many



Cassis tuberosa.

fossil species. The living ones are found in all tropical seas, and are used in making shell cameos. *Cassis cornuta* gives a white figure on an orange ground; *C. tuberosa* and *madagascarensis*, white on claret color; *C. rufa*, a salmon color on orange.

Helm'holtz, HERMANN LUDWIG FERDINAND, von: physiologist, physicist, and mathematician; b. at Potsdam, Prussia, Aug. 31, 1821. He took his degree in medicine at Berlin 1842; was a military surgeon until 1847, during which year he published his famous memoir, *Ueber die Erhaltung der Kraft* (upon the *Conservation of Energy*). Helmholtz taught anatomy in the Berlin Academy of Art 1848–49; he became Professor of Physiology and General Pathology at Königsberg (1850), where in 1851 he announced the invention of the ophthalmoscope. In 1855 he was appointed Professor of Anatomy and Physiology at Bonn, and in 1858 he was elected to fill the newly created chair of Physiology at Heidelberg. His greatest works are *Handbuch der physiologischen Optik*, the preparation of which occupied ten years (1856–66), and the almost equally important *Lehre von den Tonempfindungen* (1862). From the first, von Helmholtz had been a physicist as well as a physiologist, and in 1871 he became Professor of Physics and director of the physical laboratory of the University of Berlin, positions he held until 1887, when he was called to the head of the great physico-technical institute for research, established by the German Government at Charlottenburg. In 1883 Helmholtz, who had long been a privy councilor to the Emperor William I., became *von* Helmholtz, hereditary nobility having been conferred upon him by that monarch. Under von Helmholtz Berlin became the greatest center in the world for the study of experimental and theoretical physics. His own contributions, chiefly in the latter field, have been accorded the very highest rank. D. near Berlin, Sept. 8, 1894. E. L. NICHOLS.

Helmholtz, ROBERT, von: physicist; son of Professor Hermann von Helmholtz. He published several papers of note, particularly in the domain of the physics of gases. Two of these, entitled *The Steam-jet and the Dissociation of Gases*, in collaboration with F. Richarz (Wiedemann's *Annalen*, vol. xl., p. 161), and *The Radiation from Burning Gases*, were posthumous. The latter was awarded the prize of the Society for the Promotion of Industries in Germany. Robert von Helmholtz died at the very beginning of his scientific career, in Aug., 1889. E. L. NICHOLS.

Helmont, JAN BAPTISTA, van: physician; b. at Brussels, 1577; studied at the University of Louvain; became a mystic, and after varied experiences married a rich lady, settled down at Vilvoorden, and spent all his time in his laboratory and in curing people according to a new method. He was a leading alchemist. His writings, *Ortus Medicinæ* (1648), *Opuscula Medica Inaudita* (1644), are of much interest. D. Dec. 30, 1644.

Helmstedt: town; in the duchy of Brunswick, Germany; 24 miles E. S. E. of the city of Brunswick (see map of German Empire, ref. 4–E); has a great name in Church history, as its university, founded in 1575 by Julius, Duke of Brunswick, and suppressed by Jerome Bonaparte in 1809, was the seat of the syncretistic tendency of German theology—that form of Lutheranism which, originating from Melanchthon, or at least developing under his influence, sought a reconciliation with the Reformed Church. The town has large alum and vitriol works, and carries on a brisk trade. Pop. (1890) 10,955.

Hel'mund: a river of Afghanistan; rises in the Kuh-i-Baba Mountains, W. of Cabul; flows S. W. through Afghanistan, and receives a number of tributaries, by means of which it drains about one-third of Afghanistan S. of Cabul and Herat. It empties into the salt lake Hamun-i-Sawaran. In the upper part of its course it traverses a desert waste; the lower half of its course is fringed with villages, grain-fields, and gardens. C. C. A.

Heloder'ma [Mod. Lat., from Gr. ἧλος, nail + δέρμα, skin]: a genus of lizards, of the family *Helodermatidæ*, having, besides other distinctive anatomical characters, the head and rest of the body covered with rounded scales, suggestive of small nail-heads. The tongue is fleshy and slightly forked, the teeth are grooved and connected with the outlets of very largely developed salivary glands. The color is orange yellow, with irregular black markings, the brilliancy of coloration varying according to surrounding conditions and the time that has elapsed since the shedding of the epidermis. There are two species, *Heloderma horridum*, from Northern Mexico, and the Gila monster (*H. suspectum*) from Arizona, New Mexico, and Texas. They are sluggish in their movements, and feed to a considerable extent on birds' eggs. The helodermas are of great interest, from the fact that they are the only known venomous lizards, although the extent to which they are poisonous doubtless is dependent on the conditions under which the bite was inflicted. Marvelous tales are told in Mexico of *H. horridum*, and how men have died after having been bitten by this reptile. On the other hand, the bite of the heloderma has been followed by no serious results, and it is a question as to whether death re-

sulted from the bite, or from the ensuing treatment. Chickens, pigeons, and cats have been bitten without any ill consequences, but pigeons, frogs, and rabbits injected hypodermically with the saliva of this lizard have died in a few minutes. The poison does not attack the nerve centers, but acts on the heart, producing paralysis of that organ. See article *Lizard* in *Ency. Brit.* (9th ed., vol. xiv., p. 735); Sir Joseph Fayrer in *Proc. Zoöl. Soc.* (London, 1882, p. 632); S. Weir Mitchell and E. T. Reichert, *Med. News* (Feb. 10, 1883) and *Science* (vol. i., p. 372); and H. C. Yarrow in *Forest and Stream* (vol. xxx., p. 412). F. A. Lucas.

Heloise, or **Eloise**: See Abelard.

He'los: town of Laconia, near the mouth of the Eurotas; founded by Helius, the youngest son of Perseus. It defended itself with great stubbornness against the Dorians, who after conquering it took revenge by making all its inhabitants slaves; hence the name Helots (*q. v.*) for the Spartan serfs or state slaves, who were hired out to citizens, but might not be sold or emancipated. When Pausanias visited it in the second century A. D. he found it in ruins, and even its site is not precisely known.

He'lots [from Lat. *Helotæ* = Gr. Εἵλωται, plur. of Εἵλώτης, inhabitant of Ἕλος, a town of Sparta. See Helos]: the third and lowest class in ancient Sparta; the serfs of the state. They were divided among the *Spartiatæ*, or highest class, by lot, and tilled their lands, paying to their masters a fixed portion of the harvest. They also served in war in various humble capacities. The *Crypteia* was an organized guard over the Helots by young Spartans, made necessary by the great numbers of the former (twice as many at least as all other classes together) and their general uneasiness, but the statement that there was actual hunting and slaying of the Helots by this police guard is unfounded. See Greece, Ancient History of. C. H. Thurber.

Helps, Sir Arthur: author; b. at Streatham, Surrey, England, July 10, 1813; graduated at Cambridge in 1838; became private secretary to the Chancellor of the Exchequer, and in 1859 clerk of the privy council for England. Among his numerous works are *Thoughts in the Cloister and the Crowd* (1835); *Essays Written in the Intervals of Business* (1841); several dramas; *The Claims of Labor* (1844); *Friends in Council* (1847; 2d series, 1859); *Companions of my Solitude* (1851); *Conquerors of the New World* (1852); *Spanish Conquest of America* (1855–61); *Life of Pizarro* (1869); *Brevia* and *Casimir Maremma* (1870); *The Life of Cortez* and *Thoughts on Government* (1871); *Life of Brassey* (1872); *Ivan de Biron* (1874); *Social Pressure* (1874). Helps's writings all have a noble moral purpose, and are written in a pure though not forcible style. He enjoyed the special favor and patronage of Queen Victoria for many years. D. in London, Mar. 7, 1875. See English Language.

Hel'singborg: town of the province of Malmö, Sweden, on the Sound, opposite to Elsinore, in Denmark (see map of Norway and Sweden, ref. 14–D). Pop. (1890) 20,410.

Hel'singfors [Swed.; Helsing fall]: the capital of the grand duchy of Finland; on the Gulf of Finland (see map of Russia, ref. 5–B). It is a handsome town, with broad streets intersecting at right angles, fine parks, and stately public buildings. It has an excellent harbor, and is strongly fortified. Its fortifications, of which Sveaborg and Gustavsvärd are the two most important points, stretch over a row of seven rocky islands, and were in 1854 bombarded by the allied French and British fleet. Helsingfors has a university (removed from Åbo in 1827) attended by about 2,000 students, a military academy, and a considerable trade. The principal articles of importation are colonial and manufactured wares, wine, etc.; those of exportation are lumber, paper, and butter. The city was founded by Gustavus I. of Sweden in the sixteenth century, and the majority of the inhabitants are still Swedish in race and speech. Pop. (1890) 65,535, exclusive of the garrison.

Helst, Bartholomew, van der: portrait-painter; b. at Haarlem, Holland, in 1613. His works are to be seen in Holland and Belgium. His most important pictures are at Amsterdam; the one most famous is the *Banquet of the Civic Guard*, in celebration of the treaty of 1648, which acknowledged the independence of the Dutch republic; this is now in the museum, commonly called *Banquet of the Archers*. Also in the museum are a portrait group of the *Umpires* or judges of a shooting-match, and a dozen single portraits of great value, among which is the *Princess Mary*, daughter of Charles I. of England and mother of William III. of England. There are several portraits in the museum of Rotterdam, and others at The Hague, London, and Munich. He lived and died at Amsterdam, leaving a son who was also a distinguished portrait-painter. D. Dec. 16, 1670. Revised by Russell Sturgis.

Helvel'lyn: a mountain of Cumberland, England, 3,118 feet high, one of the highest points of land in England.

Helvetian, or **Helvetic, Republic**: the name of the state established in place of the Swiss Confederation after the French conquest in 1798, and maintained till Mar. 10, 1803. See Switzerland, History of.

Helve'tii [Lat., from Celtic, meaning high-hill men]: the ancient Celtic inhabitants of Western Switzerland. Cæsar's *Commentaries* (*De Bello Gallico*) give a graphic account of their attempt to occupy more fertile parts of Gaul, and of their terrible punishment and subjugation by the Romans (58 B. C.). Previously (107) they had met and defeated a Roman army, and had accompanied the Cimbri in their invasion of Italy, but made good their retreat after the defeat by Marius (101). In 70 A. D., refusing to recognize Vitellius, and taking the part of Galba, they were severely punished by the former. In later times they scarcely appear as a separate people. Revised by G. L. Hendrickson.

Helve'tius, Claude Adrien: encyclopædist; b. in Paris, Jan., 1715; was educated at the College of Louis-le-Grand; trained by an uncle at Caen for a financial career; appointed in 1738 to the lucrative office of farmer-general; a little later to that of chamberlain to the queen's household; acquired a large fortune; married the Countess de Ligniville; retired in 1751 to an estate at Voré, in Le Perche, where he spent the greater part of the remainder of his life in the care of his property and in literary labors. Having associated much while in Paris with the French philosophers of the day, Diderot, Holbach, and d'Alembert, he acquired a taste for philosophical study, and in 1758 brought out the celebrated work *De l'Esprit*, on which his fame chiefly rests. In this book he began with the declaration that "the difference between man and the other animals is simply the difference in their external form"; that "if nature, instead of giving us hands and flexible joints, had terminated our limbs with hoofs like those of a horse, we should have remained wanderers on the earth, chiefly anxious to find our needful supply of food, and to protect ourselves against the attacks of wild beasts"; and that "the structure of our bodies is the sole cause of our superiority over the beasts." He then advances to the position that "our thoughts are simply the product of two faculties which we have in common with other animals—viz., the faculty of receiving impressions from external objects and the faculty of remembering those impressions." From these premises he advances to the position that "all our notions of virtue and duty must be tested by reference to our senses, and the gross amount of physical enjoyment which they afford." "As all our emotions spring directly from our physical sensibilities," and "as our sensibilities are dependent on the outer world," it follows that "everything we have and are we owe to the objects which surround us." As a necessary corollary to these doctrines it followed not only that man is called upon to abandon himself most completely to the gratification of his appetites and passions, but also that in case he finds that he is not what he desires to be, he should change or overthrow those surrounding objects which compel him to be what he is. If those objects are political forms he should alter them or sweep them away. Thus the book furnished the basis of revolution in politics as well as in ethics. It had immeasurable popularity in France, and attracted great attention everywhere in Europe. The influence it exerted on morals in France was probably greater than that exerted by any other book during the eighteenth century. At his death Helvetius left several other works, that entitled *De l'Homme, de ses Facultés, et de son Éducation*, being the only one of importance. D. at Paris, Dec. 26, 1771. For his philosophy in a nutshell see the author's introduction to *L'Esprit*; also Morley, *Diderot and the French Encyclopædists*. C. K. Adams.

He'mans, Felicia Dorothea (*Browne*): poet; b. at Liverpool, England, Sept. 25, 1794; married Capt. Hemans in 1812, and in 1818, after the birth of five sons, separated from him on account of the uncongenial character of the union. Mrs. Hemans from that time resided in Wales, Lancashire, and Ireland, engaged chiefly in literary production. Mrs. Hemans's best poetry is characterized by grace and tenderness,

which is especially exhibited in her less ambitious pieces. Her works include *Early Blossoms* (1808); *The Domestic Affections* (1812); *The Forest Sanctuary* (1827); *Records of Women* (1828); *Songs of the Affections* (1830). D. near Dublin, May 12, 1835.

Hematite: See HÆMATITE.

Hematozoa: See HÆMATOZOA.

Hemeralopia: See BLINDNESS.

Hemibran'chii, or **Hemibranchiates** [Mod. Lat.; Gr. ἡμι-, half + βράγχια, gills]: an order of teleost fishes with the palatine bone directly articulated with the quadrate, without the intervention of the pterygoid; with jaws normally developed; the mouth being bounded above by the premaxillary, behind which is the supermaxillary; branchial apparatus imperfect, the superior branchihyals being rudimental, and at least the fourth wanting; anterior pharyngeal bones distinct; scapular arch connected directly with the post-temporal, no postero-temporal being developed; mesocoracoid absent; and ventral fins abdominal, the pubic bones having no connection with the scapular arch. To this order belong several families, the sticklebacks and the trumpet-fishes being the best known. They differ from most fishes in the structure of the shoulder-girdle, and the union of the palatine arch directly with the quadrate bone, as well as by the imperfection of the branchial arches, to which the ordinal name refers.

THEODORE GILL.

Hemichorda'ta [Mod. Lat., from Gr. ἡμι-, half + χορδή, an intestine, cord made of an intestine]: the group of animals known as ENTEROPNEUSTA (*q. v.*), so called in allusion to the fact that the notochord occurs only in the anterior portion of the body. See also CHORDATA. J. S. K.

Hemicra'nia: See MIGRAINE.

Hemi'na, L. CASSIUS: a Roman historian of the second century B. C., whose work in at least four books began with the founding of Rome, and included the second Punic war. The few fragments are given in Peter's *Frag. Hist. Rom.* (Leipzig, 1883). pp. 68–74. M. W.

Hemiple'gia [Mod. Lat., from Gr. ἡμι-, half + πλήσσειν, strike, smite]: that kind of paralysis which affects only one side of the body; or if both sides are affected, it is from the occurrence, a very rare one, of double hemiplegia—that is, of two concurrent paralytic strokes, one affecting each side. It manifests itself usually in the upper and lower extremities of one side, and in the parts of the head which are supplied by the fifth nerve. It may be the result of an apoplectic stroke, or of a slow effusion, or of the growth of a tumor within the brain. Owing to the decussation of the pyramids, the paralysis takes place usually on the side of the body opposite to the side of the brain in which the lesion has occurred. For example, if there be a tumor growing in the left hemisphere of the brain the paralysis will, as a rule, be manifested in the right side of the body, because the nerve-fibers cross over from side to side near the base of the brain. But if the lesion occur below this crossing, there may be hemiplegia on the same side. Hemiplegia affects chiefly the nerves of motion, but affects more or less those of sensation also. Temporary attacks of hemiplegia are also observed in chorea, epilepsy, and hysteria. The treatment of hemiplegia varies with the condition of the patient and the cause of the stroke. Generally time and rest are important to the relief of the patient.

Revised by W. PEPPER.

Hemipodii [Mod. Lat., from Gr. ἡμίπους, half-footed; ἡμι-, half + πούς, ποδός, foot]: an order, or sub-order, of gallinaceous birds containing the little bush-quails of the Old World; the equivalent of the family *Turnicidæ*. The crop is wanting and the arrangement of the bones of the palate is different from that of other fowls. The hemipodes are among the smallest of the game-birds, and with the exception of one species, which ranges into Southern Europe, are residents of Asia, including the Malayan region, Africa, and Australia. They are very pugnacious, the females especially so, and are sometimes trained, like game-cocks, for fighting by the Javanese. F. A. LUCAS.

Hemip'tera: an order of insects which derives its name from the fact that in many forms the anterior pair of wings are horny on the anterior half and membranous behind. Since this is not true of all, but since all are characterized by having the mouth parts converted into a beak or proboscis for piercing the animals or plants on which they feed, the group has frequently been termed *Rhynchota* (Gr. ῥύγχος, a beak). The group is further characterized by having the first joint of the thorax free, and an incomplete metamorphosis. The beak is composed of the under-lip rolled into a usually three-jointed tube, in which the mandibles and maxillæ, drawn out into four piercing organs, play freely back and forth. Under the term *Hemiptera* are included those insects to which the common name bug is properly applied. The order is usually divided into two sub-orders, the *Homoptera* and the *Heteroptera*. In the *Homoptera* the wings, when present, are of the same membranous structure throughout, and when at rest lie inclined upon the sides of the body. Here belong the cicadas (harvest-flies and seventeen-year locusts), the leaf-hoppers, in which the legs are fitted for springing, and the plant-lice and scale insects (frequently elevated into a sub-order, *Phytophthires*). In the *Heteroptera* the anterior wings are half horny, half membranous, and are folded flat when not in use. In some the wings are lacking. The beak is usually carried folded back between the bases of the legs. Here belong the water-skaters, the water-scorpions (*Nepidæ*), rear-horses, bed-bugs, and the like. The various LICE (*q. v.*) are frequently included as a third sub-order of *Hemiptera*. No general account of the *Hemiptera* of America has appeared. The student must seek scattered monographs and papers. See ENTOMOLOGY. J. S. KINGSLEY.

Hemitripter'idæ [Mod. Lat.; liter., belonging to the hemitripterus family; deriv. of *hemitripterus*; Gr. ἡμι-, half + τρι-, root of τρεῖς, three + πτερόν, wing, fin]: a family of acanthopterygian fishes, with the vertebræ in greatly increased number (16 + 23), having an enlarged sub-orbital bone articulating with the preoperculum, and distinguished by the elongated spinous dorsal fin, combined with the characters of the true cottoid (the head not compressed, no true scales, and ventrals imperfect and enveloped in a thick skin). The family is represented on the coasts of the U. S. by a species known as the deep-water sculpin (*Hemitripterus acadianus*). THEODORE GILL.

Hemlock, or **Spotted Hemlock**: a biennial plant (*Conium maculatum*), family *Umbelliferæ*, native in Europe, but naturalized and cultivated in the U. S. for medicinal purposes. It has an erect, round, branching stem from 3 to 6 feet high, marked with brownish-purple spots, whence the name "spotted hemlock." It bears large deep-green, decompound leaves, and small white flowers in compound terminal umbels. The plant, especially in summer, has a peculiar fetid, mousy smell. The leaves and fruit are used in medicine, the active principle being a liquid alkaloid, *coniine*, most abundant in the fruit. This is a yellowish oily fluid, volatile, of acrid taste, and strong mousy odor, slightly soluble in water, but freely in alcohol, ether, and oils. The action of hemlock results in destroying the conducting power of the nerves of motion, producing thus muscular weakness and paralysis, the effect showing itself first in the muscles of the eyes and lids and of the legs. In poisonous doses it produces complete paralysis, and thus death by paralysis of the nerves of respiration. It is not certain whether the hemlock used by the ancients as a state poison was this plant or the *Cicuta virosa*, a much more virulent herb. Hemlock has had a variety of medicinal virtues assigned to it, but its only rational use is to subdue abnormal motor activity or irritability. Many of the preparations of hemlock are apt to be inert, from lack of the volatile active principle, having been prepared from weak specimens of the plant. Revised by H. A. HARE.

Hemlock-tree, or **Hemlock-spruce** [so called from the resemblance of its branches to those of the hemlock plant]: the *Tsuga*, or *Abies canadensis*, one of the most common of the coniferous trees of the Northern States and British America. It is a very large tree, and when young is very graceful. Though the timber is coarse and cheap, it is very serviceable, and immense quantities of it are employed in house-carpentry in the older and longer-settled parts of North America. The bark and its extract are very extensively employed in tanning leather in the U. S.—much more so than any other astringent substance. The wood is of little value as fuel, burning up very quickly and with a loud crackling noise. "Hemlock oil" is distilled from its leaves and twigs, and "Canada pitch" is obtained from the old trees. The Carolina hemlock is *Tsuga caroliniana*. In cultivation the hemlock is one of the most graceful and comely of all trees, especially when young. It succeeds well in ornamental hedges. Several cultivated or horti-

cultural varieties are sold. If wild trees are transplanted to the open garden, care should be taken to select those which stand in sunny and exposed places. L. H. Bailey.

Hemmelinck, John: See Memling.

Hemmingsen, Niels: Danish theologian; b. on the island of Laaland, May 12, 1513; son of a poor peasant. After studying at Lund, he went (1537) to Wittenberg, where he remained five years, being one of Melanchthon's favorite pupils; became Professor of Greek at the University of Copenhagen in 1543, Professor of Theology in 1553, and several times rector. In 1579, on account of his Calvinistic teachings, he was dismissed from the university and deprived of his orders. He spent the rest of his life quietly in Roskilde, the latter part of it completely blind. He was a voluminous writer, all his works with one exception being in Latin. This Danish work, *Lifsens Vej* (The Way of Life, 1570), was intended both for the instruction of the people and as a confession of his own faith. His most important work is *Syntagma institutionum christianarum* (1574), the first system of theology published in Denmark. Besides theological writings, he published a number of essays on marriage and divorce, superstitions, etc. He was called "Universalis Daniæ præceptor." D. May 23, 1600. D. K. Dodge.

Hemorrhage: See Bleeding.

Hemorrhoids: See Piles.

Hemp [O. Eng. *henep*: Icel. *hampr*: Germ. *hanf*; a word common to all Teutonic tribes and borrowed from some people, probably the Scythians of Southern Russia, prior to the first mutation of consonants; cf. Gr. *κάνναβις*, Lith. *kanapes*, themselves loan-words]: a fiber, the use of which in Persia and India antedates the period of accurate knowledge, and the introduction of which into Europe was contemporaneous with civilization. This fiber is similar to that of flax, but coarser and stronger. (See Fiber.) The plant which produces it is also known as hemp, and is cultivated for its seed and for the oil which is expressed from the seed, and the hemp of warm countries, especially of India, possesses peculiar medical properties. (See Hashish.) The plant is known botanically as *Cannabis sativa*, and is an annual belonging to the nettle family (*Urticaceæ*). It is a diœcious plant, having the fruit-bearing or female flowers, and the sterile or male flowers, upon different plants. Hemp grows 4 to 12 feet high, and makes its growth almost as rapidly as Indian corn. The stem is somewhat angular, rough, and hairy, branching freely when growing singly, but very little when crowded. The leaves are generally compound, five to seven leaflets being united upon the end of one leaf-stalk. The leaflets are 3 to 5 inches long, slender, and toothed at the edges. The staminate or male flowers are of a greenish-white color, and occur in loose clusters in the axils of the leaves near the top of the plant or the ends of the branches, while the pistillate or fruit-bearing flowers occur mostly in pairs close set in the axils of the upper leaves. As usually cultivated, it flowers in June and ripens its seed in August.

The leading hemp-producing countries of the world are Russia, Turkey, India, Holland, Germany, Italy, and Great Britain. The Riga hemp of Russia combines fineness and strength, and is regarded as the best. There is, however, a kind produced in Italy called "garden hemp," raised with great care by hand-culture, which is the finest. The fiber is separated from the boon much as flax is, and is spun and woven in almost identically the same way. Excellent sheetings and shirtings, white and strong, are made from hemp, and towelings (huckaback), osnaburgs, tablecloths, napkins, floorcloths, sail-duck, and the like, are manufactured on a large scale, and form articles of extensive commerce. By far the greatest consumption of the fiber is for rope, cordage, and twine.

Cultivation.—The cultivation for fiber is simple, the seed being sown as early as the ground is warm on well-prepared sward ground, which, if of a clayey nature, should be plowed in the autumn and worked again in spring. It is not usual to manure directly for the crop. Four to six pecks of seed are used in the U. S. to the acre, but the quantity varies according to the climate and to the strength of the soil, upon which also the vigor of the plants depends. In England 2 to 3 bush. of seed are used, but there the height of the plants is about 4 to 6 feet; in the U. S. it is frequently 7 to 9. The seed is thoroughly harrowed in and rolled, and requires no attention until it is cut. Cutworms are often quite injurious to it, and crows and blackbirds on a hemp-field are the farmer's best friends. Hemp has no diseases that are serious. When the blossoms of the flowering (male) plants turn yellow and fall off, it is usual in the U. S. to cut the whole crop; but in Europe, as soon as the "blossom hemp" has fertilized the crop and the seed is set, the hands pass through, pull all the male plants, and, binding them in bundles, dry and stack them for subsequent rotting. The female plants remain until the seed is ripe, when they are cradled, the tops, in which the seed is, cut off, and the stalks dried and stacked. Hemp is generally cradled, but if over 7 feet high this is hardly possible, and it should be cut with sharp bush-scythes. After two or three days' sunning the hemp is bound and stacked, either upon the ground if it is to be dew-rotted, or near the pools if it is to be water-rotted. The rotting is performed in the autumn or at the commencement of cool weather, and requires in pools or vats ten to twenty days, according to the temperature. Vats under cover are preferred, each being about 20 by 40 feet, and 2 to 3 feet deep. The hemp is laid in crossways, and weighted down by stones laid upon planks. The water is changed by drawing off and refilling when required. The process is completed when the fiber separates readily from the stalk, or of its own accord springs off from it like a fiddle bow-string. It is dried and stacked, and "broken" in the winter. This operation is like that of breaking flax, but performed with heavier implements. The boon is scutched and beaten out of the fiber, which is twisted into hands or hanks and pressed into bales for market. In dew-rotting the hemp is exposed to the weather in thin layers, and turned occasionally until the gumminess of the stalks is gone and the fiber separates from the boon as before described.

When hemp is cultivated for the seed it is planted upon ground suitable for corn, manured the fall before if the soil be not too light and sandy. It flourishes in moist rich soils. The culture is like that of corn, the hills being 3½ to 4 feet apart, according to the richness of the land. A dozen or more seeds are dropped in each hill, and at the first hoeing the plants are thinned to five or six. Cutworms may take two or three of these, and at the second hoeing they are reduced to four. When the blossom-hemp can be distinguished, these plants are removed, and two or three of the others left to each hill. One plant of the male or blossom-hemp is allowed to remain in the alternate hills each way, making one to each four hills, and as soon as the seed is set, the blossoms having ceased to shed their pollen (the yellow dust which falls when they are shaken), these plants too are removed, leaving only the seed-bearing plants in possession of the soil. The seed-hemp is cut before the seed shells out of itself, stacked till dry, and the seed beaten out. This must be winnowed with care, and spread in thin layers in warm airy lofts, or otherwise, so that it shall not heat. The crop is 12 to 15 bush. per acre. Hemp-seed is largely consumed as food for cage-birds and fancy poultry. It contains about 25 per cent. of oil, which is of a greenish-yellow color, and is used in the manufacture of certain soaps and somewhat in paints and varnishes.

Hemp is only locally grown in the U. S., though its culture is extending in several localities. In 1890 there were grown 11,511 long tons, worth $1,102,602. Nearly 92 per cent. of this was grown in ten counties in the State of Kentucky. The only other States in which hemp was grown at all were Illinois, Nebraska, Missouri, New York, Ohio, Kansas, and California.

The name "hemp" is commercially applied to several coarse fibers which come chiefly from tropical or extreme southern countries. They resemble true hemp only in the fact that the fiber may be used for cordage and perhaps other purposes for which hemp is employed.

Revised by H. H. Wing.

Hem'pel, Charles Julius, M. D.: physician; b. at Solingen, Germany, Sept. 5, 1811; studied in Paris and the University of New York, where he graduated, having removed to the U. S. in 1835. He became in 1857 Professor of Materia Medica and Therapeutics in the Homœopathic Medical College of Philadelphia; not long after settled in Grand Rapids, Mich. He published a German grammar (1842); *True Organization of the New Church* (1848); several translations of homœopathic medical works; *Homœopathic Theory and Practice* (1865); *The Science of Homœopathy* (1874). D. at Grand Rapids, Sept. 25, 1879.

Hemphill, Charles Robert, D. D.: a minister of the Presbyterian Church South; b. in Chester, S. C., Apr. 18, 1852; educated in the University of South Carolina, the

University of Virginia, the Columbia Theological Seminary, and the Johns Hopkins University. He is of Scotch-Irish descent. He was tutor in Hebrew in the Columbia Seminary 1874–78; Professor of Latin and Greek in the Southwestern Presbyterian University, Clarksville, Tenn., 1879–82; Professor of Biblical Literature, Columbia Seminary, 1882–85; and from 1885 pastor of the Second Presbyterian church, Louisville, Ky. He has published some important critical papers, including *Christ's Testimony to the Mosaic Authorship of the Pentateuch* (1884), and *The Testimony of Christ and the Apostles to the Authorship of the Pentateuch* in *Moses and his Recent Critics* (1889).

WILLIS J. BEECHER.

Hemp'stead: village; Queens co., N. Y. (for location of county, see map of New York, ref. 8–K); on the Long Island Railroad; 21 miles E. of New York city. It contains Hempstead Institute (non-sectarian), union free school, several public halls, machine-shops, patent-leather factory, and two weekly newspapers, and has many handsome residences owned by New York business men. Pop. (1880) 2,521; (1890) 4,831.

Hempstead: city; capital of Waller co., Tex. (for location of county, see map of Texas, ref. 5–I); on the Brazos river, and the Houston and Tex. Cent. Railroad; 50 miles N. W. of Houston, 100 miles N. of Galveston. It is in a high, fertile, and healthful region, in which cotton and corn are the principal products, and has a cotton-factory, a cotton-seed oil-mill, and other industrial establishments. Pop. (1880) 1,612; (1890) 1,671.

Hems: same as HOMS (*q. v.*).

Hemsterhuys, hem'ster-hois, FRANCIS: son of the Hellenist Tiberius Hemsterhuys; b. at Groningen, Holland, in 1720. He held a subordinate diplomatic position, studied art, literature, and philosophy, and wrote, in French, letters, *Sur la sculpture*, *Sur les désirs*, *Sur l'homme et ses rapports*, etc., which were collected in 1792 in two volumes, *Œuvres Philosophiques* (2d ed. 1809). He belongs to the sentimental school of philosophy of the eighteenth century. D. at The Hague in 1790.

Hemsterhuys, or **Hemsterhusius**, TIBERIUS: Hellenist; b. at Groningen, Holland, Jan. 9, 1685; studied mathematics, philosophy, and philology in his native city and at Leyden; was appointed professor at Amsterdam in 1704; of Greek at Franeker in 1717; and at Leyden in 1740, where he died Apr. 7, 1766. No modern scholar, with the exception of his great contemporary Richard Bentley, possessed a more intimate knowledge of Greek since the time of Joseph Scaliger and Isaac Casaubonus, and it is due to Hemsterhuys primarily that the study of the Greek language and its literature, which had fallen into desuetude, was again revived and firmly re-established in the universities of Western Europe, Valckenaer and Ruhnken, his great pupils, contributing not a little to this result. His principal works are editions of the *Onomasticon* of Pollux (1706), Lucian (1743), and the *Plutus* of Aristophanes (1744), an epoch-making performance, for in this work the paramount importance of scholia for purposes of textual criticism and exegesis was for the first time recognized. He was also the first to utilize the evidence furnished by the study of Greek art for the elucidation of Greek literature. See the famous *Elogium Hemsterhusii*, by D. Ruhnken (in *Opuscula*, vol. i., 239 ff.), and L. Müller, *Geschichte der class. Philol. in den Niederlanden*, pp. 74–82. ALFRED GUDEMAN.

Hen: See POULTRY.

Hénault, ā'nō, CHARLES JEAN FRANÇOIS: historian; b. in Paris, Feb. 8, 1685; intended to enter the priesthood, but, after two years at the Oratory, changed his mind, and was soon a prominent figure in the literary and fashionable circles of the capital. Two discourses which he wrote in 1706 and 1708, respectively, won him fame, and in 1710 he was appointed president of the court of *enquêtes*. In 1723 he became a member of the French Academy. His principal work, the *Nouvel Abrégé chronologique de l'Histoire de France*, appeared in 1744, and eight editions were published in his lifetime. D. in Paris, 1770. His *Mémoires* were published in 1854.

Henbane [M. Eng., hen + bane]: the *Hyoscyamus niger*; a plant, generally biennial, though sometimes annual; family *Solanaceæ*, native in Europe, but naturalized in the U. S., growing in waste places in the Northern and Eastern States. The root somewhat resembles that of parsley, and poisoning has resulted from eating it by mistake. The stem is erect, round, branching, from 1 to 4 feet high; the leaves numerous, large, deeply sinuate, sea green, and both leaves and stem viscid and hairy. The flowers are yellow, beautifully veined with purple. The whole plant has a rank, offensive smell. The leaves and seeds are used in medicine, the active principle being an exceedingly poisonous alkaloid, *hyoscyamin*, which may be obtained in colorless needle-like crystals. The action of henbane on the system is almost identical with that of belladonna, causing increased pulse-rate, dryness of the throat, giddiness, staggering gait, dilatation of the pupils, delirium, and, in sufficient dose, death. It is considered to have more tendency to produce sleep than belladonna, though this is doubtful. Its uses in medicine are in the main similar. EDWARD CURTIS.

Hendec'agon, less correctly **Endec'agon** [from Gr. ἕνδεκα, eleven + γωνία, corner, angle]: a plain rectilineal figure of eleven sides. The area of a regular or equilateral endecagon is very nearly equal to 9·36564 times that of the square of one of its sides.

Henderson: city; capital of Henderson co., Ky. (for location of county, see map of Kentucky, ref. 3–D); on the Ohio river, and the Lv. and N., the Lv., St. L. and Tex., and the Ohio Val. railways; 143 miles W. S. W. of Louisville. It has large tobacco-stemming interests, employing 25 stemmeries and 2 large factories, and a cotton-mill with $350,000 plant, woolen-mill with $250,000 plant, whisky distilleries, foundry, carriage and wagon factories, and 6 periodicals. The county-fair grounds are here. The river is spanned by a bridge opened Aug. 6, 1885. Pop. (1880) 5,365; (1890) 8,835. EDITOR OF "GLEANER."

Henderson: town; capital of Vance co., N. C. (for location of county, see map of North Carolina, ref. 2–H); on the Richmond and Danville Railroad and the Seaboard Air Line; 43 miles N. of Raleigh. It is in the celebrated Golden tobacco belt and a choice cotton-growing region, and has 5 tobacco warehouses, 4 tobacco-factories, 3 academies, canning-factory, and 3 newspapers. Pop. (1880) 1,421; (1890) 4,191. EDITOR OF "HUSTLER."

Henderson: town; capital of Chester co., Tenn. (for location of county, see map of Tennessee, ref. 7–C); on the Mobile and Ohio Railroad; 18 miles S. E. of Jackson, 100 miles E. by N. of Memphis. It is in an agricultural and a particularly choice fruit-growing region, and has three churches, Methodist Episcopal College, West Tennessee Christian College, weekly newspaper, and growing trade interests. Pop. (1880) 493; (1890) 1,069; (1893) 1,500. EDITOR OF "NEW ERA."

Henderson: town; capital of Rusk co., Tex. (for location of county, see map of Texas, ref. 3–J); on the Int. and Gt. N. Railroad; 75 miles W. of Shreveport, La., 160 miles N. of Houston. It is in an agricultural and fruit-growing region, and has a college and two weekly newspapers. Pop. (1880) 1,656; (1890) 1,536. EDITOR OF "TIMES."

Henderson, ALEXANDER: ecclesiastic; b. at Creich, Fifeshire, Scotland, in 1583; was educated in the University of St. Andrews, and was appointed Professor of Rhetoric and Philosophy there in 1610. Early in 1612 he was presented with the living of Leuchars. His appointment was extremely unpopular there on account of his approval of Episcopacy, but his views changed and his long residence in Leuchars was marked by strong confidence and affection between him and his parishioners. As troubles came on he proved himself a mighty leader among men. In 1636 Charles I. undertook to change the constitution of the Scottish Church, but he met with the most decided opposition. The National Covenant was renewed, and Henderson drew up the bond. On Mar. 1, 1638, the public signing began in the Greyfriars church in Edinburgh, and in July, same year, Henderson proceeded to the north to debate the case with the Aberdeen professors of divinity. In this undertaking he failed; but when the General Assembly met in the Cathedral of Glasgow, Nov. 21, 1638, he was unanimously chosen moderator. When the trial of the bishops began the king's commissioner, the Marquis of Hamilton, formally dissolved the Assembly under pain of treason; but the Assembly, nevertheless, continued its sittings. Eight of the bishops were excommunicated, the other six were deposed, and Episcopacy and the articles of Perth were prohibited. Very much against his wishes, the Assembly transferred Henderson from Leuchars to Edinburgh.

While the king and the people were preparing for war

Henderson published *The Remonstrance of the Nobility* and *Instructions for Defensive Arms*, the former of which contributed very much to form in England a just opinion of the Covenanters' cause. Then followed the events known as the first and second bishops' wars, each of which closed by the king being compelled to yield everything. Henderson was active in the negotiations, finally visiting London on this business. While there he preached to crowded audiences in St. Antholine's church, held service according to the Scottish form, and published several pamphlets; and when, in the same year, the king went to Scotland, Henderson was appointed one of the royal chaplains and dean of the chapel royal. He seems to have made a very favorable impression on Charles I., and the impression continued unaltered, though later on his attempts to reconcile the king with the Parliament utterly failed.

The famous meeting of the General Assembly in Aug., 1643, again chose Henderson for its moderator, and he drew up the Solemn League and Covenant, which was adopted with slight changes, not only in Scotland, but by both houses of the English Parliament and by the Westminster Assembly, thus becoming common law for both kingdoms. As Scotch commissioner to the Westminster Assembly, Henderson stayed in England from 1643 to 1646. He often took a leading part in the debates of the Assembly.

In 1646, after the Independents gained the ascendency in England, and the only chance left to the king seemed to be a reconciliation with the Presbyterians, he sent for Henderson to Newcastle, professing scruples of conscience, and desiring to confer with him. They exchanged a series of papers, eight of which (five by the king and three by Henderson) have been printed. Then Henderson, who had long been ill, returned to Edinburgh, where, eight days later, Aug. 19, 1646, he died. Besides the above mentioned writings—of which the correspondence with the king is of special interest—he published in 1641 *The Order and Government of the Church of Scotland*. A volume of *Sermons, Prayers, and Pulpit Addresses* was published in 1867 from the notes of a hearer. See Aiton's *Life and Times of Alexander Henderson* (Edinburgh, 1836); McCrie's *Life of Alexander Henderson* (Edinburgh, 1846); *The Letters and Journals of Robert Baillie* (1841–42); Howie, *Scots' Worthies*; Hetherington, *Church of Scotland*, vol. i.; Collier, *Ecclesiastical History of England*, vol. viii.; *Church Principles* (Edinburgh, 1863); Masson's *Life of Milton*; and *Life of Drummond of Hawthornden*; Burton's *History of Scotland*.

Revised by WILLIS J. BEECHER.

Henderson, JAMES PINCKNEY: politician; b. in Lincoln co., N. C., Mar. 31, 1808, from whence he removed to Mississippi and engaged in the practice of law. In 1836 he was appointed a brigadier-general in the army of the republic of Texas; on its disbandment was chosen Attorney-General, and subsequently (1837–39) Secretary of State of the republic. He went as minister from Texas to Great Britain to procure the recognition of the republic, and in 1844 to the U. S. to secure its annexation, which being accomplished he was chosen its first Governor (1846–47). In the Mexican war he commanded a division of Texan volunteers, with the rank of major-general. In 1857 he was elected U. S. Senator from Texas. D. at Washington, D. C., June 4, 1858.

Henderson, PETER: horticulturist; b. near Edinburgh, Scotland, in 1823. At sixteen years of age he was apprenticed to a gardener, and at twenty he emigrated to the U. S. He pursued gardening for many years, but became interested in the seed business in 1865, becoming the leading partner in the firm of Henderson & Fleming. His books are *Gardening for Profit* (New York, 1866), which marked an epoch in market-gardening in the U. S., and of which nearly 250,000 copies had been sold at the time of his death; *Practical Floriculture* (1868); *Gardening for Pleasure* (1875); *Handbook of Plants* (1881); *Garden and Farm Topics* (1884); and he was joint author of *How the Farm Pays* (1884). D. in Jersey City, N. J., Jan. 17, 1890.

Hendersonville: town (founded about 1845); capital of Henderson co., N. C. (for location of county, see map of North Carolina, ref. 5–E); on the Richmond and Danville Railroad; 21 miles S. of Asheville, 255 miles W. by S. of Raleigh. It is in a region producing principally cabbages, potatoes, apples, and hay; is the seat of Judson College (Baptist), has an academy, Methodist, Baptist, Presbyterian, and Protestant Episcopal churches, and weekly newspaper. Pop. (1880) 554; (1890) 1,216; (1893) estimated, 1,500.

EDITOR OF "TIMES."

Hendricks, THOMAS ANDREWS: Vice-President of the U. S.; b. in Muskingum co., O., Sept. 7, 1819; removed with his father in 1822 to Shelby co., Ind.; graduated in 1841 at South Hanover College; was admitted to the bar in 1843. In 1850 he was an active member of the State constitutional convention; member of Congress 1851–55 from the Indianapolis district; commissioner of the general land-office of the U. S. 1855–59; U. S. Senator (Democratic) 1863–69. He was chosen Governor in 1872 for the term of four years, and was nominated Vice-President of the U. S. by the Democratic party June 29, 1876, and July 11, 1884. He was elected Vice-President of the U. S. Nov. 4, 1884. D. at Indianapolis, Ind., Nov. 25, 1885.

Hendrickson, GEORGE LINCOLN: philologist; b. in Winchester, Ill., May 15, 1865. He graduated at Johns Hopkins University; continued his studies in Germany; was Professor of Latin in Colorado College in 1889–91; and in the latter year was appointed to the same chair in the University of Wisconsin. He contributed philological papers to the *Colorado College Studies*, vol. i., and to *The American Journal of Philology*, vol. xiii., 2, 4, and xiv., 2.

Hendrix, EUGENE RUSSELL, D. D., LL. D.: bishop; b. at Fayette, Mo., May 17, 1847; educated at Wesleyan University and Union Seminary, New York; from 1878 till 1886 president of Central College, Fayette, Mo.; in 1886 made bishop of the Methodist Episcopal Church South; resides in Kansas City, Mo. He published *Around the World* (1877).

Hengest, hen'gest, or **Hengist** [O. Eng., horse, steed: O. H. Germ. *hengist* > Mod. Germ. *hengst*, steed]: a prince of the Jutes, who in 449, with Horsa, his brother, landed with 300 followers at Ebbsfleet on the Isle of Thanet, and was employed by Vortigern, King of Britain, to repel the Picts and Scots. This the Jutes accomplished by aid of fresh reenforcements from the Continent, but soon turned their arms against the Britons, whom they overcame in a series of bloody wars. Horsa was slain at Ægelsthrep 455; Hengest declared himself King of Kent 457, and repeatedly defeated the Britons in battle (465–473). D. 488. The very existence of Hengest and Horsa has been sharply questioned by modern critics, but it is probable that, after the obviously mythical parts of this story are rejected, a considerable portion of truth remains.

Heng'stenberg, ERNST WILHELM: theologian and author; b. at Fröndenberg, Westphalia, Oct. 20, 1802; studied (1819) Oriental languages and theology at Bonn. In 1826 he was appointed Extraordinary Professor of Theology at the University of Berlin; in 1828 ordinary professor; in 1829 Doctor of Theology. In 1827 he founded in Berlin the *Evangelische Kirchenzeitung*, which soon became one of the most prominent religious periodicals in Germany; and after some years' labor as professor, journalist, and author he stood as the acknowledged head of the old Lutheran orthodox party. During the reign of Frederick William IV. he had great influence at court, and consequently great power at the university, but the exclusiveness of his theoretical views made him intolerant in practical life, and he raised a bitter opposition against himself. D. in Berlin, May 28, 1869. His best services were directed to the defense of the Old Testament against destructive criticism. His principal works are *Christologie des Alten Testaments* (3 vols., Berlin, 1829–35; 2d ed. 1854–57; Eng. trans., Edinburgh (Clark's Foreign Theological Library), 4 vols., 1854–58); *Einleitung ins Alte Testament* (3 vols., 1831–39: translated under the title *Contributions to the Introduction of the Old Testament*, 3 vols., 1847–48); *Commentar über die Psalmen* (4 vols., 1842–47; 2d ed. 1849–52; translated *Commentary on the Psalms*, 3 vols., 1843–44); *Das Hohelied Salomons* (1853); *Der Prediger Salomo* translated, 1859); *Ecclesiastes* (1860); *Das Evangelium des Johannes* (3 vols., 1861–63; translated *Commentary on the Gospel of St. John*, 2 vols., 1865); *Die Offenbarung Johannes* (2 vols., 1849–51; 2d ed. 1862; translated, 2 vols., 1852); and *History of the Kingdom of God in the Old Testament* (1869–71, 3 parts; translated, 2 vols., 1871–72). Revised by SAMUEL MACAULEY JACKSON.

Henkle, MOSES MONTGOMERY, D. D.: clerical writer; b. in Pendleton co., Va., Mar. 23, 1798; entered the itinerant ministry of the Methodist Episcopal Church in 1819, and filled important stations in Ohio, Pennsylvania, Kentucky, Tennessee, and Alabama. He was for some time associated with Dr. J. B. McFerrin in editing *The Christian Advocate* at Nashville; he also edited *The Southern Lady's Companion* 1847–55. He wrote largely for the periodical press. He

published several books, among which are the *Platform of Methodism* (1851); *Analysis of the Principles of Church Government* (1852); *Life of Bishop Bascom* (Nashville, 1854), etc. He was connected with several literary institutions as professor or president. D. in Richmond, Va., 1864.
Revised by S. M. Jackson.

Hen'le, Friedrich Gustav Jakob, M. D.: b. at Fürth, Bavaria, July 9, 1809; graduated M. D. at Bonn 1832; became an assistant in the anatomical museum at Berlin, and in 1834 prosector in the university, but was imprisoned for connection with a students' society which had become offensive to the government; became in 1837 a private tutor of histology and pathological anatomy; was 1840–44 Professor of Anatomy at Zurich; held a similar professorship at Heidelberg 1844–52, and in the latter year took the chair of Anatomy at Göttingen: did much for microscopic anatomy, pathology, physiology, anthropology, etc., and has a worldwide fame in these departments of science. Among his works are *Ueber Schleim- und Eiterbildung* (Berlin, 1838); *Vergleichende Anatomie des Kehlkopfs* (Leipzig, 1839); *Pathologische Untersuchungen* (Leipzig, 1840); *Handbuch der allgemeinen Anatomie* (Berlin, 1841); *Handbuch der rationellen Pathologie* (2 vols., Brunswick, 1846–52); *Handbuch der Systematischen Anatomie* (3 vols., 1855–68); *Grundriss der Anatomie des Menschen*, with atlas (Brunswick, 1880; 2d ed. 1883). D. at Göttingen, May 13, 1885.

Hen'ley, John: known as Orator Henley; b. at Melton-Mowbray, England, Aug. 3, 1692; was educated at St. John's College, Cambridge, where he wrote two numbers of *The Spectator* (396, 518); took orders in the Church; received appointments in London and elsewhere; became incumbent of Chelmondiston 1723, but soon gave up that living in consequence of reports affecting his character; opened the Oratory in London 1726, where he declaimed twice a week upon religion, fashion, and other subjects, and where he attempted to found a sect of Henleyarians, and to establish a system of popular education. In 1746 he was arrested by order of Lord Chesterfield for treasonable speeches. D. Oct. 13, 1759. Among his somewhat numerous works are the *Complete Linguist, or a Universal Grammar*; *Oratory Transactions* (1728, *seq.*); *Esther, a Poem*; *History of Sweden*, and *Primitive Liturgy*, for the service in his Oratory, etc.; and for a time he edited *The Hyp-Doctor*, a stupid weekly comic paper, subsidized by Walpole.

Hen'lopen, Cape: See Cape Henlopen.

Henna [= Arab. *henna*], or **Alkan'na** [from Span. *alcana*, from Arab. *al henna*, the henna]: a paste made from the leaves of *Lawsonia inermis* or of *L. spinosa*, mixed with catechu, and used in the East to stain the nails, the fingertips, and the edges of the eyelids of women and the beards of men. It primarily gives an orange color, which, if desired, may be changed to black by adding other stains. Some species of *Hibiscus* are in Eastern Asia put to the same use. The Lawsonias are shrubs of the order *Lythraceæ*. Their leaves are used in Europe for dyeing leather. The use of the henna for dyeing the nails, the inner surface of the hands, and the soles of the feet was of very early date in Egypt, as is proved by the mummies. The practice was at one time so general in that country that it would have been considered a breach of decency not to comply with the custom. Probably it was introduced among the Jews by Solomon's wife, the daughter of Pharaoh. Since it is still practiced throughout Southern Asia, from the Mediterranean to India, it can hardly be considered as a mere caprice. Indeed the henna is said to restrict perspiration and to produce an agreeable coolness in the hands and the feet.
Revised by H. A. Hare.

Hen'nepin (Fr. pron. eñ'păñ'), Louis: Franciscan missionary and explorer; b. at Ath, in Flanders, about 1640. In 1675 he became a missionary to Canada. He was (1679–80) a member of La Salle's memorable band of explorers, who traversed the Great Lakes and the upper Mississippi and its tributaries. He returned to Europe, and soon afterward published *Description de la Louisiane* (Paris, 1683), a valuable work, though full of exaggerations, and *Nouvelle découverte d'un très grand pays* (1697), which contains his previous work, enlarged by a narrative of a pretended voyage down the Mississippi to its mouth. In later life Hennepin abandoned the habit and the obedient life of his order, though still claiming the title of Récollet missionary. D. at Utrecht about 1706.

Hennequin, eñ'kăñ', Alfred: French dramatist; b. at Liège, Belgium, Jan. 13, 1842. He was educated as a civil engineer, and practiced his profession first on the Belgian state railways, later as manager of one of the tramway systems in Paris. He early began to write plays, however, producing in Brussels, under the pseudonym Alfred Lebrun, two comedies: *J'attends mon oncle* (1869) and *Trois chapeaux* (1870). In Paris he made a hit with *Le procès Veauradieux* (1875), and thereafter entirely abandoned his profession for play-writing. He wrote alone or in collaboration the following gay and not always too proper pieces: *Les dominos roses* (1876); *Bébé* (1877) and *Nounon* (1879), with Émile Najac; *La femme à papa* (1879), with Millaud; *La corbeille de noces* (1880); *La route de Tabi* (1881); *Niniche* (1882); *Cherchez la femme* (1885). Excessive production and fatigue produced finally softening of the brain, from which Hennequin never recovered. He died at Épinay, Aug. 7, 1887. A. R. Marsh.

Henner, hen'năr', Jean Jacques: figure and portrait painter; b. at Bernwiller, Alsace, Mar. 5, 1829; a pupil of Drolling and Picot; Grand Prix de Rome 1858; third-class medals, Salons of 1863, 1865, and 1866; first-class, Paris Exposition, 1878; officer Legion of Honor 1878; member of the Institute 1889. A most skillful technician, who paints with a somewhat conventional arrangement of light and shadow, but whose methods are individual. His painting of the nude figure is luminous and beautiful in general tone. Four fine works are in the Luxembourg Gallery, Paris, and a *Nymph* is in the collection of W. T. Walters, Baltimore. Studio in Paris. William A. Coffin.

Hen'nessy, Sir John Pope: British colonial governor; b. in Cork, Ireland, 1834; educated at Queen's College, Cork; called to the bar at the Inner Temple in 1861; entered the House of Commons 1859; Governor of Labuan 1867; of the West African settlements 1872; of the Bahamas 1873; of the Windward islands 1875; of Hong Kong 1877; of the colony of Mauritius 1882. He contested North Kilkenny in Dec., 1890, against the Parnell candidate immediately after Mr. Parnell's exposure, and was elected by a large majority. D. in Youghal, Oct. 7, 1891. C. H. T.

Henoch, hā'nōkh, Edward Heinrich, M. D.: physician; authority on diseases of children: b. in Berlin, Germany, July 16, 1820; educated at University of Berlin; professor in University of Berlin since 1858; director of the clinic for children's diseases since 1872; author of *Klinik der Unterleibskrankheiten* (3d ed. 1867); *Beiträge zur Kinderheilkunde* (1861–68); *Vorlesungen über Kinderkrankheiten* (7th ed. 1893). C. H. T.

Henotheism [Gr. *εἷς, ἑνός*, one, and *θεός*]: defined by Max Müller, with whom the term originated (*Contemporary Review* for 1878, p. 710), as "a belief and worship of those single objects, whether semitangible or intangible, in which man first suspected the presence of the Invisible and the Infinite, each of which was raised into something more than finite, more than natural, more than conceivable, and then grew in the end to be an *Asura* or living thing, a *Deva* or a bright thing, an *Amartya*, that is, not a mortal, and at last an immortal and eternal Being—in fact, a God, endowed with the highest qualities which the human intellect could conceive at the various stages of its own growth." This, according to Max Müller, is the "general name for the earliest form of religion among the Vedic Indians" (Hindus). He further says (pp. 723–724), henotheism as the worship of single gods is totally different from monotheism, or the worship of one god, involving a distinct denial of all other gods, and from polytheism, the worship of many divinities, which together form one divine polity. S. M. Jackson.

Henri I., King of Haiti: See Christophe, Henri.

Henrietta: town; capital of Clay co., Tex. (for location of county, see map of Texas, ref. 2–H); on the Little Wichita river, and the Mo., Kan. and Tex. and the Ft. Worth and Denver Railways; 13 miles S. of Red river, 96 miles N. W. of Fort Worth. It is in an agricultural and stock-raising region, and coal has been found in its vicinity. It contains a normal college, public school, private school, Roman Catholic convent, two weekly newspapers, flour-mills, ice-factory, cigar-factory, electric lights, and water-works. The town was founded prior to 1861, was destroyed by Indians, and was re-established in 1874. Pop. (1890) 2,100; (1893) 2,500.
Editor of "Independent."

Henriquez. Francisco Fernandez de la Cueva: See Fernandez de la Cueva Henriquez.

Henry: city; Marshall co., Ill. (for location of county, see map of Illinois, ref. 4–E); on the Illinois river and on

the Chi., Rock Is. and Pac. Railway; 33 miles N. by E. of Peoria, 128 miles S. of Chicago. The river is here spanned by an iron and wood bridge that cost $80,000, and the first lock and dam for the improvement of the river were built here. The city contains 6 churches, electric-light and telephone plants, artesian well, fine school-building, and 2 weekly newspapers. Senachwine Lake, a popular pleasure resort, is 4 miles distant. Pop. (1880) 1,728; (1890) 1,512.

EDITOR OF "REPUBLICAN."

Henry, DOM: cardinal; King of Portugal; third son of Emanuel the Fortunate; b. on Jan. 31, 1512. He was educated for the Church, and in his twentieth year (1532) was made Archbishop of Braga; when he ascended the throne he held three archbishoprics—namely, those of Braga, Lisbon, and Coimbra—besides the immensely wealthy abbacy of Alcobazar. In 1539 he was made grand inquisitor of Portugal, and it was he who introduced the Inquisition into the Portuguese colonies. In 1545 he was made a cardinal. He ascended the throne of Portugal Aug., 1578. Urged to decide as to his successor, he delayed the decision, and died Jan. 30, 1580. He was succeeded by Philip II.

Revised by C. K. ADAMS.

Henry I. (styled BEAUCLERC on account of his learning): King of England; son of William the Conqueror and Queen Matilda, and successor of William Rufus; b. at Selby, Yorkshire, in 1068. His youth was marked by strange quarrels with his elder brothers; and when William II. died Henry hastened to assume the crown (1100) while Robert was absent in Palestine. He at once recalled Anselm, declared the validity of the Confessor's laws, and married Maud of Scotland, shrewdly securing the Church, the English, and the Scots against Robert in the coming struggle, in which Henry was entirely successful; he was acknowledged Duke of Normandy in 1106, and soon engaged in advantageous wars with France. The drowning of his son William in 1120, and the troubles with his nephew William in Normandy, and with the Welsh in the West of England, greatly disturbed the last of his reign. D. at Rouen, Dec. 1, 1135, leaving as his heir his daughter, the countess Matilda of Anjou, former wife of Henry V. of Germany. His influence was immeasurable in uniting Normans and English into one people; for after his reign the two races never met in arms on English soil. An old chronicler says of him, "Peace he made for man and deer."

Revised by C. K. ADAMS.

Henry II.: first Plantagenet King of England; son of Geoffrey Plantagenet and of Matilda, former Empress of Germany, the heiress and only surviving child of Henry I.; b. at Le Mans, in Maine, Mar. 5, 1133; was educated in Normandy and England; in 1152 invaded England with troops for the overthrow of King Stephen, with whom in 1153 a peace was concluded by which Henry was acknowledged as heir to the crown; succeeded Stephen in 1154, having in 1151 become Count of Anjou, Touraine, and Maine by his father's death; and by his marriage in 1152 with Eleanor of Aquitaine, the divorced Queen of France, he acquired sovereignty over nearly half of France, subject in some degree to French suzerainty. The great events of Henry's eventful reign were the Irish conquest; the wars with the Scots, Welsh, and the French king; the destruction of more than 1,000 feudal castles in England—"dens of thieves" Henry called them; the contest with Thomas à Becket; the subscription to the Constitutions of Clarendon (1164); and the rebellion of his sons and queen. He was, says Freeman, the great legislator of English feudalism, but was always Angevin, never English, in his feelings. D. at Chinon, July 6, 1189. See Green, *Henry II.*

Revised by C. K. ADAMS.

Henry III.: King of England; b. at Winchester, Oct. 1, 1207; succeeded John, his father, in 1216. Henry's minority at his accession, and the great power acquired by the barons under King John, crippled his authority and made his reign a weak one. Simon de Montfort, Earl of Leicester, was the great leader in the task of recovering for the nobles the privileges lost under Henry II., and by giving representation to the boroughs, formed the nucleus of the House of Commons. This was not accomplished, however, without a civil war, in which the king was defeated and captured at Lewes in 1264. De Montfort was defeated and slain in the following year by Prince Edward and Gloucester at Evesham. Henry III. was, notwithstanding the misfortunes of his reign and the misgovernment with which he has been often reproached, a man of some talent—chiefly eminent as a builder; many of the finest structures in the Early English Gothic style are the work of Henry and of his brother Richard, King of the Romans. D. at Westminster, Nov. 16, 1272, having reigned fifty-six years, and was succeeded by his son, Edward I. See Prothero, *Life and Times of Simon de Montfort* (1887).

Revised by C. K. ADAMS.

Henry IV.: first Lancastrian King of England; b. at Bolingbroke, Lincolnshire, Apr. 3, 1367; son of John of Gaunt, the fourth son of Edward III., while his mother was a lineal descendant of Henry III. He was made Earl of Derby and Duke of Hereford. With his adversary, the Duke of Norfolk, he was banished in 1398 by Richard II., who seized his immense estate upon the death of John of Gaunt in 1399. Soon Henry landed at Ravenspur, in Yorkshire, with a small following, the king being absent in Ireland. All England joined Henry, and Richard was dethroned and Henry crowned. Henry's defective title led him to persecute the Lollards, so as to win the support of the Church, but his reign was much disturbed by formidable rebellions. On Mar. 3, 1401, the first case of burning for heresy occurred in England. D. Mar. 19, 1413. See Wylie, *England under Henry IV.*

Revised by C. K. ADAMS.

Henry V.: King of England; son and successor of Henry IV.; b. at Monmouth, Aug. 19, 1387; served in his youth against the rebellious Glendower and Hotspur. The tales of his irregular life in youth are at least gross exaggerations. He was very popular, and his father seems to have been jealous of him. He came to the throne in 1413, persecuted the Lollards, and in 1414 announced to Parliament his intention of making the conquest of France upon the strength of Edward III.'s claim to that sovereignty; landed near Harfleur, which he took Sept. 22, 1415; totally defeated the greatly superior force of the French at Agincourt, Oct. 25, in one of the notable battles of history; occupied the greater part of France, aided by the Duke of Burgundy and other malcontents; married in 1420 the French princess Catharine, and was recognized as heir-presumptive. The remainder of his reign was largely occupied by wars in France. D. at Vincennes, Aug. 31, 1422. See Church, *Henry V.*

Revised by C. K. ADAMS.

Henry VI.: the last Lancastrian King of England; son of Henry V.; b. at Windsor, Dec. 6, 1421; succeeded his father on Sept. 1, 1422, and in 1431 was crowned King of France at Paris. His reign was marked by the wars of the Roses, maintained on the Lancastrian side more by the energy of Margaret of Anjou, the queen, than by the pious but irresolute Henry. The weakness of the king was largely responsible for the rebellion headed by JACK CADE (*q. v.*). In France Joan of Arc and her followers had expelled the English, and the popular sense of disgrace vented itself upon the unoffending king whose title was indeed defective. Perhaps the best of Henry's work was in founding Eton School (1440) and King's College, Cambridge (1443), and in building the great chapels which are among the glories of English architecture. He was found dead in the Tower (where he had been imprisoned), May 21, 1471.

Revised by C. K. ADAMS.

Henry VII.: the first of the Tudor Kings of England; b. in Wales, Jan. 28, 1456. He was descended, on his mother's side, from John of Gaunt (son of Edward III.) and Catharine Swynford, whose offspring had been legitimated by the pope, the king, and the Parliament. His father was a son of Owen Tudor, a Welsh gentleman, and Catharine, widow of Henry V. of England, whose marriage to Tudor has been denied. Young Henry became Earl of Richmond; was attainted by the Yorkists 1461; and in 1471 retired to France; attempted a revolt in 1483; landed at Milford Haven in 1485; defeated and killed Richard III. at Bosworth; married Elizabeth, heir of the Yorkist sovereigns, 1486, thus happily uniting the houses of York and Lancaster. His reign was much disturbed by insurrections. The king was politic, encouraged commerce and industry, and filled his treasury by means previously untried, and unquestionably illegal. D. Apr. 22, 1509. See Gairdner, *Henry VII.* (1889).

Revised by C. K. ADAMS.

Henry VIII.: second of the Tudor monarchs of England; son and successor of Henry VII.; b. at Greenwich, June 28, 1491; became in 1502 Prince of Wales on the death of his brother Arthur; married Catharine of Aragon, Arthur's widow, in 1509; succeeded to the crown in 1509; joined the Emperor Maximilian in a war with France 1511-

14, during which war the Scots were utterly overthrown at Flodden Sept. 9, 1513; made Wolsey chancellor 1515; was involved in competition with Francis I. and Charles V. for the imperial crown of Germany; wrote in 1521 his book on the sacraments against Luther, for which he received from the pope the title of "defender of the faith"; made war in 1522 against France in the interest of Charles V.; applied in vain in 1528 to the pope for a commission to inquire into the legality of his marriage. The king applied in 1529, by Cranmer's advice, to the universities with better success. The influence of the king and Wolsey at Rome was completely foiled by the Spanish interest in the queen's behalf, and the great seal was taken from Wolsey and given to Sir Thomas More. The convocation was now compelled to acknowledge Henry as the head of the English Church; the king married Anne Boleyn in 1533, and the following year Parliament declared the former marriage with Catharine invalid, at the same time declaring that the succession should lie with the issue of the marriage of Henry with Anne Boleyn. As this act was not assented to by More and Fisher they were executed, Thomas Cromwell made vicar-general, and the visitation and destruction of monasteries began. Anne Boleyn was executed on a charge of unfaithfulness, and Jane Seymour was married to the king in 1536; Roman Catholic insurrections broke out in 1536, and Queen Jane died in 1537; Anne of Cleves was married to the king in 1540, soon after which Cromwell was executed, and the marriage annulled by convocation and Parliament; Henry married Catharine Howard in the same year, and had her executed in 1542; was married in 1543 to Catharine Parr, his sixth and last wife. Many Roman Catholics, and Reformers as well, were executed during the latter part of Henry's reign, and great numbers of the nobles and aristocracy died on the scaffold on suspicion of treason. D. at Westminster, Jan. 28, 1547. The two modern English political parties have been said to date from this reign, in which there was a conservative or national Catholic party, led by Bishop Gardiner and others (many of them becoming Roman Catholics again under Queen Mary), and a reforming party, led by Thomas Cromwell, Cranmer, and others scarcely less distinguished. Notwithstanding the turbulent and bloody vicissitudes of the reign, Henry VIII. has always been held in great esteem by the masses of the English people. He not only united in his own person the claims of the houses of York and Lancaster, thus putting an end to the long struggle of the Roses, but in all his characteristics, mental, moral, and physical, he was the most intensely English of all English kings. He fought the battle of England against the popes of Rome in a way that seems strangely to have secured for him an affectionate admiration. For the best defense of Henry's character, see Froude's *History*, vol. i.–iv.; see also Brewer's *Calendar of State Papers* (1862, *seq.*); and Brewer's ed. of Fuller's *Church History*. Revised by C. K. Adams.

Henry I.: King of France; b. 1005; succeeded Robert II., his father, 1031; was a weak prince, whose reign was much disturbed by civil wars and public calamities. D. at Vitri, Aug. 4, 1060, and was succeeded by Philip I., his son.

Henry II.: King of France; b. Mar. 31, 1519; married Catharine de' Medici 1533; succeeded Francis I., his father, 1547. His reign was distinguished by bloody persecutions of the Protestants, and by wars with Charles V. and his son, Philip II. of Spain. These wars were at first advantageous to France as military operations, but afterward the French were disastrously defeated at Naples, at St.-Quentin, and Gravelines. These battles were followed by the disastrous peace of Cateau-Cambrésis (1559), by which Henry gave up the greater part of his advantages. D. July 10, 1559, in consequence of a wound received in a tournament. Revised by C. K. Adams.

Henry III.: King of France; third son of Henry II. and Catharine de' Medici; b. at Fontainebleau, Sept. 19, 1551; served as Duke of Anjou against the Huguenots 1569–73; elected King of Poland in 1573; abandoned Poland, and succeeded his brother, Charles IX., as King of France 1574. His reign was disturbed by the wars of the League, designed to prevent the succession of Henry IV., and is further memorable for the assassination of the Guises 1588, and for the king's unbounded licentiousness. Henry was stabbed by Jacques Clément, a partisan of the Guises, and died Aug. 2, 1589. He was the last of the Valois line, and was succeeded by Henry IV., the first Bourbon king. See Freer's *Henry III.* (3 vols., 1858). Revised by C. K. Adams.

Henry IV.: King of France and Anjou, the first Bourbon monarch of France; succeeded Henry III. in 1589, being a lineal descendant of Louis IX. Henry was born at Pau, Dec. 14, 1553, the son of Antoine de Bourbon and Jeanne d'Albret, Queen of Navarre; he was bred a Protestant by his mother, and trained to all hardy exercises. In 1569 he joined the Protestant army under Coligny. In 1572, after the peace of St.-Germain, and just before the massacre of St. Bartholomew, he married Margaret of Valois, sister of Charles IX., and was compelled to abjure his faith. He had just succeeded to the crown of Navarre, but was detained at court until 1576, when he escaped and put himself at the head of the Protestants, and by his valor and skill greatly bettered their circumstances in the wars which followed. In 1584 Francis of Anjou died and Henry became heir-presumptive to the crown. In 1585 he was excommunicated by Sixtus V., and declared incapable of the succession. Then followed the "war of the three Henrys" (1586–87), the murder of Henry III. (1589), the claim of the cardinal of Bourbon to the throne, the battle of Ivry (1590), the siege of Paris, the Spanish invasion under Parma, and a long and varied war, in which Henry, with small means and the ineffectual support of the English, performed prodigies of valor and activity. In 1593 Henry professed the Roman Catholic faith, and the fear of the ambition of Philip II. caused many of Henry's former enemies to go over to his side; he was anointed king at Chartres 1594; entered Paris, and in the course of four years had expelled the Spaniards and brought all France to subjection. In 1598 he published the Edict of Nantes and restored toleration. Prosperity followed such as France had never known before. Henry was murdered by one Ravaillac, a fanatic, May 14, 1610, and all France mourned the event as a national calamity. See Matthieu, *Histoire de Henri IV.*, and Freer, *Henry IV.* (6 vols., 1860–63).

Revised by C. K. Adams.

Henry (I.) the Fowler: King of Germany and Duke of Saxony; b. in 876; succeeded his father, Otho I., as duke in 912; elected to succeed Conrad I. in 919; carried on wars with Lorraine (which he conquered in 923–925), with the Hungarians, the Slavi, Danes, etc. This great monarch was one of the founders of the German supremacy in the Middle Ages, as terrible in war as he was just and wise in peace. He is reckoned as Henry I. in the line of German emperors, but never bore the imperial title, except in consequence of having been saluted *imperator* by his troops, in the old Roman fashion. D. at Mansleben, July 2, 936.

Henry II.: Emperor of Germany; the last of the Saxon line of German monarchs, and the first Henry who properly bears the imperial title, known also as The Lame; b. May 6, 972; succeeded to the duchy of Bavaria 995; was elected King of Germany, to succeed Otho III., in 1002; carried on wars in Poland, and with vassals in Germany, and with Italy and France, etc.; erected Hungary into a kingdom 1007; was crowned Emperor of the Romans 1014. D. at Grone, Saxony, July 14, 1024; was canonized 1152 on account of his zeal for the Church, and is honored July 15.

Henry III.: Emperor of Germany, surnamed The Old, The Black, or The Pious; b. at Osterbeck, in the Low Countries, Oct. 28, 1017; was elected king in 1026, and succeeded Conrad II., his father; ruled with the greatest dignity and success, managed the affairs of Church and state alike; was crowned emperor in 1039; compelled Hungary, Bohemia, Apulia, and Calabria to acknowledge themselves as vassals of the empire; built many churches and cathedrals, including those at Worms, Mainz, and Spires; won applause by challenging Henry I. of France to mortal combat, and died at Botfeld, Oct. 5, 1056. His first wife was a daughter of Canute of England.

Henry IV.: Emperor of Germany; son of Henry III.; b. Nov. 11, 1050; was king when but three years old, and succeeded Henry III., his father, in 1056. His reign was a long series of bloody contests with vassals at home and with Pope Gregory VII. in Italy, who at the period of Henry's lowest fortunes compelled him to sue at Canossa for absolution (1077). This he received, and after many years of warfare in Germany he compelled the pope to retire, under the protection of Robert Guiscard, to Salerno (1084). Henry was dethroned and imprisoned by his son, Henry V., in 1105, but escaped, and died at Liège, Aug. 7, 1106. See Floto, *Heinrich IV.* (2 vols., 1855–57); Giesebrecht, *Ges. des deuts. Kaiserz. IV.* Revised by C. K. Adams.

Henry V.: Emperor of Germany; b. Aug. 11, 1081; was crowned king and colleague of his father, Henry IV., in 1099; deposed his father 1105; was crowned emperor 1111. His reign was much disturbed by discussions with the popes regarding investitures, and he was four times excommunicated. A compromise was reached in the important concordat of Worms (1122), in which the advantage rested with the pope. Wars at home and with Flanders, Hungary, and Poland vexed Germany during his reign. He married Matilda, daughter of Henry I. of England. D. at Utrecht, May 23, 1125. He was the last of the Salic line.

Henry VI.: Emperor of Germany, surnamed THE CRUEL; b. in 1165; succeeded Frederick Barbarossa, his father, in 1190. His reign was much disturbed by Italian wars, and is famous for the imprisonment of Richard Lion-heart at Trifels (1192-94). D. at Messina, Sept. 28, 1197, poisoned, it was supposed, by his wife.

Henry VII.: Emperor of Germany (Henry of Luxemburg); b. in 1262; was elected King of the Romans in 1308; invaded Italy at the head of a Ghibelline army, and had an interview with Dante; received the iron crown of Lombardy in 1311; was crowned emperor in 1312. D. Aug. 24, 1313, poisoned, it was supposed, while receiving the Eucharist.

Henry, surnamed THE LION: Duke of Saxony and Bavaria; son of Henry the Proud; b. at Ravensburg, 1129; succeeded to the duchy of Saxony, and in 1156 made good his claims to Bavaria; extended his dominions by conquest until he became the most powerful of German princes and the rival of the Emperor Frederick. His desertion of the latter in the war against the Lombard League was one of the causes of the defeat at Legnano in 1176. Refusing to obey the emperor's summons to appear before the Diet at Worms in 1177, he was placed under the ban, stripped of his possessions, and withdrew to England, but regained a portion of his dominions by an agreement with Frederick's successor, Henry VI. D. at Brunswick, 1195.

Henry, CALEB SPRAGUE, D. D., LL. D.: clergyman and author; b. at Rutland, Mass., Aug. 2, 1804; graduated at Dartmouth in 1825; studied divinity at Andover and at New Haven. After holding Congregational pastorates at Greenfield, Mass. (1829–31), and at Hartford, Conn. (1833–35), he was ordained in the Protestant Episcopal Church, and was Professor of Mental and Moral Philosophy in Bristol College, Pennsylvania (1835–38). In 1837 he became one of the founders of *The New York Review*, and edited it till 1840. He was (1838–52) Professor of Philosophy and History in the University of New York; 1847–50 rector of St. Clement's, New York, and in Litchfield, Conn. (1870–73). D. in Newburg, N. Y., Mar. 9, 1884. Among his works are enlarged translations from the French, *An Epitome of the History of Philosophy* (New York, 2 vols., 1842), and of Cousin's *Elements of Psychology* (Hartford, 1834; 4th ed. rev. 1856); and the original works, *Compendium of Christian Antiquities* (Philadelphia, 1837); *Moral and Philosophical Essays* (New York, 1839); *About Men and Things* (1873); and *Satan as a Moral Philosopher* (1877).

Revised by S. M. JACKSON.

Henry, JOSEPH, LL. D.: physicist; b. at Albany, N. Y., Dec. 17, 1797; educated in the common schools of that city and in the Albany Academy, where (1826) he became Professor of Mathematics, and (1827) began a course of investigation which was continued for a number of years, and resulted in certain highly important discoveries in electricity and electro-magnetism. Though previously to these investigations the electro-magnet in a certain sense was known, it was nothing more than a philosophic toy, in which a feeble magnetism was excited by currents of low intensity. The means of developing in soft iron a high degree of magnetization, or of producing such an effect at a distance in any appreciable degree at all, were unknown. Prof. Henry's first success consisted in producing the electro-magnet properly so called; an exceedingly important invention which no subsequent improvement has essentially modified. He next demonstrated that the difficulty of exciting electro-magnets at a distance, which had led Barlow in 1824 to pronounce the idea of an electric telegraph to be chimerical, may be completely overcome by the use of a battery of high electro-motive force, provided that the receiving electro-magnet be constructed with many turns of a single wire. He also showed that the magnetization of an iron bar depends not only upon the amount of current which traverses the coils around it, but also upon the number of turns of wire, so that when it is desired to bring an electro-magnet into action at a great distance, the loss of current due to the resistance of the intervening circuit may be compensated by winding the magnet with many turns of fine wire. It was the demonstration of this principle which first made the electric telegraph a possibility. In a communication made to *The American Journal of Science* in 1831, describing some of his experiments, Prof. Henry called attention to the practicability of applying what he called the intensity-magnet to telegraphic uses. During the same year he produced the first mechanical contrivance ever invented for maintaining continuous motion by means of electro-magnetism; and he also constructed and exhibited a similar contrivance for making signals by electro-magnetism at a distance—the signals being produced by means of a lever striking on a bell. This was operated by a current sent through more than a mile of insulated wire carried in successive turns around the walls of an apartment in the Albany Academy. He also devised a scheme for producing large mechanical effects at a distance, by causing heavy weights to fall in consequence of the rupture of electric currents. Some of the electro-magnets constructed by him at this time were of enormous power. One of these, prepared for Yale College (1831), sustained a weight exceeding a ton, and another at the College of New Jersey carried not less than 3,600 lb. In 1832 he made the discovery of the secondary currents produced in a long conductor by the induction of the primary current upon itself; and he succeeded in the same year in producing the electric spark by means of a purely magnetic induction. The spark was similarly and almost simultaneously produced by Mr. J. D. Forbes, of Edinburgh (afterward Principal Forbes), but the two results were independent of each other. These discoveries embraced the germ of the science of magneto-electricity, which subsequently received from Faraday so large a development.

Prof. Henry's services to science as an investigator of the phenomena of electro-magnetic induction received appropriate recognition when the chamber of delegates of the electrical congress, held in Chicago in 1893, unanimously gave to the practical unit of self-induction the name of "the Henry."

In 1832 Prof. Henry was elected Professor of Natural Philosophy in the College of New Jersey, and in his earliest lectures at Princeton demonstrated the feasibility of an electro-magnetic telegraph, with experimental illustrations. He visited Europe in 1837, and in London held interviews with Prof. Wheatstone, the inventor of the needle magnetic telegraph, to whom his discoveries were already well known, and whom he acquainted with his plans for producing not only signals, but large mechanical effects at distances indefinitely great, by means of electro-magnetism. In 1846 he was elected secretary of the Smithsonian Institution at Washington, being the first incumbent of that office, a position he held till his death. In 1849 he was elected president of the American Association for the Advancement of Science. In 1868 he was elected president of the National Academy of Sciences. This distinguished post he held till his death. He was made chairman, in 1871, of the light-house board of the U. S., and in this capacity was constantly engaged till 1878. He received the honorary degree of doctor of laws from Union College in 1829, and from Harvard University in 1851. He published *Contributions to Electricity and Magnetism* (1839), and numerous papers in *The Am. Philos. Trans.*, *The Am. Jour. of Science*, *The Jour. of the Franklin Inst.*, the *Proceedings of the Am. Assoc. for the Adv. of Sci.*, and in the annual reports of the Smithsonian Institution. D. May 13, 1878.

Revised by E. L. NICHOLS.

Henry, MATTHEW: divine and author; son of Philip Henry, a Nonconformist clergyman; b. at Broad Oak, Flintshire, Wales, Oct. 18, 1662; studied law and divinity; became Nonconformist (Independent) pastor at Chester 1687, at Hackney, London, 1712. D. at Nantwich, June 22, 1714. Chiefly remembered for his *Exposition of the Old and New Testament*, which was a reproduction of his regular expository sermons and covers the entire Bible, but his own work ends with the Acts. The remainder was prepared by thirteen Nonconformist divines. The first volume appeared in London, 1708, fol.; vol. v., 1710, completes the Gospels; vol. vi. appeared later. The work passed through numerous editions, and has the distinction of being eminently readable, while destitute of scholarship. He also wrote other religious works and a

Life of his father (1698). His own *Life* has been written by W. Tong (1716) and by J. B. Williams (1828; n. e. 1865); cf. *Diaries and Letters of Philip Henry*, edited by Matthew Henry Lee (1883). Revised by S. M. Jackson.

Henry, Patrick: lawyer and statesman; b. at Studley, Hanover co., Va., May 29, 1736; son of John Henry, a Scotchman of strong and sound intellect and liberal education. His mother was of the family of Winstons, the members of which are said to have been marked by vivacity of spirit and by "a gift for music and for eloquent speech." The father was the nephew of William Robertson, the historian, and second cousin of the mother of the British statesman and orator, Henry Brougham. Patrick inherited many of the characteristics of both his parents. In early years he cared little for books, but after he was ten years of age, with the help of his father and of an uncle, he acquired some knowledge of Latin and Greek, and a little more of mathematics. At the age of fifteen he was put into the shop of a country tradesman, but after a year of apprenticeship his father set him up in trade for himself. At the end of a year the experiment terminated in failure. At the age of eighteen he married Sarah Shelton, the daughter of a small tavern-keeper in the neighborhood. During the next two years he tried to get a living from a small farm, but failed. At the age of twenty he once more turned his hand to merchandise, but in three years' time he was bankrupt. After six weeks of study he was admitted to the bar in 1760. Though the tradition is that for some years he had very little practice, the recent discovery of his fee-books shows that from the first his practice was large and lucrative. It was not, however, till 1764 that general attention was called to his ability by means of "The Parsons' Cause," a celebrated case in which all his abilities were enlisted and displayed. The testimony is abundant that his oratory exceeded anything ever before heard in Virginia. In 1765 he was elected a member of the House of Burgesses, and at once distinguished himself by introducing and advocating the passage of the celebrated series of resolutions in regard to the Stamp Act. Of the memorable struggle that ensued few details have been preserved, except in regard to what Mr. Jefferson called the "torrents of sublime eloquence from Mr. Henry." It was at the climax of a passage of invective that he exclaimed: "Cæsar had his Brutus; Charles the First his Cromwell; and George the Third" ["Treason!" shouted the Speaker. "Treason! treason!" arose from all parts of the room. The orator paused in defiance of these exclamations, and then deliberately added]— "and George the Third may profit by their example. If this be treason make the most of it." The resolutions passed by a majority of only one or two, but they unquestionably had a prodigious influence on public opinion throughout the colonies. Mr. Henry now became at once the acknowledged leader of the friends of colonial liberty in Virginia, and his distinguished ability as a speaker and advocate won him fame and fortune at the bar. From early life he had been a reader of history, and he was now able to bring to his speech numerous illustrations from his historical knowledge. His acquaintance of the law was neither very comprehensive nor very profound, but his gift of speech and of generalization was such that he had a marvelous power over the court as well as over the jury. He was sent to the General Congress at Philadelphia in 1774, and was chosen its first Speaker. In 1775, in the Virginia convention, he delivered his celebrated speech in favor of putting the colonies into a state of defense. From 1776 to 1779 he was Governor of Virginia, an office which he held a second period, from 1781 to 1786. Though elected to the Federal convention of 1787, he positively declined to take his seat, urging as his reason his professional engagements and his repugnance to the attitude of Congress on the question of the free navigation of the Mississippi. After the adoption of the constitution by the Constitutional Convention he was the most strenuous opponent of its ratification by Virginia. He held that the convention had transcended its authority in adopting a new constitution instead of amending the old one; that it had adopted a consolidated government instead of amending a confederacy; that the new form would destroy the State governments and swallow the liberties of the people; that while it had created a tremendous power over the States, it had extended no shield over them for their protection; that, in short, in its details as well as in its general spirit, its functions were such as to inspire distrust and alarm. Holding these views, he pleaded not for a rejection of the constitution outright, but for a postponement of action until a "bill of rights" could be submitted to the other States for their adoption. He fought his battle with extraordinary power and skill at every point in the proceedings. Of the printed report of more than 600 pages, the speeches of Henry occupy nearly a quarter of the entire space. In one speech alone he was on his feet for seven hours. Though he was unsuccessful, his advocacy reduced the majority in favor of the constitution from fifty to ten. After the final adoption Mr. Henry entered with great zeal into the plan of securing such guarantees as were afforded by the first ten amendments, and his efforts exerted a very powerful influence. During the next five years he confined himself closely to the honorable and lucrative duties of his profession. In 1794 he retired to private life, but the appointments that were tendered him bear ample evidence of the high esteem in which he was held. In 1794 Governor Lee appointed him U. S. Senator, but he declined the offer. In Oct., 1795, Washington tendered him the position of Secretary of State, and in December of the same year that of Chief Justice of the U. S. Feb. 25, 1799, President John Adams nominated him as envoy extraordinary and minister plenipotentiary to France. All of these great offices he declined. It was not until the passage of the "Virginia and Kentucky Resolutions" that the old man came forth from his happy retirement and lifted up his feeble but still eloquent voice in opposition to the spirit of disunion. He declared Virginia to be to the union what the county of Charlotte was to Virginia. In the most explicit terms he denied the right of a State to decide upon the constitutionality of federal laws. But his great speech in defense of the union was too much for his feeble strength. Though he was elected to the House of Delegates by a large majority as the representative of the union cause, he was never able to take his seat or to appear again in public. His death occurred June 6, 1799. His attitude on the great question of the indestructibility of the union, though perfectly consistent with his former views, secured the bitter enmity of Jefferson, the author of the Kentucky Resolutions, and did much to create the disfavor in which for many years the great orator was held. The *Life* of Henry by Wirt abounds in erroneous statements. See Tyler, *Patrick Henry*, in American Statesmen Series, and William Wirt Henry, *Patrick Henry, Life, Correspondence, and Speeches* (3 vols., 1891). The third volume is exclusively devoted to the letters and speeches. C. K. Adams.

Henry, William Alexander, Q. C.: judge; b. at Halifax, Nova Scotia, Dec. 30, 1816; was admitted a barrister in 1841 and appointed queen's counsel in 1849. He has been for many years prominent in the affairs of Nova Scotia; was solicitor-general 1854, 1859, and 1863; provincial secretary 1856–57; and has been surrogate, mayor of Halifax, etc. He took a prominent part in the question of the union of the provinces in 1867. He was judge in the trial of election cases in Nova Scotia in 1874, and was appointed a judge of the Supreme Court of Canada in Oct., 1875. He was instrumental in procuring measures for the protection of Canadian fisheries, in establishing a complete system of telegraphs for Nova Scotia, and in publishing the revised statutes of that province. Revised by C. H. Thurber.

Henry, William Wirt, LL. D.: lawyer and historical writer; b. at Red Hill, Va., Feb. 14, 1831; educated at the University of Virginia; member of the Legislature four sessions; president American Historical Association and of the Virginia Historical Society. Author of *Life, Correspondence, and Speeches of Patrick Henry* (3 vols., 1890–91), and historical addresses and essays. C. H. T.

Henry, Cape: See Cape Henry.

Henry of Battenberg, Prince: son of Prince Alexander of Hesse; b. Oct. 5, 1858; married, July 23, 1885, Princess Beatrice; is governor of the Isle of Wight and of Carisbrooke Castle.

Henry the Navigator: the fourth son of King John I. of Portugal; b. at Oporto in 1394; greatly distinguished himself at the conquest of Ceuta in 1415, and was afterward placed at the head of African affairs. He fixed his residence at Sagres, in Algarve, near Cape St. Vincent, where he established a school of navigation in which a number of young Portuguese noblemen were educated. Every year he sent out expeditions of exploration. In 1418 the Madeira islands were discovered; in 1440 Cape Blanco, on the coast of Guinea, was reached. From this school issued that movement of maritime discovery and commercial enterprise which placed

the Portuguese people at the head of European civilization for more than half a century, and whose two greatest results were the discovery of America and the discovery of the water-route to India around the Cape of Good Hope. The introduction of the compass and the astrolabe was due to him. Henry died at Sagres, Nov. 13, 1460.

Hen'schel, Georg: singer, composer, and conductor; b. at Breslau, Germany, Feb. 18, 1850; was educated at the Leipzig Conservatory and Berlin. His voice is a baritone of great power and richness. In 1881 he was appointed conductor of the newly established Boston Symphony Orchestra, and remained for three seasons. In 1885 he went to London and has remained there conducting, singing, and teaching, occasionally visiting the U. S. D. E. H.

Henshaw, Henry Wetherbee: ornithologist and ethnologist; b. in Cambridgeport, Mass., Mar. 3, 1850. He prepared for Harvard, but owing to ill-health was unable to enter college. He spent the winter of 1869–70 in Louisiana collecting birds, and the following year visited the less known portions of Southern Florida. In 1872 he was offered the position of assistant field naturalist to the Wheeler survey, then operating in Utah. Subsequently he was called to Washington to assist in the preparation of the natural history reports, and became permanently attached to the survey as naturalist, a post he held for nine years. In 1875 his report (300 pp.) upon the ornithological results obtained by the survey up to that time was published, and minor reports upon the same subject followed annually. In 1879 he was appointed to a position in the Bureau of Ethnology, and took charge in 1880 of the Indian division of the tenth census. He has published several papers on archæological subjects, including one entitled *Animal Carvings from Mounds of the Mississippi Valley* (1886). J. W. Powell.

Hentz, Caroline Lee: author; a daughter of Gen. John Whiting; b. at Lancaster, Mass., June 1, 1800. In 1825 she married Nicholas M. Hentz (d. 1856), a French gentleman, who was an artist and entomologist, as well as a teacher of languages and belles-lettres, and with him she resided successively at Northampton, Mass., Chapel Hill, N. C., Covington, Ky., Cincinnati, O., Florence, Ala., Tuscaloosa, Ala., Tuskegee, Ala., Columbus, Ga., and Marianna, Fla., where she died Feb. 11, 1856. She wrote a novel, poem, and play before she was thirteen years old, and afterward the play *De Lara*, in competition for a prize; *Lamorah*, a tragedy; *Constance of Weidenberg*; the tales *Linda* (1850); *Rena* (1851); *Eolin* (1852); *Helen and Arthur* (1853); *The Planter's Northern Bride* (1854); *Ernest Linwood* (1855); and numerous other novels and some poetry.

Henzada, hen-zaa'dăă: a district and city of the Irawadi division of Lower Burma; on the Irawadi river above Rangoon, and E. of Arakan. Area, 1,948 sq. miles. It is a level plain, subject to inundations, from which it is protected by immense embankments, and is everywhere suitable for the cultivation of rice. Pop. 320,000. The chief town is Henzada, on the right bank of the Irawadi, in about lat. 17° 40′ N. (see map of S. India, ref. 3–I). Pop. 17,000. The district was once a part of the Talaing kingdom of Pegu, but was annexed to Burma in 1753. M. W. H.

He'par Sul'phuris [Lat., liver of sulphur, so called from its brownish or liver color]: a crude mixture of the bisulphide and trisulphide of potassium with the sulphate of potash. It is employed to some extent as a medical remedy.

Hepat'icæ: See Liverworts.

Hepati'tis [Mod. Lat., from Gr. *ἧπαρ, ἥπατος*, liver: Lat. *jecur*: Sanskr. *yakṛt*, liver]: an inflammation of the liver. Hepatitis may be acute or chronic, the latter being much more common than the former. The only form of acute inflammation of the liver substance proper is that characterized by formation of pus, constituting *abscess of the liver*. This is a rather more common disease in the tropics, and most frequently is a sequel of dysentery. Acute inflammation may also attack the gall ducts in the liver substance, and this generally leads to Jaundice (*q. v.*). Chronic inflammation of the liver is known as cirrhosis, just as certain chronic inflammations of other organs are called cirrhosis. It is met with especially in heavy drinkers, whence the name "gin-drinker's liver," and causes irregularity of the surface, giving rise to the name "hob-nail liver." It is a progressive incurable disease, generally accompanied by ascites or abdominal dropsy. Syphilis may lead to cirrhosis, but only in rare instances. William Pepper.

Hepburn, James Curtis, A. M., M. D., LL. D.: Japanese scholar and missionary; b. at Milton, Pa., Mar. 13, 1815. He graduated at Princeton College in 1832, and studied medicine thereafter in the medical department of the University of Pennsylvania. In 1840 he offered his services as a medical missionary to the Presbyterian Board of Foreign Missions, and was accepted. He sailed with his wife for Siam in 1841, but went no farther than Singapore. Their destination was then altered to China, where Dr. Hepburn spent the next few years, leaving in 1846 on account of broken health. In 1859 he entered the newly opened Japan field, and resided in Yokohama for thirty-three years. Dr. Hepburn is author of the standard *Japanese-English Dictionary*, which is now in its fourth edition. In 1892 he published a Japanese dictionary of the Bible. J. M. Dixon.

Hephæs'tion (in Gr. *Ἡφαιστίων*): the friend of Alexander the Great; b. at Pella about 357 B. C. At what time he and the prince became companions is not known; they are first mentioned together on the occasion of Alexander's visit to Troy, where Hephæstion brought the same honors to the grave of Patroclus as Alexander to that of Achilles. But after that time they never separated until the death of Hephæstion in Ecbatana in 324, one year before that of Alexander. Alexander never preferred Hephæstion to a better man, and Hephæstion never disappointed the confidence Alexander placed in him. When Hephæstion died Alexander sent messengers to inquire of Jupiter Ammon how he should honor Hephæstion, and was instructed to sacrifice to him as a hero. Alexander then celebrated the funeral, which was one of the most magnificent in history. A portion of the walls of Babylon was razed in order to make room for the pyre, which cost 12,000 talents, while the animals offered in sacrifice to the new hero numbered 10,000, and the entire army were guests of the king on the occasion. Temples were erected in honor of Hephæstion in various parts of the empire. Revised by J. R. S. Sterrett.

Hephæstion: a Greek grammarian of Alexandria, according to Suidas; flourished about A. D. 150, as Julius Capitolinus speaks of him among the tutors of the Emperor Verus. To him is ascribed the *Ἐγχειρίδιον περὶ μέτρων* (*Manual of Meters*), from which most of our knowledge of the Greek meters is obtained. Suidas assigns to him other works not now extant. The best edition of the *Manual* is by Gaisford (Oxford, 1810, 8vo; Leipzig, 1832; revised, Oxford, 1856, 2 vols.). Revised by J. R. S. Sterrett.

Hephæs'tus (in Gr. *Ἥφαιστος*): in Greek mythology, the god of fire and lightning and the smith of the gods, identified by the Romans with Vulcan (*q. v.*). Homer found his myth already fully elaborated. It illustrates the origin of the gods from natural phenomena, for Hephæstus and fire (his element) continued to be synonymous terms even in post-classical times. His home and smithy were on Olympus. His frame was huge, the upper part of his body being well developed, strong, and powerful, though he was lame from his birth, and his weak and puny legs barely allowed him to hobble along. The ancients themselves explained his body as being typical of the twofold nature of fire—its might and its uncertain flickering character. He has to walk with a staff, and he is supported by little golden maidens endowed with intellect, his own handiwork, and even then his gait is halting. Externally he is a common smith, but his cunning works prove his divinity, for they are such as no mortal could execute. In Homer Hephæstus is the son of Hera by Zeus, though his descent from Zeus gradually became obscured and finally forgotten. Hesiod does not know of his descent from Zeus, and makes Hera beget him of herself in envy that Zeus had begotten Athene without her assistance. But disgusted at his lameness, she cast him out of heaven in the hope thus to conceal him from the gaze of the gods. The Nereides Thetis and Eurynome cared for him in their home in the depths of the sea, where he abode nine years and wrought wondrous works. There is another version of his fall, according to which Zeus grasped him by the foot and hurled him out into space because he wished to assist Hera, whom Zeus had suspended from heaven. He fell upon Lemnos, and was cared for by Sintian men. By command of Zeus, Hephæstus made Pandora (*q. v.*) by mixing earth and water. He thus became the creator of the human race, though to Prometheus the honor of man's creation is usually ascribed. It was Hephæstus who cleft the head of Zeus with an ax in order that Athene might be born from it. In the *Iliad* Charis is his wife; in the *Odyssey* he is married to Aphrodite.

Though reckoned as one of the twelve great gods, he was singularly helpless except in his own realm of fire, where he was supreme. He was of a kindly disposition, as witness his gentleness toward Hera and his sympathy for Prometheus. As the halting cup-bearer of the gods he caused infinite merriment in Olympus. In later times his forge is transferred from Olympus to the center of volcanoes, where his activity may still be noted.

LITERATURE.—Rapp, in Roscher's *Ausführliches Lexicon*; Schwartz, *Ursprung der Mythologie* (Berlin, 1860); Blümner, *De Vulcani in veteribus artium monumentis figura* (Breslau, 1870); Roscher, *Die Gorgonen* (Leipzig, 1879) and *Nektar und Ambrosia* (Leipzig, 1883); Preller-Robert, *Griechische Mythologie* (Berlin, 1887); Kuhn, *Herabkunft des Feuers und des Göttertranks* (Gütersloh, 1859).

J. R. S. STERRETT.

Heptan'omis [= Gr. Ἑπτανομίς, liter., the seven provinces; ἑπτά, seven + νομός, province; deriv. of νέμειν, divide, distribute]: the central division of Egypt lying between the Delta and the Thebaïs, and including the territory between Memphis and Hermopolis Magna. The threefold division belongs to the Græco-Roman period, and the name is first used by Ptolemy in the first part of the second century. In the middle of the fifth century (*Notitia Dignitatum*) it is replaced by the name Arcadia. During the French occupation the threefold division of the land was revived.

CHARLES R. GILLETT.

Hep'tarchy [from Mod. Lat. *heptar'chia*, a seven-rule = Gr. ἑπτά, seven + ἄρχειν, rule]: a government by seven, especially applied in a somewhat misleading way to the seven principalities of the Anglo-Saxons in England before the reign of Egbert, the first King of England, who became King of Wessex 800, and died 836. Eight kings, of six different kingdoms (all except Essex and Mercia), had at times possessed a certain supremacy over the rest. The actual number of kingdoms was sometimes greater and sometimes less than seven, and yet seven stand out so prominently that they have led to the use of the term heptarchy. The seven kingdoms were: 1, Kent (449–823); 2, Sussex (477–823); 3, Wessex (519–823); 4, Essex (526–823); 5, Northumbria (547–827); 6, East Anglia (571–823); 7, Mercia (584–827). In 828 Egbert of Wessex, the eighth bretwalda, became the first hereditary King of England; but some of the minor kingdoms existed for many years thereafter.

Revised by C. K. ADAMS.

Hep'worth, GEORGE HUGHES, D. D.: minister and author; b. in Boston, Mass., Feb. 4, 1833; studied divinity at Cambridge, Mass., and graduated 1855; pastor of Unitarian church at Nantucket 1855–57; of the Church of the Unity, Boston, 1858–70; became in 1862 a regimental chaplain in Louisiana, and served in 1863 on the staff of Gen. Banks. He was (1870–72) pastor of the Church of the Messiah, New York. In 1872 he became a Trinitarian, and soon organized the Church of the Disciples, of which he was pastor till Feb. 14, 1879; pastor of Belleville Avenue Congregational church, Newark, N. J., 1882–85; became an editor of *New York Herald* in 1885. His works include *Whip, Hoe, and Sword* (Boston, 1864); *Rocks and Shoals* (1870); *Starboard and Port* (1876). Revised by S. M. JACKSON.

He'ra (in Gr. Ἥρη, Ἥρα): in Grecian mythology, a daughter of Cronus and Rhea. Cronus swallowed her just as he had done all his children before the birth of ZEUS (*q. v.*), who, in pursuance of the plans of Gaea, gave Cronus an emetic. In this way the children were saved, and Hera became the wife of Zeus and the queen of heaven. She was a very ancient and venerable goddess, worshiped everywhere throughout the Greek world, but especially in Argos and Mycenæ, near which place her most celebrated temple stood. Homer paints her as jealous, spiteful, and quarrelsome. Roscher, in his *Juno und Hera* (Leipzig, 1875), has brought forward strong arguments in favor of the moon-goddess theory, showing first that Hera was the counterpart of the Italic moon-goddess Juno; that in common with all moon-goddesses she was the goddess of women, childbirth, and marriage; that she was especially concerned with the monthly menstruation of women; that like Juno her festivals were celebrated at the time of the new moon; that she was the queen of heaven, not merely because she was the wife of Zeus, but especially because the moon is by right the queen of the stars; that she was worshiped in high places from which the phases of the moon might best be observed, etc. The old idea that Hera was the earth was based on a misconception. Her marriage with Zeus, the highest god, was regarded as the ideal marriage: it was called the sacred marriage, and its incidents were imitated in mortal marriages. The children of this marriage were Hebe, Eileithuia, Ares, and Hephæstus. Hera resented bitterly the amours of Zeus with mortal women, and she was wont to visit her wrath both upon the women and their offspring. Leto experienced her anger, and so did Alcmene, and Samele, and Io, and Callisto. She sent the sphinx to distress the Thebans because Hercules was born there; she hated all Trojans because Paris did not give her the golden apple that was inscribed "To the most beautiful"; she made Teiresias blind because in a mooted question between Zeus and herself he decided in favor of the former. The few statues of Hera that have come down to us are divided into two classes, those with a veil and those without. She usually stands on her left foot with her right leg bent at the knee, so that her foot is shoved back and rests on the toes; her right arm is bent at the elbow, and is elevated so that the whole arm rests on a scepter which she holds in her hand; her left arm is lowered slightly in front of her, and in her hand she holds a patera. The best statues of Hera without a veil are the Torso from Ephesus (now in Vienna) and the Barberini statue (now in the Vatican). The best statues of Hera with a veil are the bronze statuettes in Vienna, in Turin, in Paris, and in Florence. Of busts, the most celebrated are the Juno Farnese (in Naples) and the Juno Ludovisi (in Rome), concerning the relative importance of which expert opinion varies, though Brunn, the prince of archæologists, awards the palm to the Juno Farnese. It is not absolutely certain what artist fixed the type of Hera, though probably it was Polyclitus, from whose colossal sitting statue in gold and ivory in the Heræum, near Mycenæ, the Juno Farnese was probably imitated or copied. The head found by archæologists from the U. S. at the Heræum during the course of excavations on the site bears a striking resemblance to the head of the Juno Farnese, and is a strong argument in favor of the theory that both come from a Polyclitean original, though if this theory be correct then the personality of the copyist or imitator must be made responsible for the fact that he did not imitate accurately, for the Hera of Polyclitus certainly wore a high, broad headband or crown.

LITERATURE.—Schwartz, *Sonne, Mond und Sterne* (Berlin, 1864); Overbeck, *Griechische Mythologie* (Leipzig, 1873); Roscher, as cited above, and Roscher and Vogel in the *Ausführliches Lexicon* under *Hera*. J. R. S. STERRETT.

Heraclei'a: a Greek city of Lucania, in Southern Italy; near a place now called Policoro, and not far from the Tarentine Gulf. It was founded 432 B. C., and attained great wealth and power, and became a kind of capital for the Italiote Greeks. In the first century B. C. it was a Roman *municipium* of some importance. In 1732, not far from its site, were found the bronze tablets containing the *Lex Julia municipalis* of Cæsar (45 B. C.), a monument of great importance for the student of Roman history and Roman law. Many other ancient towns bore this name, among which was an important one on the south coast of Sicily.

Revised by G. L. HENDRICKSON.

Heraclei'dæ [Lat. = Gr. Ἡρακλεῖδαι, plur. of Ἡρακλείδης; Ἡρακλῆς (Hera's fame), Heracles + patronymic ending *-ίδης*, son of]: the descendants of Heracles (Hercules), to whom many prominent Greek families traced their origin. But the name especially belongs to those Heracleidæ who joined the Dorians in their invasion and conquest of the Peloponnesus, which is often called "the return of the Heracleidæ," because they were considered as Achæans by race. The Greek historians narrate with considerable detail the exploits and successes of the Heracleidæ in the early Dorian wars, and much of the story must be regarded as possessing historic truth. The Heracleidæ became the progenitors of several princely houses, and were even admitted to rule over Dorians. Revised by J. R. S. STERRETT.

Heracleop'olis [Egyptian, Chenensuten or Chenensu; present, Ahnas]: the name given by the Greeks to the capital of the twentieth nome of Upper Egypt. Its site is now 12 miles W. and inland from Benisuef, and is marked by a few pillars and a large mass of rubbish. It was a very ancient city, and in the twelfth dynasty was an important center of literature and art. In mythology it was also important, since it is mentioned in the legend concerning the destruction of mankind for revolt against the sun-god Ra, and it also contained the hill upon which Ra first appeared, bringing light and order into the world. CHARLES R. GILLETT.

Heracli'des Pon'ticus [Lat. = Gr. Ἡρακλείδης ὁ Ποντικός. *Heraclides* (Ἡρακλείδης) called *Ponticus* from his native place on the *Pontus* Euxinus]: author; b. probably B. C. 378. He appears to have gone at an early age to Athens, where he attached himself to Plato, about 361 or 358; he attended the lectures of Aristotle also, and must have studied the Pythagorean philosophy, which he followed in his writings on natural philosophy. He was a man of great learning, and wrote on a great variety of subjects—philosophy, natural science, mathematics, music, grammar, history, and poetry—so that he was fairly entitled to the designation of *polyhistor*. Of all his writings only fragments remain, with the exception of a small treatise entitled (Ἐκ τῶν) περὶ πολιτειῶν (Extracts from Forms of Government), which is believed to be merely a compilation from different writings of the author, possibly also from Aristotle's treatise on the subject. For another work, called Ἀλληγορίαι Ὁμηρικαί (Allegories from Homer), which passes under the name of Heraclides, see HERACLITUS. The best editions of the Περὶ πολιτειῶν are that of Köler (Halle, 1804), that of Coraës (Paris, 1805), of Schneidewin (Göttingen, 1847), and in Müller's *Fragm. Hist. Grac.* (vol. ii., pp. 197–224). See Roulez, *Comment. de vita et scriptis Heraclidis* (Louvain, 1828); and the *Prolegomena* to Schneidewin's and Müller's editions.

Revised by B. L. GILDERSLEEVE.

Heracli'tus: surnamed THE DARK (σκοτεινός); philosopher; b. at Ephesus, in Asia Minor, according to some authorities, about 535 B. C., according to others about 500. The son of Blyson (or Heracion), he belonged to the noble family of the Codrids. Unlike most of the philosophers of his time, he took no part in public affairs. He is said to have refused the proffered sovereignty of Ephesus, as well as an invitation to the court of Darius. The stories related about him are to a very great extent legendary. His contempt for the unthinking rabble, as well as for the social and political condition of Ephesus, was extreme. Though he was evidently acquainted with the works of Hesiod, Pythagoras, Xenophanes, and Hecatæus (see *Diog. Laert.* ix., 1, 1), he was apparently justified in asserting that he had learnt everything from himself. The profoundest of the pre-Socratic philosophers, he had numerous disciples for many succeeding ages. He is known to have written only one work, which, like most other philosophical works of the time, was entitled *On Nature*. It went under several other names, and was divided into three parts: I. *On the All*; II. Political; III. Theological. The much talked-of obscurity of his writing, usually considered as intentional on his part, or as owing to fear of persecution for impiety, probably was due rather to the fact that he wrote only for the few, and that prose-writing and philosophical terminology were in his day very undeveloped. Of the work of Heraclitus, which was apparently extant in the third century A. D., numerous fragments are scattered through the works of various authors. The best collections of them are in Mullach's *Fragmenta Philosophorum Græcorum*, vol. i., pp. 310–329; Schuster's *Heraklit von Ephesus*, vol. iii. of Ritschl's *Acta Societatis Philologæ Lipsiensis*; and Bywater's *Heracliti Ephesii Reliquiæ*. The second contains on pp. 351–358 an excellent Heraclitean bibliography. Besides these, the following works are valuable: Schleiermacher, *Herakleitos der dunkle von Ephesos* (1808); Hegel, *Geschichte der Philosophie* (1833), vol. i., pp. 327–353; J. Bernays, *Heraclitea* (1848); F. Lassalle, *Die Philosophie Herakleitos des dunkeln von Ephesos* (1858, 2 vols. 8vo, written from an extreme Hegelian standpoint, and with a very imperfect knowledge of Greek); A. Gladisch, *Herakleitos und Zoroaster* (1859); Bernays, *Die Heraklitischen Briefe* (1869); E. Zeller, *Philosophie der Griechen*, 3d ed., vol. i., pp. 523–603; J. Mohr, *Ueber die historische Stellung Heraklits von Ephesos*; Teichmüller, *Neue Studien zur Geschichte der Begriffe*, Heft. i., *Herakleitos*, ii., pp. 103–253, *Herakleitos als Theolog*; Pfleiderer, *Die Philosophie Heraklits von Ephesus im Lichte der Mysterienidee*; Patrick, *The Fragments of the Work of Heraclitus of Ephesus on Nature, translated from the Greek Text of Bywater with an Introduction, Historical and Critical*; G. Mayer, *Heraklit von Ephesus und Arthur Schopenhauer*; C. Baumker, *Das Problem der Materie in der griech. Philosophie*, pp. 19–33; Th. Gomperz, *Griechische Denker*, vol. i., pp. 49–65.

Philosophy.—The philosophy of Heraclitus, which Gladisch and others have tried to connect with Zoroastrianism, was, in fact, a development of the Ionic or Hylozoic doctrine, influenced by the speculations of the Eleatic Xenophanes. This development consists in an advance from the idea of *being* to that of *becoming*. The principle—i. e. the inner essence of all things (not their origin)—is fire (πῦρ, πρηστήρ), a fine, dry, ever-active, necessarily self-determined ether, whereof the purest form is soul or spirit, and which, by rhythmical, qualitative, and local change, resulting in condensation and rarefaction, creates and uncreates the sensible world. The way to creation (διακόσμησις), or the downward way (ἡ ὁδὸς κάτω), is through extinction or deprivation (χρησμοσύνη), and proceeds thus—fire, water, earth; the way to dissolution (ἐκπύρωσις), the upward way (ἡ ὁδὸς ἄνω), is through ignition or fullness (κόρος), and proceeds—earth, water, fire. All things are in motion (πάντα χωρεῖ): stability is an illusion produced by uniformity of motion. Resolution into original fire is utter spiritual activity, and, at the same time, rest and peace in the union of contraries; creation is relaxation of activity, but, at the same time, war, through the declared opposition of contraries. War, strife, is therefore the parent of all relative created things. These are known to us through our senses, which, however, though necessary, are bad witnesses, unless corrected by the inner, universal wisdom which alone recognizes in and through itself the inner λόγος or fate, which is the law of the universe—a law hidden from the foolish, but open enough to the wise. The soul is immortal, a part of the dry, primal fire, but takes rest from utter activity in the creation of a body. The microcosm is the image of the macrocosm, a shorter rhythmic pulse within a longer. The philosophy of Heraclitus deeply affected all subsequent thought. It furnished a leading element in the doctrines of the Sophists; caused the reaction of Socrates in favor of a permanent, transcendental element in nature and man; was revived by Zeno, and made the basis of Stoicism; passed thence into Greek Christianity, which it supplied with some of its leading doctrines—e. g. those of the Logos, or Word, of a final conflagration (ἐκπύρωσις), etc.; and, finally, passed in a sublimated form into the *Logic* of Hegel. At the present moment it bids fair to be resuscitated in the form of Monism, and has doubtless a great and beneficent future.

THOMAS DAVIDSON.

Heraclitus: Greek grammarian; author of *Homeric Allegories* (Ἀλληγορίαι Ὁμηρικαί), in which Homer is allegorized in an absurd fashion. The work was attributed by Gesner to Heraclides Ponticus, and published under his name by Schow (1782). Since then R. Schmidt has claimed the authorship for Porphyry, another idle guess. The time remains uncertain. See the edition by Mehler (1851). B. L. G.

Heraclius: Byzantine emperor; b. in Cappadocia about 575; came to the throne after a successful revolt against the Emperor Phocas in 610; was noted for his conduct of the war against the Persians under Chosroes II., who during the early years of his reign ravaged the Asiatic provinces of the empire, and so reduced the imperial revenues that in 618 Heraclius was forced to discontinue the public distributions of grain, and planned to change his capital from Constantinople to Carthage. Dissuaded from this by the prayers of the people and gaining a respite from his Western foes, the Avars, by a humiliating treaty, he raised an army, entered Asia Minor, won the battle of Issus, and, after a series of brilliant campaigns which place him among the greatest generals of history, crushed the power of Chosroes in the battle of Nineveh in 627. The rest of his reign, in contrast to the activity which he showed in the Persian war, is marked by a singular apathy in the midst of dangers more serious than the encroachments of Chosroes. The Mohammedans wrested Syria and Egypt from the empire while he busied himself with useless theological dialectics, and made only dilatory and feeble efforts to save the provinces. D. in 641.

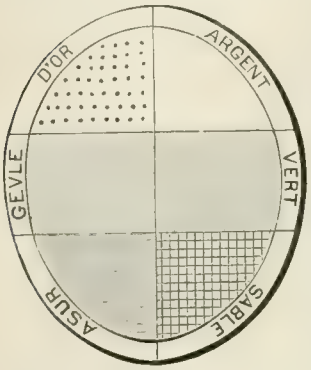
F. M. COLBY.

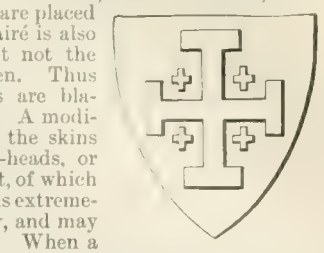
Herald [M. Eng. *herald*: M. H. Germ. *herolt* (> Mod. Germ. *herold*) from O. Fr. *heralt* (> Mod. Fr. *héraut*): Span. *heraldo*: Ital. *araldo*; Teuton. cf. O. H. Germ. *heriwalto*, herald; *hari*, army + *waltan*, rule]: a messenger charged with an important mission, as a declaration of war or international treaty; in the Middle Ages an official who marshaled the combatants in the lists, and served as a messenger between princes. The heralds were charged also with questions of genealogy and heraldic bearings. See HERALDRY.

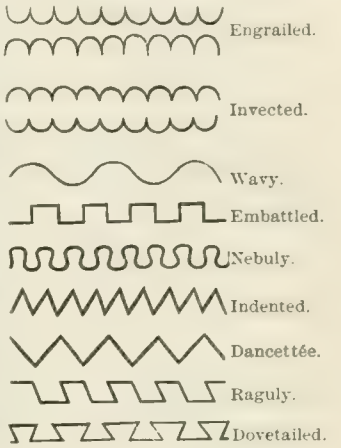
Heraldry [from O. Fr. *heraulderie*; deriv. of *heralt*, herald. See HERALD]: in general, the science which treats of coat-armor, descents, precedence, ceremonies, and processions—that is, the art and occupation of a HERALD (*q. v.*);

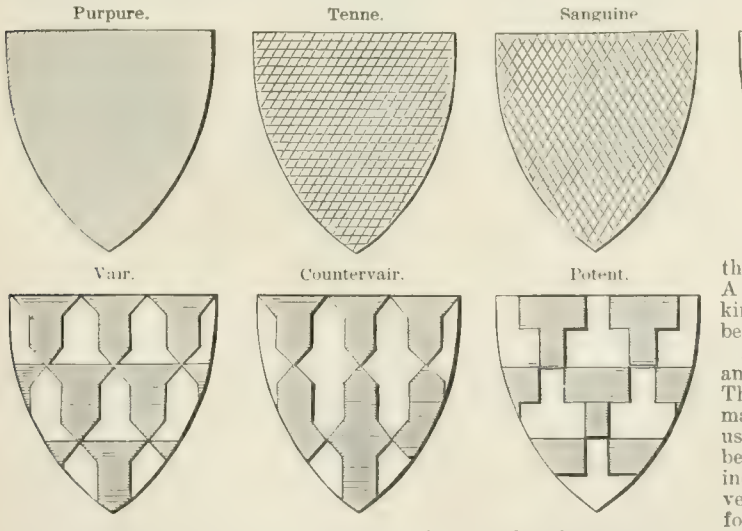
in a narrower sense, the science of coat-armor, or the art of identifying, drawing, and describing coats-of-arms. In Great Britain the whole subject is intrusted to the College of Arms or Heralds' College, which has the right of granting and confirming coats-of-arms; of recording pedigrees and descents, and of visiting the counties of the kingdom for that purpose; of directing solemn ceremonies, particularly those of a coronation; and of deciding all questions of precedence. Its officers are Garter, Clarencieux, and Norroy kings-of-arms, with six heralds and four pursuivants. In the U. S. there is no official body charged with these functions.

The older (though perhaps not the oldest) writers have attributed a fabulous antiquity to the use of armorial bearings. The science of heraldry can not be traced with any certainty beyond the twelfth century. It appears to have had its origin in necessity. When warriors wore armor and looked exactly alike, even concealing their faces in their helmets, some method of distinguishing them was absolutely necessary. The shield was the most conspicuous part of their armor, and nothing would be more natural than to decorate it with color, or to enrich it with figures of natural or artificial objects. Hence arose the system of tinctures, ordinaries, and charges; from which simple beginnings the whole science of heraldry, or, as some prefer calling it, of armory, has been developed. The tinctures are divided into metals, colors, and furs. The metals are two, gold and silver, called *or* and *argent*. The colors are red, black, blue, green, and purple, called respectively *gules*, *sable*, *azure*, *vert*, and *purpure*. To these some writers add orange tawny and blood color, in heraldic language, *tenné* and *sanguine*, which they call *stainand* colors. The usual pigments are gold, or gamboge, for or, and pure white for argent. Silver is more correct, but its tendency to tarnish makes it objectionable. Vermilion, India-ink, ultramarine, and verditer with gamboge answer well for the colors, and purple can be readily made by mixing carmine (lake) with Prussian blue. The furs are ermine and vair; the former white, with black spots, arranged in a peculiar way (see cut below), the latter composed of bell-shaped or shield-shaped figures, alternately argent and azure, placed in rows, base to base, so that the base of every white figure touches that of every blue one (see cut). Modifications of these furs have been introduced from time to time. They are ermines, with the field sable and the spots argent—i. e. ermine reversed—and therefore more correctly called by the French heralds contre-ermine; erminois, the field or and the spots sable; erminites, the same as ermine, but with a red hair on each side of the white spots; pean, the field sable and the spots or. The derivatives of vair are vair en point, when the point of one figure is opposite the base of another, and countervair, when those of the same tincture are placed base to base. The term vairé is also used when the figures but not the tinctures of vair are given. Thus the arms of Earl Ferrars are blazoned vairé, or, and gules. A modification of vair, in which the skins take the form of crutch-heads, or potents, is known as potent, of which there are four varieties. It is extremely rare in English heraldry, and may be of any metal and color. When a charge appears in its natural colors it is said to be proper. The annexed arrangement of tinctures (omitting purpure, which is given separately) is borrowed from Mr. Planché, who has engraved it from Sir Nicholas Bysshe's edition of *Upton*, A. D. 1674. The mode of indicating the tinctures which it presents, and which is found very useful in engravings or in sculpture, or under any circumstances in which the blazon or description can not be given, is said to have been invented by Father Silvestre de Petrasancta in the seventeenth century. Or is shown by a multitude of dots; argent is white; gules is indicated by perpendicular and azure by horizontal lines; vert by diagonal lines from right to left, and purpure by similar lines from left to right; sable is marked by perpendicular and horizontal lines crossing each other. The right or dexter part of the shield is opposite the left hand of the person looking at it, and the left or sinister opposite his right hand; animals, etc., used as charges, unless it be otherwise specified in the blazon, always look to the dexter. Modern heraldic illustrators make little use of the lines of Petrasancta, but prefer giving the arms in their books in outline or *trick* and accompanying them with the blazon, thereby saving trouble and expense in drawing and engraving. It is a general rule that color is not to be placed upon color, nor metal upon metal. Exceptions, however, occasionally occur; and they are called by the French arms *pour enquérir*, meaning that there is something peculiar in their origin, about which inquiry is to be made. A good example is found in the arms of the kingdom of Jerusalem: "Argent, a cross potent between four crosslets or." See above.





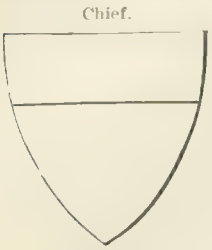


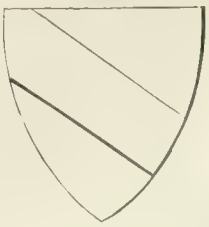


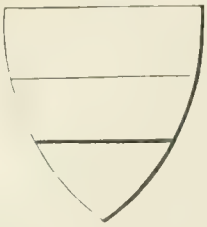
Anything borne upon the field is a charge, and charges may be put upon other charges. The ordinaries are the simplest charges, and may be considered divisions of the field formed usually by straight lines, though the lines may be engrailed, invected, embattled, wavy, nebuly, indented, dancettée, raguly, or dovetailed. Invected is the reverse of engrailed—i. e. in the former the points turn outward, in the latter toward the inner part of the ordinary. The ordinaries are usually reckoned as nine in number, as follow: the chief, the bend, the fess, the pale, the bend sinister, the cross, the saltire, the chevron, and the bar. Mr. Planché, indeed, suggests the substitution of the quarter and the pile for the bend sinister and the bar, but he supports his proposal by no very cogent argument. "The two latter," he says, "are

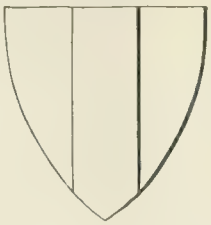
merely varieties of the bend and the fess"; but that is probably the very reason why they are introduced.

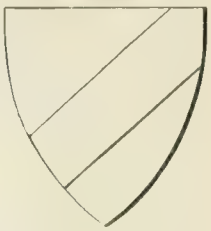
The chief is formed by a horizontal line, cutting off the chief or upper part of the field, the bend, by two parallel


Chief.

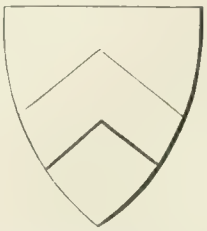

Bend.


Fess

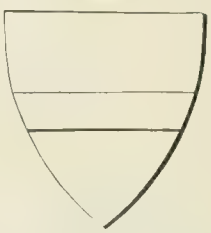

Pale.


Bend sinister.

Cross


Chevron.

Saltire.


Bar

The dimensions of the ordinaries are usually one-third of the field when charged, or one-fifth when uncharged, except the chevron and the bar, which occupy one-fifth. In practice, however, it is hardly possible to follow these stringent rules, and it is common to make the ordinaries smaller.

diagonal lines from the dexter chief to the sinister base; the fess by two similar lines crossing the shield; and the pale, by the like lines from chief to base. The bend sinister is

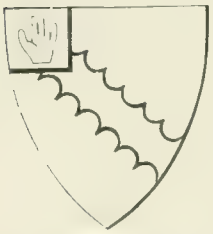
Chevron couched.

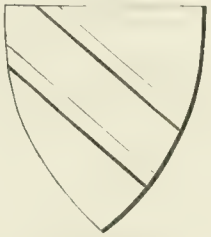
Chevron enhanced.

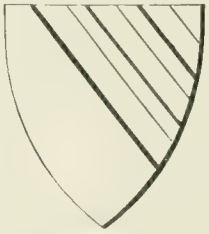
Chevronel.

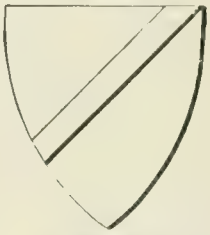
Bend cottised.

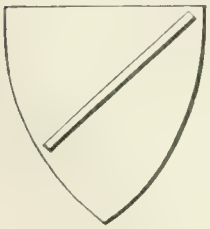
Bendlet.

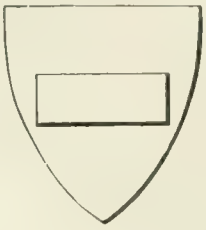

Bend engrailed.

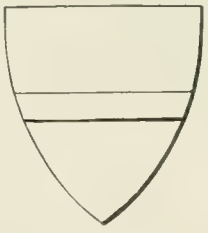

Two bendlets.

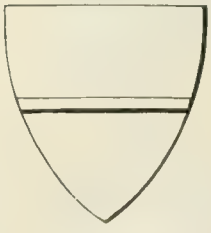

Three bendlets enhanced.

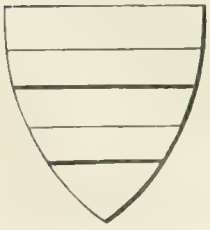

Scarpe.

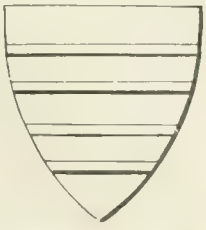

Baton.


Fess humetty.

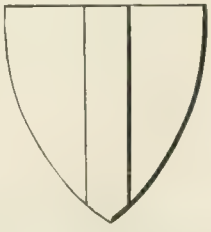

Closet.

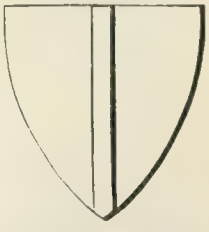

Barrulet.


Two bars.

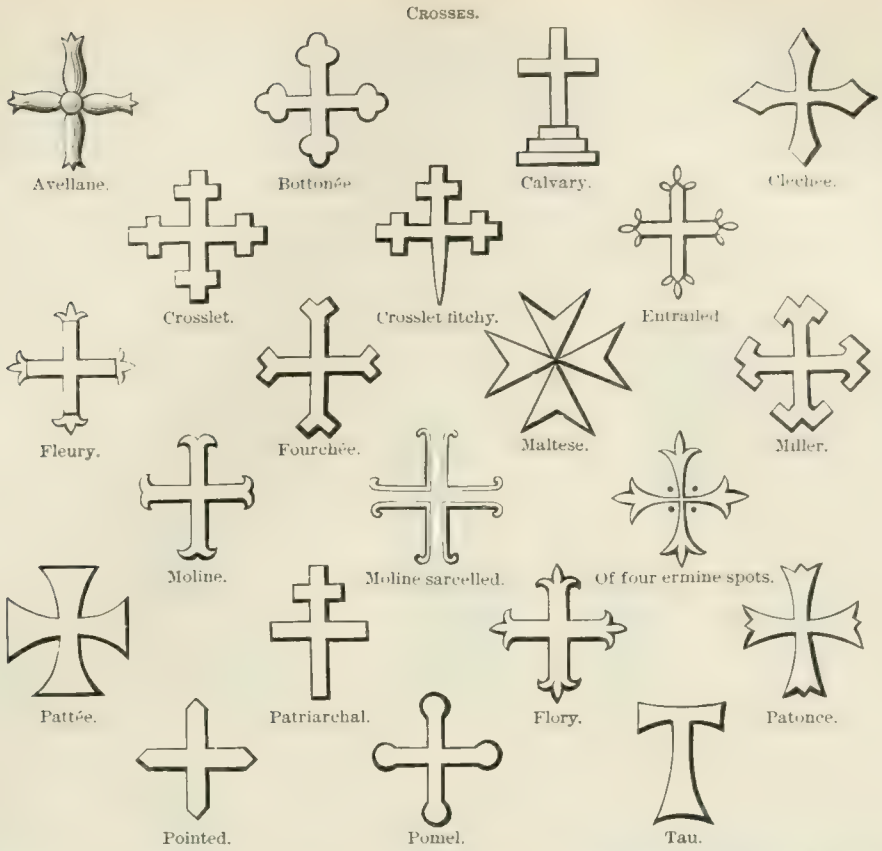

Two bars gemels.

Three chevrons braced.

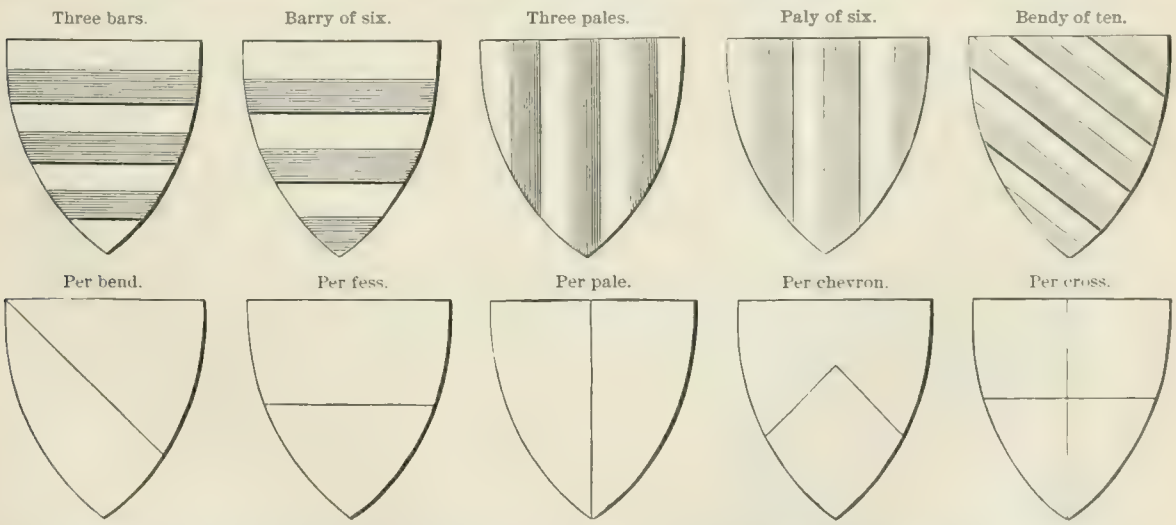

Pallet.


Indorse.

the bend reversed. Several of the ordinaries have diminutives, as the couple close for the chevron, and the cottise for



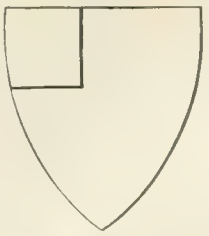
the bend. A bend borne between two cottises, or narrow figures like itself, is said to be cottised, and the same word is applied to other ordinaries in like positions. If the tincture of the field be a metal, the ordinary must be color, and the reverse; but furs may be combined with either metal or color. The same rule applies to other charges. The ordinaries also admit of certain variations of form. Except the chief, they may be humetty—i. e. they may have the ends cut off. The chevron may be rompu or couched, and the bend may be enhanced, i. e. borne in the upper part of the shield, instead of the middle. The field may also be divided by lines derived from the ordinaries, and is then said to be paly, bendy, barry, etc.; it is apparently filled with many little pales or bends, alternately of metal and color. There is a distinction to be observed between an escutcheon which is paly or bendy, for instance, and those which contain several palets or bendlets. In the former case the number of divisions is even, and if the first be a metal the last is a color; in the latter the number of divisions is unequal, and the first and the last are alike. Thus paly of six argent and azure, given by Burke to a family of Gorney, is to be carefully distinguished from argent three pales azure, the arms of Thornton. The sub-ordinaries are the bordure, the canton, the flanches (with their diminutives, flasques, and voiders), the fret, the gyron, the inescutcheon, the orle, the pile, the pall, the quarter, and the tressure; and these in their turn lead to new divisions of the shield, such as pily, checquy, compony, counter-compony, fretty, some of which, like barry pily, bendy pily, are extremely complicated. A detailed account of

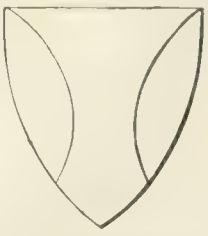


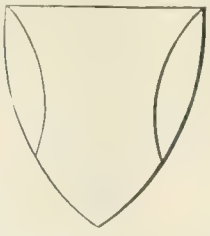
these must be sought in heraldic manuals and grammars.

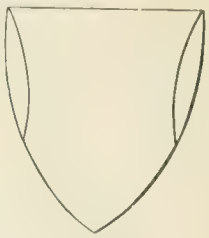
Charges may be anything in nature, or indeed out of it.

Bordure.

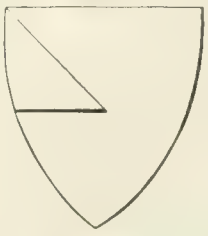

Canton.

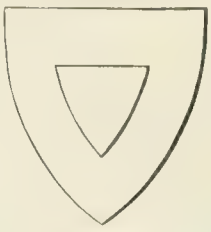

Flanches.

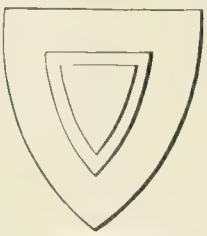

Flasques.


Voiders.

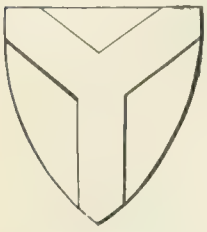
Fret.

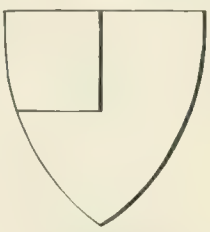

Gyron.

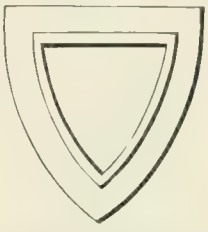

Inescutcheon.

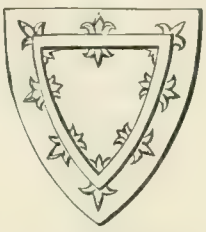

Orle.

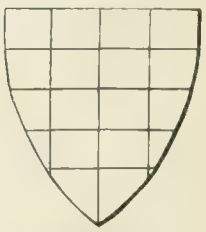
Pile.

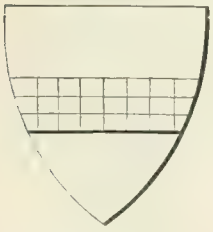

Pall.

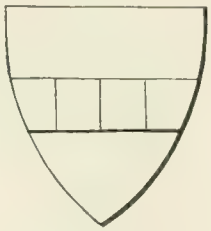

Quarter.

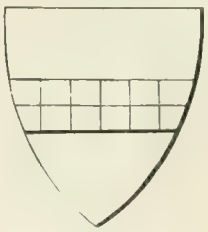

Tressure.

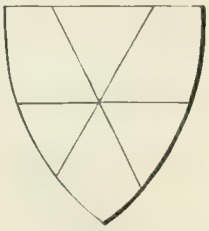

Tressure flory.

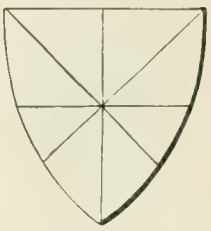

Checquy.


Fess checquy.

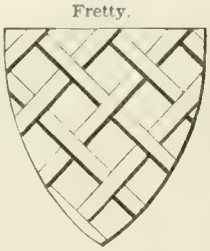

Fess compony.


Fess counter compony.


Gyronny of eight.


Gyronny of ten.

A charge is a figure borne either upon the field or upon another charge, as often upon an ordinary. The variety of figures used as charges is very great, and there appears to be no limit to the choice. Lions, eagles, wolves, tigers, and antelopes are generally drawn conventionally, and not naturally, though some modern painters seem disposed to depart in this respect from the ancient rules. Other animals, fruits, and flowers, commonly follow nature, but the heavenly bodies do not. Fishes do, except the dolphin. Artificial figures are drawn as they appear.


Fretty.

There are also definite terms employed to describe the position of animals and other charges, as a lion rampant, a lion passant gardant. The former is called by the French heralds a lion, the latter a leopard. Ignorance of this simple fact has led to prolonged discussions whether the arms of England, gules three lions passant gardant in pale, or, gave lions or leopards. Charges are generally readily understood, but some few, like the fleur-de-lis, the clarion, and the fylfot, are obscure, and are called doubtful charges.

Besides the above there are certain figures peculiar to heraldry, and of very frequent occurrence. The roundle is supposed to be derived from the gold coin of Byzantium, and therefore when it is or is called a bezant. When gules, it becomes a torteau; azure, a hurt; vert, a pomey; sable, a pellet or ogress; purpure, a golpe; argent, a plate; tenné, an orange; and sanguine, a guze. A roundle barry wavy argent and azure is a fountain or sykes, and is borne by a family of the latter name. When the field is sprinkled with pointed figures resembling

Griffin.

Wivern

Antelope

Wolf.

Tiger.

Lion rampant.

Eagle displayed.

Lion salient.

Rampant crowned.

Rampant double-queuée.

Lion rampant gardant.

Rampant regardant.

Passant.

Passant gardant.

Sejant.

Couchant.

Dormant.

Demilion.

Lion's head.

Gamb.

Tail.

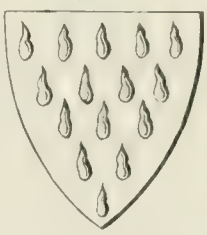
Stag's head caboshed.

drops, it is said to be gutté, and a single drop is called also a gutté. If the drops be white, the field is gutté d'eau—filled with drops of water. Guttés de larmes, blue drops, represent tears; de poix, sable, drops of pitch; de sang, red, drops of blood; d'huile or d'olive, green, drops of oil; d'or, gold, drops of gold. A lozenge is the common figure of that name: the horizontal diameter is equal to one of the sides, but the perpendicular diameter is longer; a mascle is a lozenge voided—i. e. having the middle removed, so that the field is visible through it, and marking the outline by two slender lines, one within the other. Ordinaries also may be voided. The fusil was originally the spindle, and in some old arms is borne in its original form; it is now merely the lozenge elongated. These charges give rise to the divisions of the shield known as lozengy, masculy, and fusilly, with their combinations. When lines like those of the fret are extended throughout the field or cover an ordinary, it is said to be fretty. The annulet is a ring; the millrind or fer-de-moline, the iron of a millstone; the pheon, an arrowhead; the caltrop, an iron instrument formerly strewn in a field of battle to entangle the feet of horses, and so constructed that a sharp point was always uppermost. For other charges it is necessary to refer the reader to some manual of heraldry.

Bezant.

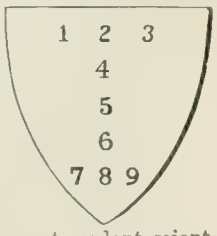
Fountain.

Guttés.



Blazoning is the art of so describing arms that a drawing can be made from the description. It is necessary first to understand the points of the escutcheon, which are: (1) the dexter chief point; (2) the middle chief; (3) the sinister chief; (4) the honor point; (5) the fess point; (6) the nombril point; (7) the dexter base; (9) the sinister base; and (8) the base or middle base point. The terms of art must next be learned; not only the heraldic names of things, but the various attitudes of animals and the position of charges. Beasts of prey are blazoned rampant, passant, passant-gardant, sejant, rampant-gardant, couchant, dormant, etc.; and when at rest, statant, though this is generally understood. Beasts of chase, however, are not rampant, but springing; not passant, but trippant; not couchant, but lodged. A griffin is not rampant, but segreant. Lions are always langued and armed. If the field or the lion be gules, the tongue and claws are azure; if of any other tincture they should be gules. Stags, etc., are attired and unguled, horned and hoofed. Birds are displayed rising, volant, or at rest. Fishes are naiant when in fess, or hauriant when in pale.

Points of escutcheon.



Lozenge.

Fusil.

Mascle.

Billet.

Caltrop.

Shackbolt.

Trefoil.

Bird-bolt.

Annulet.

Fer-de-moline.

Pheon.

Cinquefoils.

Sun.

Trunk.

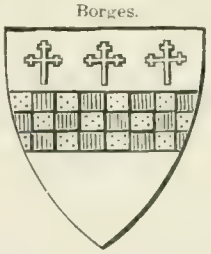
Flowers are often slipped, and trees eradicated or torn up by the roots. Certain charges, also, are blazoned in a peculiar manner. The sun, surrounded by rays and or, is said to be in his splendor; the full moon, argent, in her comple-

D'Aubernoun. Fitz-Neele.

ment. Both are drawn conventionally, with a human face. When sable, the moon is said to be eclipsed. A crescent has its horns toward the chief, an increscent toward the dexter, and a decrescent toward the sinister side of the escutcheon. A peacock with his tail extended is said to be in his pride, and is depicted proper. A pelican in her nest, feeding her young, is said to be in her piety. In blazoning care must be taken to use language with extreme accuracy, since the least departure from correctness may produce an entirely different coat from that which it is intended to describe; to use as few words as possible, and to avoid repetition, particularly of the name of a tincture or of numbers. The tincture of the field must first be mentioned, then the bearing and its tincture, as, Azure, a chevron or (see D'Aubernoun). The field must be blazoned first, as, argent, or Paly of six argent and gules. Next to the ordinary, if there be one, other charges placed upon the field are named, as, Ermine, a chevron azure between three garbs or. Garbs are wheat-sheaves. If the ordinary and charge be of the same tincture, it need be named but once, as, Azure, a chevron between three garbs or (see Fitz-Neele). If the ordinary be charged, it must be next mentioned, Azure on a bend ermine three mullets sable (see Gay). Lastly, the bordure or chief

Crescent. Decrescent. Increscent. Estoile. Mullet. Pierced.

Gay. Borges.

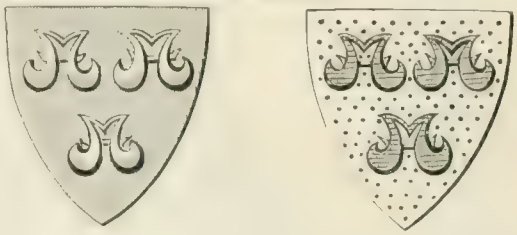


must be mentioned, with its charges, if any, Azure, on a chevron or between three bells argent, an eagle displayed between two lions rampant gules, all within a bordure ermine. If there be no ordinary, but a charge, it is to be treated in the same way, as, Sable, a lion rampant or, Azure, a lion rampant between three crosses crosslet or. The repetition of the names of tinctures is avoided by using the expressions, "of

Differences.

the field," "of the first," "of the second," etc., as, Argent, a fess checquy or and gules, in chief three crosses crosslet fitchée of the third (i. e. gules). The repetition of numbers may be avoided thus: Sable on a chevron or between three estoiles of the second, as many crosses pattée fitchée gules. Finally, the difference and the baronet's badge, if there be any, the crest and the supporters, are to be described. The difference is a small charge employed to distinguish the arms of the sons of a house, from the first to the ninth. Modern differences, or marks of cadency, are the label, the crescent, the mullet, the martlet, the annulet, the fleur-de-lis, the rose, the cross moline, and the double quatrefoil, which are given to the sons in that order. They appear to have been in use since the fourteenth century as differences, but have been longer employed as charges. Ancient differences were much more conspicuous, and consisted in a variation of the tinctures (see arms of the Roos family), or even in the addition of a charge. The baronet's badge is Argent

Arms of Roos family



a sinister hand, erect, open, and couped at the wrist or, and was given in commemoration of the purpose of the institution of that order by King James I. in 1611, to encourage plantations in Ulster. The badge of the Nova Scotia baronets appears to have been laid aside since 1629. As borne by the celebrated William Alexander, first Earl of Stirling, it was, Argent on a saltire sable, an escutcheon charged with the arms of Scotland, and was borne in an inescutcheon ensigned with the royal crown.

Above the arms the helmet is placed, which varies in form and material according to the degree of the wearer. This, in a complete achievement, is covered by the lambrequin or cover of the helmet, which is slashed or jagged, and often arranged in elaborate scroll-work. Above the helmet is placed the wreath, in form like two cords twisted together; the tinctures of the wreath are properly those of the principal color and metal of the arms. Sometimes a cap of maintenance is substituted for the wreath. Above all is the crest. Below the shield is the motto in a scroll. This is a brief sentence or a single word, frequently breathing some pious sentiment or vigorous thought, but often alluding to the arms, the name, or the crest. Of the former character are "Dum spiro spero," "Garde la foy"; of the latter, "Pie repone te" (*Pierrepont*). That of Livingston, "Spero meliora," is an elegant allusion to the crest, a ship tossing in a stormy sea. It is the modern custom, however, to give only shield, crest, and motto, omitting the helmet and lambrequin. The term mantling is sometimes applied to the lambrequin, but the mantle or mantling is generally a large mass of drapery disposed behind and around the achievement in the case of royalty or the higher nobility.

Supporters are figures of men or animals placed one on each side of the shield, and so called because they appear to support and hold it up. They are borne in England by the sovereign and the princes of the blood, by peers and Knights of the Garter, and Grand Crosses of the Bath, and, either by patent or prescription, by some baronets and private gentlemen.

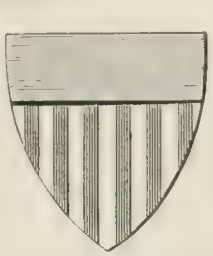
It is right to add that the foregoing is the merest outline of the rules of blazoning. It is only possible to learn to blazon well by acquiring a correct knowledge of the terms of art and by the careful study of examples. It is not necessary to do more here than to allude to the methods of blazoning by planets and precious stones adopted by some heralds. Briefly, in blazoning the arms of sovereigns, they substituted the names of planets for those of the tinctures as they are now employed. Thus or is Sol; argent, Luna; azure, Jupiter; gules, Mars; purpure, Mercury; sable, Saturn; vert, Venus. By this method the royal arms of England would be disguised as Mars three lions passant gardant in pale Sol. The arms of peers were blazoned by precious stones. Or is topaz; argent, pearl; azure, sapphire; gules, ruby; purpure, amethyst; sable, diamond; vert, emerald; sanguine, sardonyx; and tenné, jacinth.

Marshaling is the art of arranging arms with the externals in an achievement. The mode of doing this when there is only one coat in the shield has been explained. Marshaling includes also the arrangement of several coats-of-

arms in a shield, as when a man having a right to arms marries an heiress or a woman of very high rank, and wishes to bear her arms with his own.

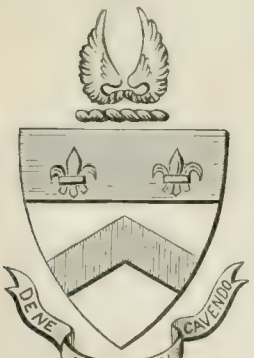
The correct placing of many coats-of-arms in one shield is called quartering, and the rules which govern it are included among those of marshaling. There are several methods of marshaling arms. Those of a husband and wife are impaled, or placed side by side in one shield, and divided by a perpendicular line. Formerly, arms were occasionally dimidiated—i. e. only half of each coat was drawn—but this practice has been long abandoned, except in the case of bordures, orles, and tressures, the inner half of which is omitted in impaling or quartering. The arms of a bishop and his see are also impaled, those of the see occupying the dexter or baron's side, and are ensigned with a miter. Those of a Knight of the Garter and his wife are usually placed in two shields set side by side, and the former only is encircled by the garter. Unmarried women bear their arms in a lozenge instead of a shield as do widows, but the latter may impale their arms with those of their husband. Arms descend to all the sons and their posterity forever, but according to the rules of English heraldry women are only entitled to them during their life, unless they be heiresses, in which case they descend to their posterity. An heiress, in heraldry, does not necessarily inherit property, but represents a name; she is, in fact, a woman without brothers. Her arms, together with those which she may have inherited from female ancestors, other heiresses, descend to her children, who quarter them with their paternal coat. If but one coat-of-arms be thus inherited, it is placed in the second and third quarters, reckoning in rows from right to left, and the paternal arms in the first and fourth.

Arms of the United States



The arms of the U. S. are what are called arms of dominion. They are borne in rather an unusual way. The following is the blazon: Argent, six palets gules, a chief azure, borne on the breast of the American eagle displayed proper, in his dexter talon an olive branch, in his sinister thirteen arrows, also proper; above his head a sky azure charged with as many mullets 5, 4, 3, 1, argent and environed with clouds proper, and beyond rays or; in his beak a scroll with the words "E Pluribus Unum." This blazon is from a painting in St. Paul's chapel, New York. As an illustration of a gentleman's achievement borne in the modern manner, without helmet or mantling, the arms of Sigismund Hugget are given from a mural tablet in the same chapel. They are, Argent, a chevron gules, on a chief azure, two fleurs-de-lis of the first. Crest, two wings expanded, per fess gules and argent. Motto, "Dene agendo vel cavendo." This is an evident mistake for "Bene," but it is literally copied from the mural tablet. These arms may be Dutch.

Hugget.



Funeral achievements or hatchments, though familiar in Great Britain, are little known in the U. S. They are usually hung on the fronts of houses or placed in churches. They follow the usual rules of marshaling, but are commonly drawn very large, and the arms, crest, and motto are placed on a ground in the form of a lozenge. If the hatchment be in memory of an unmarried person, the ground is all black, and the arms of a maid or widow are drawn in a lozenge and ensigned with a cherub instead of a crest. If the husband be dead and the wife living, his arms are placed on a black ground and hers on a white. If the wife die first, her arms are on the black ground, and her husband's on the white; but if both be dead, the ground is all black. The arms of a deceased bishop are impaled in the usual way with those of his see, and the latter are on a white ground.

As regards the use of heraldic devices in the U. S., it is to be observed that very few persons know exactly what arms they are entitled to, if any, and that by far the greater number of crests, escutcheons, etc., used on plate, note-paper, carriage-doors, and the like, have been simply assumed, without authority, either by the present wearer or one of his predecessors. There is no such thing as "the arms of a family." Arms are borne by an individual and by his male descendants after him, his oldest son bearing those arms unaltered, the other sons bearing the same escutcheon *differenced*. Therefore, if one finds that an English or French family of his name has in use a certain shield, this fact gives him not the slightest right to assume it. If he finds that his great-grandfather bore a certain escutcheon, he must still ask: 1. Had my grandfather a right to it? 2. Am I descended from the eldest son in each generation? for, if not, I must find out what differences I ought to add to the escutcheon. That his granduncle or a cousin has had certain arms regularly granted to him gives no one any right to use them, or any part of them; direct descent alone or direct grant by proper authority can justify any one in assuming a coat-of-arms. The crest is somewhat more doubtful; it is certain that in old times it was changed often; but it is especially to be observed that a crest used alone, without the escutcheon, is of the nature of a BADGE (*q. v.*), and may be taken and used freely, not being a true heraldic device at all.

The choice of an emblematic or other device, badge, or cognizance, motto, etc., is open to every one. Let us suppose that a book-plate, or *ex-libris* is required, and that no ancestral arms exist. One may perhaps obtain a grant of arms from the Heralds' College in London; but "fire-new" arms do not seem very precious possessions. A better way is to think out an emblematic scheme of some sort, and an appropriate motto, and to have them drawn by an artist of fanciful taste, and etched or engraved. The same device, or a part of it, with the motto, may be painted, carved, engraved on metal, and the like. Thus suppose that the name is Hart or Harte, and that the owner of it adopts the well-known device of Jacques Cœur, two or more hearts, grouped in almost any way, with or without a scroll, and the motto *Aux cœurs vaillans rien impossible*; perhaps even the second motto as well, *En boucheclose n'entre mousche* (flies do not enter the shut mouth). It will be the business of the decorative artist to make a good design of these elements in any use they may be put to; and there will have been no unwarranted use of heraldic devices.

BIBLIOGRAPHY.—This is extensive. Among old and well-known works are Leigh's *Accidence of Armory*, Ferne's *Blazon of Gentry*, published in 1586, and Peacham's *Complete Gentleman* (1622). These are entertaining and historically useful, but their authors belong to the mystical school, which tries to discover recondite meanings in the simplest matters, and their works must be used by the student with caution. Guillim is high authority; his *Display of Heraldry* (editions of 1610 and 1724) marks the beginning of the transition from the mode of treatment which allies heraldry with nearly everything, and the stricter scientific method of the modern writers. Among old French works on the subject is de la Colombière's *Science Héroique* (1669). Clark's *Grammar of Heraldry*, published in 1776, which has passed through fourteen editions, is the precursor of the modern method. Porny's *Heraldry* (by Porny, French master at Eton College and an accomplished scholar), published first in the *Encyclopædia Britannica*, and afterward in a volume by itself, is a very good but not very complete treatise. Of recent works Boutell's *Heraldry, Historical and Popular* (1864), contains almost all that one need know of the art, but lacks completeness of arrangement, cross-references, etc. The same author's smaller work, *English Heraldry*. Clark's *Introduction to Heraldry*, Cussan's *Handbook of Heraldry*, Planché's *The Pursuivant-at-Arms*, and Worthy's *Practical Heraldry*, are useful books for the beginner. See also Whitmore's *Elements of Heraldry* (Boston, 1866). Of French works, Bouton's *Nouveau Traité de Blason* (1863) and d'Eschavanne's *Traité complet de la Science du Blason* may be consulted, but they lack indices and other conveniences for reference. Berry's *Encyclopædia of Heraldry* should

be used by one who wishes to make a serious study of the matter. See also *A Treatise on Heraldry, British and Foreign*, by Rev. John Woodward and George Burnett, Lyon King at arms (2 vols., 1892), and Woodward's *Ecclesiastical Heraldry* (Edinburgh and London, 1894).

Revised by RUSSELL STURGIS.

Heralds' College, or **College-of-Arms**: a corporation instituted in 1464 by Edward IV., chartered in 1483 by Richard III., confirmed by Edward VI. in 1549, and rechartered by Philip and Mary in 1554. Its office is in Queen Victoria Street, London. Its president is the Duke of Norfolk, hereditary earl-marshal of England. The three English kings-of-arms, Garter, Clarencieux, and Norroy, the heralds, Chester, Windsor, Lancaster, York, Somerset, and Richmond, and the pursuivants, Portcullis, Bluemantle, Rouge Croix, and Rouge Dragon, are members of the corporation, whose business it is to decide what heraldic bearings are properly borne, to grant new ones, etc. All the members of the college have salaries. The Lyon Office in Scotland and the Office-of-Arms in Ireland perform similar functions. See HERALDRY.

Herat': an important city in Western Afghanistan; on the Heri-rud, in lat. 34° 22' N. and lon. 62° 9' E. (see map of Asia, ref. 5–D). It is fortified and situated in a fertile and highly cultivated country. It has large bazaars, and, besides its own manufactures of carpets, woolens, and leather, it has a considerable trade with China, India, and Persia. On account of its position it may become the point of contention between Great Britain and Russia in their Asiatic rivalries. Its population is estimated at between 20,000 and 30,000.

Hérault, ā'rō: department of Southern France, on the Mediterranean. Area, 2,393 sq. miles. The nothern part is traversed by branches of the Cévennes, which inclose fine valleys. The coast is low and marshy. The mountains are rich in minerals—coal, iron, lead, copper, and marble; the valleys produce wheat, wine, and fruits. In the marshes much salt is manufactured, and the lakes and the sea furnish large quantities of fish. Other important industries are the cultivation of olives and the breeding of silkworms. Capital, Montpelier. Pop. (1896) 469,684.

Herba'rium [= Mediæv. Lat. *herbarium*, neut. of Lat. *herba'rius*, botanist, deriv. of *her'ba*, herbage, plant, grass], or **Hor'tus Sic'cus** [Lat., dry garden: *hort'us*, garden (: Eng. *yard*) + *siccus*, dry]: a botanist's collection of specimens of plants for study and reference. Such collections are now to be found in connection with nearly all the larger colleges and universities in the U. S., and in the National Museum in Washington is the National Herbarium. In Europe among the greatest collections are those at Kew (Kew Gardens), London (British Museum), Paris (Jardin des Plantes), Geneva (de Candolle), and Berlin (University). In the preparation of herbarium specimens it must be remembered that the specimen is valuable only as it furnishes materials by which we may make out its structure. Most specimens are dried under enough pressure to prevent wrinkling. Sheets of heavy blotting-paper or soft "carpet-paper," 12 by 18 inches, and called "driers," are used to absorb the moisture, and a stone or a few bricks weighing from 10 to 20 lb. may supply the pressure, which must vary with the number of specimens treated. Nearly all green and red algæ must be floated out in water and arranged on heavy cards of paper; a damp cotton cloth must be laid over each card before it is put between the driers, in the press. After a few hours, or at most a day, the driers, now moist, must be removed and fresh ones used. When the specimens are dry, the cloth may be removed by carefully peeling it off from one side, the specimen adhering to the paper. Usually the brown algæ may be preserved by placing them between the driers, and applying pressure, changing the driers frequently. The smaller fungi may be lightly pressed in small envelopes, or where too fragile must be at once placed in shallow pill-boxes (a quarter of an inch high). The parasitic leaf-fungi may be preserved by drying the leaves under pressure. The larger fungi may be cut into slices and then dried under pressure.

Mosses and liverworts (which must be in fruit) should be freed from dirt as much as possible, and then separated and dried under some pressure. Fernworts also must be in fruit and the specimens must include the roots, stems, and leaves (except, of course, in case of very large species). In drying them some of the leaves should show the upper face, and others the lower. Specimens of flowering plants should include the whole plant, or as much of it as possible. In most cases they must show the flowers, flower-buds, fruits, seeds, leaves, stems, and roots. They should be carefully spread out and dried between the driers with enough pressure to keep all parts from wrinkling. In all cases great care must be taken to change the driers frequently enough to avoid blackening or moulding.

Many fruits, cones, seeds, samples of woods, etc., are simply dried in the open air, and preserved in proper drawers. Fleshy fruits and flowers and other parts of plants may be preserved in diluted alcohol (25 to 50 per cent.).

All the ordinary specimens for the herbarium should be mounted upon sheets of heavy white paper (36 lb. paper), cut 11½ inches wide and 16½ inches long. The cards to which the algæ are attached are fastened by a few drops of mucilage, as are the envelopes containing fungi, lichens, mosses, seeds, etc. All other plants, however, are fastened to the sheets by means of white glue prepared by heating in water in the usual way. The under side of the specimen is coated with glue, and it is then laid carefully upon the sheet and kept there under a light pressure until dry. The label, including the scientific name of the specimen, date, and place of collecting, name of collector, etc., should be attached to the lower right-hand corner of the sheet. Specimens so mounted are preserved in herbarium cases, consisting of sets of pigeon-holes 18 inches deep, 12 inches wide, and 4 inches high. All the species of a genus are put into a "genus cover" of heavy Manilla paper, and these genus-packets (properly labeled) are arranged in their families in regular order. Tightly fitting doors cover the pigeon-holes to exclude dust and insects, while the latter are still more effectually guarded against by poisoning the specimens with an alcoholic solution of corrosive sublimate.

CHARLES E. BESSEY.

Herbart, JOHANN FRIEDRICH: philosopher; b. at Oldenburg, Germany, May 4, 1776; studied in the gymnasium of his native town; entered the university at Jena in 1794. Here he studied under Fichte, his philosophical interests having been aroused in the gymnasium. He soon wrote a critique on some of Schelling's positions, and laid the foundation for his own future system. In 1797 he became a tutor in a private family at Berne, where he began the elaboration of his educational theories. In 1802 he became docent in Philosophy and Pedagogy at Göttingen, and in 1805 professor extraordinarius. In 1809 he was called by Wilhelm von Humboldt to Königsberg to succeed Krug, the successor of Kant, as professor ordinarius. Here he also founded a pedagogical seminary. In 1833 he was recalled to Göttingen, where he remained until his death. His chief philosophical works are *Lehrbuch zur Einleitung in die Philosophie* (1813); *Lehrbuch zur Psychologie* (1816); *Psychologie als Wissenschaft, neu gegründet auf Erfahrung, Metaphysik und Mathematik* (1824–25); *Allgemeine Metaphysik nebst den Anfängen der philosophischen Naturlehre* (1828–29); *Kurze Encyclopädie der Philosophie, aus practischen Gesichtspunkten entworfen* (1831). The complete works of Herbart have been edited in 12 vols. by G. Hartenstein (Leipzig, 1850–52).

Philosophy.—Herbart's philosophy is one of the offshoots from the great system of Kant, and lies at the opposite pole from the Idealism of Fichte and Hegel. Its prevailing characteristic is a metaphysical realism, which reminds one strongly of the Monadology of Leibnitz, except that the monads, or *reals*, as Herbart calls them, have no inherent principle of development. There is a return to the eleatics for the notion of being, and to the atomists for that of multiplicity of being. The idealistic aspect of Kant's system is wholly rejected, so that internal self-realization and transcendental freedom of will are dismissed as fictions. Yet Herbart takes his system from Kant, explaining that metaphysics must consist in elaborating our notions so as to free them from contradictions. Any metaphysical assumption is freely made which appears to assist in doing this, no matter what difficulties may be involved in the assumptions themselves. The result of his deductions is that behind the known world of phenomena, as its active metaphysical cause, there lies a world of monads, or *reals*—metaphysical atoms. They are simple in quality, and possess the power of self-preservation against all disturbances from other reals. Instead of regarding the monad as a self-developing unit, as Leibnitz did, every real is regarded by Herbart as dependent upon other reals for any occurrence that may take place within it. The reals are conceived to be in a state of

partial interpenetration, and as capable of creating "disturbances" in one another. The soul itself is one of these reals, perhaps of a higher order, and is in reciprocity with other reals, preserving itself against the annihilation which they threaten. Each of these "self-preservations," or internal states, arising from the disturbance of other reals, is an idea. When not under "arrest," i. e. when not suppressed by other ideas, it is in consciousness. The nature of the soul as a unit (which is shown by the blending of ideas) makes it impossible to have all the ideas which the soul possesses present in consciousness at one time; yet ideas endure in the soul as states striving for representation. The soul monad, or real, has its seat in the brain, being in close relation with a multitude of other reals. Any excitation upon the peripheral ends of the nerves is conveyed to the brain, and reaches the soul through the medium of the reals in immediate juxtaposition or in partial interpenetration with it.

These inner states of the soul, the ideas, are conceived as becoming forces which further or resist one another, according to their nature and composition. In so far as they are similar they blend or fuse, thus accounting for association; but in so far as they are opposed in nature they tend to arrest one another, or to drive one another out of consciousness. Where several ideas are present in consciousness at once there is a "sum of arrest" which is shared by the separate ideas inversely as their strength; hence the weaker an idea is the more it suffers from the arrest. The assumption that ideas become forces in virtue of their relations, and that, like other forces, they are subject to law, makes it possible to apply mathematics to psychology. It may now be seen how Herbart's claim of founding psychology upon metaphysics, mathematics, and experience is justified. The doctrine of reals is metaphysical, that of the statics and dynamics of ideas as forces is mathematical, while the fact that the soul develops no life from within, but depends wholly upon excitations coming from without, points to the conclusion that experience is the sole source of knowledge.

Apperception.—Of special importance and interest is Herbart's doctrine of apperception, or mental assimilation, since this is the key to his important contributions to pedagogy. Apperception with Kant is the organization of knowledge through the self-active agency of the mind; but with Herbart, who acknowledges no such mental constitution, it is plain that the process must be explained from another standpoint, viz., that of experience. Ideas already obtained become forces, with which any newly entering idea must deal. It follows naturally that, aside from the original receptivity of the soul for impressions, i. e. its power of self-preservation, it is the ideas already gained from experience that constitute the apperceiving forces for each new idea. It takes ideas, therefore, to apperceive ideas. This gives rise to the distinction between that which apperceives and that which is apperceived. Each newly entering sensation (perception) serves as a stimulus to older and related ideas, thus calling them and their associates into consciousness. At first the new sensation is the dominating force; but as arrest of opposing and fusion of kindred elements proceed, the older and more established ideas assert their superiority, adjusting the new experience to themselves, i. e. apperceiving it. In this way knowledge increases in complexity and force, and consequently in apperceiving power. In a similar way, elements of former experience coming simultaneously to consciousness will undergo the apperceiving process, the weaker ideas yielding ultimately to the greater apperceiving power of the stronger. Herbart's theory of apperception is therefore *a posteriori*, whereas Kant's is *a priori*. The latter makes the original constitution of the mind the synthesizing power whereby experience is possible; while Herbart, neglecting this aspect of the subject, fixes his attention upon the influence which acquired experience has upon that which is being acquired. His theory, now generally accepted as essentially true, has been extended and largely freed from contradictions by Lazarus, Steinthal, and Wundt. Non-Herbartian psychologists have treated the same phenomena of mind under a number of heads, such as sensation, perception, association, and the like.

As a philosopher Herbart can hardly be said to have left a school, but the importance of his thought when applied to education has given rise to a distinct body of educational followers in Germany, the members of which, though not numerous, are distinguished by earnestness and vigor. The most important names among the educators are Ziller, Rein, Lange, Stoy, Frick; and among the psychologists, Volkmann, Waitz, Lazarus, Steinthal. Since experience is the chief source of knowledge, and since the experience we have acquired is largely determinative of that which we acquire, it follows that the best standpoint from which to examine the problems of teaching is the growing apperceptive power of the child. All the problems of instruction, such as the studies to be selected, the amounts of each to be taught, the order of topics in each subject, and their correlation in different branches, together with all questions of method, are to be investigated in the light of the child's power of mental assimilation, as determined by his knowledge, tastes, interests, and disposition at any given time. As a guide to teaching, the logical order of developed systems of knowledge must give way to the psychological order of apperception. The application of Herbart's principles to education was first made by his successors. His most noteworthy pedagogical works are accessible to English readers in translation, as is also his text-book on psychology. Not only is the process of apperception a guide to instruction, but it also shows how to reach with each child the grand aim of all education, which Herbart conceives to be the development of a strong moral and religious character. But character, like knowledge, is a resultant of the experience of the individual—not a few of his experiences, depending it may be upon moral maxims or dogmatic religious instruction, but all his experience resting upon the whole complex of knowledge, desire, and volition. With Herbart it is the whole child that is to become moral. It has consequently been one of the main purposes of Herbart's successors to show how those branches of knowledge usually considered secular or non-moral may materially aid in the development of moral character. CHARLES DEGARMO.

Herbelot, BARTHÉLEMY, d', dār'blō': Orientalist; b. at Paris, Dec. 4, 1625; studied at the University of Paris, and became well versed in the Oriental tongues; sojourned much in Italy; was patronized by Fouquet and Colbert; was royal secretary and Oriental interpreter, and in 1692 became professor of Syriac in the College of France. D. in Paris, Dec. 8, 1695. His *Bibliothèque Orientale* (1697), a storehouse of facts regarding Eastern literature, is still highly valued.
Revised by C. H. TOY.

Herbert, EDWARD, Baron: usually styled Lord Herbert of Cherbury; soldier, statesman, philosopher, and author; b. of an ancient family at Eyton in Shropshire, in 1583; educated at University College, Oxford; served with renown in the Netherlands; became a gentleman of the court of James I.; was ambassador to France 1618–24; entered the Irish peerage in 1625, and the English in 1630. His deistical *Tractatus de Veritate* appeared in 1624, and the *De Religione Gentilium* was added in 1645. His philosophical writings are somewhat obscure, but he maintained the existence of innate ideas and of a personal Deity, and taught that the mind of the devout seeker for truth may become illuminated by an inward light. The indistinctness of his expressions and the somewhat mystical subtlety of his notions have caused him to be little read or understood. D. in London, Aug. 20, 1648. His autobiography, brought down to 1624, was published in a new edition by Sidney L. Lee in 1886, and his poems, edited by Churton Collins, appeared in 1881.

Herbert, GEORGE: religious poet; brother of Lord Herbert of Cherbury; b. at Montgomery Castle, April 3, 1593; was educated at Trinity, Cambridge, where he received a fellowship in 1615 and proceeded M. A. in 1616; was university orator 1619–27, and seemed destined for civil promotion, which was promised by the king and courtiers; took holy orders in 1625; became a prebendary under the Bishop of Lincoln 1626, and in 1630 rector of Bemerton, where he died of a quotidian ague Feb., 1632. Herbert was a man of profound learning and sincere piety. His poetry, and especially *The Temple* (1632), with its rich imagery and quaint expressions, somewhat marred as it is by forced *concetti*, after the fashion of his times, includes some of the finest sacred lyrics in our language. The most popular of his prose-writings has been his *Character of a Country Parson* (1647).
Revised by H. A. BEERS.

Herbert, HENRY WILLIAM: novelist; a son of the Dean of Manchester and grandson of the Earl of Carnarvon; b. in London, Apr. 7, 1807; educated at Eton and Oxford; settled in New York in 1830, where he was for a time a highly successful teacher of Greek. He published a successful series of historical novels, including *Cromwell* (1837), *Sherwood Forest* (1855), etc., and some translations from the French and other languages, including a poetic version of the *Prometheus* and *Agamemnon* of Æschylus 1849. He

was also author of the "Frank Forester" series of sporting volumes, partly tales of out-door life, but also including *My Shooting Box* (1846), *Field sports of the United States* (1849), *The Fish and Fishing of the United States* (1850), *The Horse and Horsemanship of America* (1857), and other works of this character. He also produced some well written historical works, such as *The Captains of the Old World*, *Henry VIII. and his Six Wives*, etc., besides performing much editorial and other literary labor. D. in New York, by suicide, May 17, 1858. Revised by H. A. Beers.

Herbert, Hilary Abner: Secretary of the U. S. navy; b. at Laurensville, S. C., Mar. 12, 1834; removed with his father at the age of twelve years to Greenville, Butler co., Ala.; was educated at the universities of Alabama and Virginia; studied law and was admitted to the bar of the Supreme Court of Alabama; served in the Confederate army as captain and colonel of the Eighth Alabama Infantry; was disabled at the battle of the Wilderness May 6, 1864; after the war resumed the practice of law at Greenville till 1872, when he removed to Montgomery, where he has practiced since; was elected to the 45th, 46th, 47th, 48th, 49th, 50th, 51st, and 52d Congresses, and declined renomination for the 53d; was chairman of the committee on naval affairs in the 49th, 50th, and 52d Congresses; was appointed Secretary of the Navy, was confirmed by the U. S. Senate Mar. 6, 1893, and entered upon the discharge of the duties of the office Mar. 7, 1893.
C. H. Thurber.

Herbert, Maj.-Gen. Ivor Caradoc: soldier; b. at Llanarth, Monmouthshire, England, July 15, 1851. He entered the Grenadier Guards Nov. 5, 1870, and became colonel Aug. 18, 1889. He was brigade-major of the expedition sent to Egypt from Aug. 4, 1882; brigade-major of the home district 1882–83; commandant of school for auxiliary forces at Wellington barracks 1885–86, and in the latter year was appointed military *attaché* at St. Petersburg. He served with distinction in the Nile expedition of 1884–85, and was appointed major-general commanding the militia of Canada Nov. 20, 1890.
Neil Macdonald.

Herbert, Sidney, Baron: statesman; b. at Richmond, England, Sept. 16, 1810; a younger son of the eleventh Earl of Pembroke; studied at Harrow and Oriel College, Oxford; entered Parliament in 1832; secretary to the admiralty 1841–45; Secretary at War 1845–46, 1852–55, and 1859; privy councilor 1852; raised to the peerage as Lord Herbert of Lea 1861. He was an able and popular Conservative leader, a liberal patron of art, and a man of great political ability and industry. D. at Wilton, Aug. 2, 1861. His eldest son became in 1862 the thirteenth Earl of Pembroke.

Herbert, Victor: violoncellist and composer; b. in Dublin, Ireland, Feb. 1, 1859; the grandson of Samuel Lover; went to Stuttgart when six years old, and, after completing his studies, went on a concert tour through Europe. He settled in New York in 1886. He is an excellent violoncello-player, an able conductor, and a fine composer. His cantata *The Captive* was produced at the Worcester (Mass.) festival of 1891. He has also composed several pieces for his favorite instrument, with and without orchestra, besides songs and other pieces. D. E. Hervey.

Herbort von Fritzlar: priest and poet of the Middle Ages; lived at the court of Landgraf Hermann von Thüringen, and early in the thirteenth century wrote a German version of the Trojan war, in rhyme, under the title *Liet von Troie*. The style is artificial and stilted, and is little more than a paraphrase of the French *Roman de Troie* by Benoit de Sainte-More. See K. F. Frommann, *Herborts von Fritzlar Liet von Troie* (1837), and Dunger, *Die Sage vom Trojanischen Krieg in den Bearbeitungen des Mittelalters* (1869).

Hercher, hăr'cher, Rudolf: Hellenist; b. at Rudolstadt, Germany, Jan. 11, 1821; studied in Jena, Leipzig, and Berlin; professor at the Joachimsthaler Gymnasium in Berlin. Editor of *Epistolographi Græci* (1873); *De fluviis*, which he proved not to have been written by Plutarch (1851); *Scripta Minora* of Arrian (1854; 2d ed. 1885); *Erotici Scriptores Græci* ((2 vols., 1859); Ælian, Artemidorus, Plutarch's *Moralia* (vol. i., 1872); *Apollodori bibliotheca* (1874); and author of valuable articles on the Homeric question, especially in connection with the topography of Ithaca. D. Mar. 26, 1878. Alfred Guldman.

Hercula'neum [Lat., liter., the town of Hercules (sc. *oppidum*, town), neut. of *Hercula'neus*, pertaining to *Hercules*]: a city of ancient Italy, on the Mediterranean, at the foot of Mt. Vesuvius, much frequented in the later days of the Roman republic and in the early empire by the wealthy families of Rome, because of its beautiful location and its mild and healthful climate. In the year 63 A. D. it was shaken violently by an earthquake, which seems to have wrought damage from which the city had not entirely recovered in 79 A. D., when it was completely overwhelmed by the eruption of Vesuvius, which also destroyed Pompeii. The mass of ashes, lava, and other volcanic matter was increased by subsequent eruptions, and, under the influence of moisture, it has become transformed into a soft tufa, covering the ancient city to a depth varying from 50 to 100 feet. Upon the soil deposited on this formation have arisen the villages of Portici and Resina. In the early part of the eighteenth century attention was called to frequent finds of rare and unusual kinds of marble made by the inhabitants of the villages mentioned, and an excavation for a well, somewhat deeper than usual, led to the discovery of a number of beautiful and perfectly preserved statues.

But it was not until the year 1738 that systematic exploration was begun on the site of these discoveries by the architect Alcubierre, working under the direction of Charles III., King of the Two Sicilies. These excavations soon revealed something of the extent and character of the buried city, and brought to light new treasures in marble and bronze. The building in which the first statues had been discovered was identified as a theater, the size of which was at first very greatly overestimated, so that it was believed to have provided places for more than 30,000 people. Its capacity did not, however, exceed 3,000. In 1750 the famous Villa Suburbana, the library of which contained nearly 2,000 papyrus rolls or volumes, a considerable number of which have been opened successfully and in part deciphered, was discovered. Of the works thus recovered the most important are fragments of the *Ethics* of Epicurus and a number of treatises of philosophical and rhetorical character by a certain Philodemus, a contemporary of Cicero. The character of the works discovered indicates that their owner was an enthusiastic Epicurean. (For the literature of this subject, see E. Hübner, *Bibliographie*, Berlin, 1889, p. 47.) In 1755 the Academia Ercolanese, which had been formed for the purpose of investigating and making known the remains of the ancient city, began the publication of its famous description of the results of the excavations. At the time this work created a great sensation as being the first detailed account of the wonderful discoveries which had been reported from Herculaneum, although it was by no means free from gross errors of ignorance and of method, as was to be expected in the infancy of archæological science. To this period belong the most remarkable discoveries that excavations at Herculaneum have yielded—such marbles, for instance, as the equestrian statues of the Balbi and the figure called Aristides, as well as nearly all of the magnificent bronzes from this site, which are among the chief ornaments of the museum at Naples. The excavations of the nineteenth century (1827–37 and from 1868 on) have not been so rich in discoveries of works of art as the earlier ones, but they have laid bare for the first time (since the older work was prosecuted entirely by underground tunnels) a portion of the city, and have disclosed some of the most perfect examples of the Roman house. The exact extent of the city has not been determined, so that it is difficult to estimate its probable population in antiquity. In general its remains are found in a better state of preservation than those of Pompeii.

Literature.—J. J. Winckelmann, *Sendschreiben von den herculanischen Entdeckungen* (1764); Fernow, *Werke*, vol. ii., p. 1, ff.; Robert A. McLeod, *Can Herculaneum be Excavated?* in *Atlantic Monthly*, 1877, p. 641; D. Comparetti and G. de Patra, *La villa ercolanese dei Pisoni* (Turin, 1883); M. Ruggiero, *Storia degli scavi di Ercolano* (Naples, 1885).
G. L. Hendrickson.

Herculano de Carvalho e Araujo, Alexandro: poet and historian; b. in Lisbon, Portugal, Mar. 28, 1810; studied modern languages in Paris; allied himself to the liberal party in Portugal; edited *Panorama* (1837–43); was city librarian at Oporto; transferred in 1845 to the royal library at Ajuda. Among his works are the poems *A voz de propheta* (1836); *A harpa do crente* (1838); the historical novels *Eurico o presbytero* (1847); *O monasticon* (1844–48); the histories *Historia de Portugal* (1845–52); *Da origem e estabelecimento da inquisição em Portugal* (1854–59); *Estudos historicos* (1876); *Opusculos* (1873–79). See de Serpa

Pimentel, *Herculano e o seu tempo* (1881). D. near Santarem, Sept. 13, 1877.

Her'cules [= Lat., from Gr. Ἡρακλῆς], or **Her'acles**: the most famous hero in the Greek mythology; a son of Zeus and Alcmene. He was possessed of most extraordinary physical strength. While a babe in the cradle he strangled two serpents sent by Hera to kill him. When full grown he upheld the dome of the heavens while Atlas was away in the gardens of the Hesperides. He was sensual, but good-hearted, straightforward, and just. He happened to intoxicate himself and make an unseemly noise in the house of Admetus, but when he heard that his friend mourned the death of his wife, shame at once made him sober, and according to some writers he descended into Hades and brought back Alcestis. He killed the eagle and unchained Prometheus, whom Zeus had unjustly bound to the rocks. But Hera hated him, and struck him twice with insanity. During the first fit he slew his three children, and in order to expiate this horrible crime the Delphic oracle sent him to serve Eurystheus. While here he performed the twelve famous labors: (1) Slaying the Nemean lion; (2) killing the Lernæan hydra; (3) catching the Arcadian stag; (4) hunting the Erymanthian boar; (5) cleansing the Augean stable; (6) destroying the Stymphalian birds; (7) capturing the Cretan bull; (8) carrying away the mares of Diomedes; (9) fetching the girdle of the queen of the Amazons; (10) chasing the oxen of Geryon; (11) stealing the apples of the Hesperides; and (12) seizing Cerberus and carrying him up into the daylight. During the second fit he killed his good friend Iphitus, and in obedience to the Delphian oracle he now went and served Omphale, the Queen of the Lydians, as her slave. His death was tragical, and more purely sublime than any part of his life. Believing that it was a philter, Deianira, his wife, tinged his garment with a poison she had received from Nessus. When Hercules put on the garment the poison attacked his body, and, tearing the flesh from his bones, he fled from place to place in frightful agony. At last he could bear it no longer. He heaped up a huge pile of wood and, setting fire to it, he placed himself on its top. But when the flame began to lick his tortured body a cloud came down from the sky and carried him up to heaven. There is perhaps no name in the whole Greek mythology around which myths cluster so thickly as around that of Hercules, and although most of these tales are gross, many are genuinely humorous, and some exquisitely beautiful and sublime. Hercules was also a favorite subject in epics and dramas and with sculptors. In art Hercules is represented with the skin of the Nemean lion and a club cut from a Nemean olive-tree. The Farnese statue is the most widely known; it represents the tired Hercules leaning upon his club, whose small end is placed under his left armpit, his right arm is thrown behind his back and his head droops slightly toward the left. See Roscher, *Lexicon*, under *Herakles*, and Baumeister, *Denkmäler*, under *Herakles*.

Revised by J. R. S. Sterrett.

Hercules-beetle: a giant beetle (*Dynastes hercules*) of the family *Scarabæidæ*; a native of Brazil. It is about 6 inches long, and the male has a huge horn upon the head and a smaller one upon the thorax.

Hercules, Pillars of: the name given by the ancients to Calpe (Gibraltar) and Abyla (now Ceuta), two rocky promontories, one on each side of the Strait of Gibraltar. It was fabled that Hercules found them one mountain, but tore them asunder, thus making a connection between the ocean and the Mediterranean Sea. In heraldry they figure as the supporters of the Spanish national arms. They are seen with the motto *Ne plus ultra* (No more beyond), indicating that the pillars are at the end of the world, as anciently believed. These are the well-known pillars on Spanish coins, and the sign $, standing for "dollar," is thought by some to represent these pillars with the fillet for the motto across them.

Hercyn'ian Forest (*Hercynia silva*): a name employed by Greek and Roman writers to denote the great central and southern forest-region of ancient Germany. The term was always a vague one. In its widest sense it seems to have included the Bohemian Forest, the Harz (a name which seems to be connected with the ancient designation), the Black Forest, and others.

Revised by G. L. Hendrickson.

Her'der, Johann Gotfried, von: one of the founders of modern German literature, and one of the most powerful and wholesome influences of modern German civilization: b. Aug. 25, 1744, at Mohrungen, East Prussia, where his father kept a small school and held a subordinate position in the Polish Church. He was educated in his home till his fifteenth year, after which time he spent a couple of years in a position midway between a secretary and an errand-boy in the house of a clergyman, which he left to go to Königsberg and study medicine. While here he had to maintain himself, but through the influence of Kant, who took a great interest in the youth, his situation became more comfortable. He abandoned the study of medicine, and when he left the university his knowledge of theology, philosophy, languages, art, and literature was very extensive, and his intellect was as bright and vigorous as comprehensive. In Königsberg he also made the acquaintance of Hamann, whose teachings concerning the origin of poetry and language exerted the greatest influence on Herder's mind. In 1765 he went to Riga, where he occupied until 1769 a position as teacher and clergyman. Here he published his famous *Fragmenten über die neuere deutsche Litteratur*, a book which placed him at once as a literary critic in the same rank with Lessing, and which in fact may be considered the beginning of the Storm and Stress period of German literature. Annoyed by the literary conflicts into which he was drawn by this book and the subsequent publication of the *Kritische Wälder*, he left Riga and went on an extended journey, which also took him to Strassburg, where, in 1770, he met young Goethe, whose intimate friend and teacher he became. While being treated here for an eye disease he wrote his famous treatise, *Ueber den Ursprung der Sprache*. He then accepted the position of a court-preacher at Bückeburg, which he held until 1776, when, through Goethe's influence, he was called to Weimar. Here he was not only a member of the great literary circle composed of Goethe, Schiller, Wieland, etc., but he also filled with the greatest success the influential and responsible positions of a court-preacher, superintendent of the schools, and president of the consistory. In Weimar also he produced his greatest literary achievements. There is, with the exception of the natural sciences, no department of learning in Germany which is not indebted to Herder for its later development. He may not be called a great scholar, but he possessed a power of intuition which must be considered in many cases as prophetic, and which made him a pathfinder whose traces are followed up to the present day. As a theologian he was a forerunner of the great Schleiermacher and the critical school of the nineteenth century, for it was he who by his excellent book, *Vom Geiste der Ebräischen Poesie*, showed the way to a truly historical and critical understanding of the Bible. He was not a philosopher of a systematic turn of mind, but in the greatest of all his books, in his *Ideen zur Philosophie der Geschichte der Menschheit*, he outlined a philosophy of history which exerted a powerful influence on later philosophers, as, e. g., on Hegel. The same book revolutionized historiography, the science of geography, and ethnography, by teaching the idea of evolution, and by directing the attention to new unexplored fields in all these various sciences. For his greatest achievements we must, however, look in the domain of literature and literary criticism. Not that he was a great poet himself or a critic of Lessing's ability. His was, however, a poetic susceptibility and intuitive power of feeling which penetrated into the very sanctuary of the genius. Thus he continued Lessing's critical work, inaugurated the Storm and Stress period of German literature, by his discovery of *Volkspoesie* and by his æsthetic doctrines, and enriched the literature of his people by exquisite translations from the poetry of all nations (*Volkslieder*, *Cid*, etc.). It is now generally known what an immense influence he exerted upon the poetic development of Goethe and on the efforts of the later Romanticists. Back of the great life-work of Herder, in every field of his marvelous activity, we notice, however, the noble idea of attempting to penetrate into the very nature of man in order to advance the true ideal of what he called "humanity." See R. Haym, *Herder nach seinem Leben und seinen Werken*, one of the best biographies in the German language. D. Dec. 18, 1803.

Julius Goebel.

Herd's-grass: See Timothy.

Heredia, ā-rā-dee'āa: a central province of Costa Rica; between Alajuela, San José, and the Comarca of Limon; area about 1,000 sq. miles. The surface is mountainous in great part, the Desengano peak being 6,308 feet above the sea; the valleys are very fertile, adapted for coffee-planting, which is the principal industry, and there are excellent pas-

riverlands. Pop. (1888) 29,409. Heredia, the capital, is on a plain at the southern base of the extinct volcano of Barba; it is well built and attractive, with a considerable trade; pop. 7,500. Barba, Santo Domingo, Santa Barbara, and San Rafael are towns of some importance.

HERBERT H. SMITH.

Heredia, PEDRO, de: soldier; b. in Madrid, Spain, about 1500. He was of noble family, but, owing to an affray in which he killed three men, he was obliged to fly to Hispaniola; subsequently he was acting governor of Santa Marta, and made several expeditions in the interior of the region now called Colombia. In 1529 he returned to Spain and obtained the privilege of colonizing and governing Nueva Andalucia, between the Magdalena river and the Gulf of Urabá or Darien. He took out 150 men and added many experienced colonists at Hispaniola. With these he sailed to the South American coast, and, after a fight with the Indians, founded the city of Cartagena, Jan. 14, 1533, as the capital of his new domain. Shortly after he marched overland to the Magdalena, and obtained an immense amount of gold from the Indians; other expeditions were hardly less successful. Owing to quarrels with the authorities of Panama and to various irregularities, he was imprisoned and sent to Spain in 1537, but was restored to his governorship in 1539. In 1542 he encroached on the territory of Benalcazar, and was again imprisoned for a time. Cartagena was sacked by the French pirate Baal in 1544, and Heredia was forced to pay a heavy ransom. In 1548 and again in 1554 he was forced to return to Spain to answer charges against him. On the last voyage he was shipwrecked and drowned on the Spanish coast near Cadiz, Jan. 27, 1554. HERBERT H. SMITH.

Heredia y Campuzano, ee-kaăm-poo-zaa'nō, JOSÉ MARIA: Spanish-American poet; b. at Santiago de Cuba, Dec. 31, 1803. With his family he lived successively in Florida, Santo Domingo, and Venezuela; returning to Cuba, he graduated in law at the University of Havana 1819. Taking part in the attempted revolution of 1823 he was banished, and lived in the U. S. for two years. In 1825 he went to Mexico, where he was naturalized, and held various civil and judicial positions; he was also connected with several journals. His first collection of poems was published at New York in 1824; it contained many of his finest productions, including his magnificent *Ode to Niagara*, which has been translated into many languages. Heredia is generally conceded to be one of the most brilliant of the Spanish-American poets, and he is surpassed by few of those of the peninsula. His style is elegant, without stiffness, and he excels in descriptive passages. D. at Toluca, Mexico, May 7, 1839. Of the many editions of his works, one of the best is that by Ponce de Leon (New York, 1875). HERBERT H. SMITH.

Heredit'aments: in law, all those kinds or articles of property which on the death of an individual owner, without a disposition by will, pass to an heir. By the English common law all the property of an intestate must devolve either upon his administrator or his heirs; personal property passing to the administrator, and real to the heirs. The word "hereditaments" thus becomes one of the most comprehensive terms in the law to indicate real property or landed interests. The distinction between "hereditaments" on the one hand, and "chattels" (as indicating personal property) on the other, is thus of great practical importance, as the two classes of property are governed by distinct sets of rules. (See PROPERTY.) Hereditaments are of two kinds —*corporeal* and *incorporeal*. Under the term corporeal hereditaments are included the land itself and heirlooms. See LAND and HEIRLOOMS.

Incorporeal hereditaments are tangible, and are rights claimed by one person in the land of another. The right in legal phrase is *dominant*; that is, it is superior to the claims of the owner of the land over which it is exercised. The land to which the right is attached is said to be *servient*. In other words, the right of the owner of it is subordinate to that of the owner of the incorporeal interest, as in the case of a highway where the rights of the owner of the land are subservient to the power of the public to use it for the purposes of travel, etc. The Roman lawyers, regarding the subject principally from this point of view, used the term "servitutes" to indicate this class of rights. See SERVITUDES.

There are a number of rights in Great Britain that are deemed to be incorporeal estates which have no existence in the U. S., such as *advowsons*, or a right of presentation to a church; *tithes*, a right of an ecclesiastical nature to take a portion of the profits of land for the use of the church (see TITHES); and certain public *offices*, of which an example is the office of a sheriff. *Dignities* or titles of nobility, and *annuities*, belong to the same class. In the U. S. incorporeal hereditaments are divisible into three principal classes—*profits à prendre*, *easements*, and *rents*. *Profit à prendre* is a phrase derived from the Norman-French language, indicating a profit which consists in taking something from the land of another, such as a right to take fish, petroleum, or minerals. Rights of this kind in Great Britain are also known as "rights of common." These have been divided into four principal classes—pasture, piscary, turbary, and estovers. The first signifies a right of one or more persons to pasture cattle upon the land of another; the second, to take fish from another's land; the third, to take turf, coal, or minerals; and the fourth, to take necessary wood or timber for the purpose of repairs of buildings. These rights, so far as they refer to pasturage or fishing or repairing of buildings, are not frequently under consideration before the courts of the U. S. The right to take minerals is of great importance in certain districts. It is not uncommon in these localities to find grants by the owners of land conferring upon grantees the right to take specified minerals, or to sink wells to obtain salt or other substances, and if a grant of this kind be unrestricted, the owner of the land must submit to the disturbance of the soil in order to reach the minerals, and may, perhaps, be debarred from all profitable use of the land. A distinction must be carefully taken between the right to mine and a grant of the minerals. In the latter case there would be two ownerships—one of the surface land, and the other of the minerals beneath it; and it would not necessarily follow that the owner of the minerals could disturb the surface.

An easement (called in Scottish law a servitude) differs from a *profit à prendre* in the fact that nothing is taken by the owner of the incorporeal right from the land over which it is exercised. This class of rights has already been considered. (See EASEMENT.) A special instance of the application of this branch of the law may be found in the interest which the public may acquire in the land of an individual by an act termed "dedication." The meaning of this word is the act of giving up one's land to public use, as for the purposes of a highway or park. The public, *as such*, can not be a grantee, as it is a fluctuating body of persons. An easement is, however, acquired over the land of the dedicator by the doctrine of estoppel. The theory of the case is that there is a representation by the owner to the public that they may make use of his land for a special purpose, and an act done by them on the faith of the representation. A dedication may be implied in cases where the public encroach on the rights of the owner, and he makes no resistance for a length of time sufficient under the circumstances of the case to raise a presumption of an offering by the owner and acceptance by the public. Under these doctrines the public must take that which is dedicated according to the intent of the owner as expressed by his acts. Thus if he should dedicate land for a highway in which there is an open pit he would be under no obligation to fill it up or make the place convenient for travel. The owner after dedication may still use the land in any way not inconsistent with his action toward the public, and must be regarded in all respects as owner, except so far as the public have claims upon him by virtue of the dedication.

The third class of incorporeal hereditaments is that of rents. By a rent is meant that which one person pays to another periodically as a return for the use of land. It differs from a *profit à prendre* in the fact that it is no part of the land. The details of this subject will be stated under RENT.

There is an important class of incorporeal rights termed franchises, which can not be strictly included under either of the three principal classes of hereditaments already considered. See FRANCHISE.

When an incorporeal right is enjoyed in connection with the ownership of an estate, it in general follows the ownership as that passes from one to another. A sale transfers it to a purchaser. An example is a right of way over the land of another as incidental to the ownership of adjoining land. On the other hand, the right may be a mere personal privilege, having no connection with the ownership of land, when it would be termed a right "in gross."

Revised by F. STURGES ALLEN.

Heredity: a term applied to that law of living things whereby the offspring resembles the parent, the characteristics of one generation being repeated in the next. When the word is used one is apt to recall only those striking instances of inheritance of genius (e. g. of musical ability in the Bach family), or of physical peculiarities (like the repetition of the "Bourbon nose" in successive generations of the former royal family of France). It includes not only the fact that six-toed cats are apt to have six-toed kittens, but the really more wonderful fact that cats have kittens rather than some other form of animal life. In other words, it is through the action of heredity that all the structural features of the parent are repeated in the offspring, and that in the development of the individual these are outlined and matured in certain fixed and definite ways.

The scientific mind is not satisfied with the statement that this is so because it is "natural"; it seeks for explanations and for a knowledge of the methods by which it is brought about, and as a result several theories of heredity have been formulated, a few of which are outlined below. A satisfactory theory must fulfill, among others, the following conditions: (1) It must be in full accord with the facts learned by embryology. (2) It must allow not only for the reappearance of general form and structure, but of individual peculiarities as well. (3) It must, at the same time, allow for individual congenital variation. (4) It must permit of the inheritance of at least certain variations and modifications. (5) It must explain the reappearance of peculiarities after they have been dropped for several or many generations (atavism). (6) It must, at the same time, admit of the participation of both parents in the formation of the germ (fertilization), and permit, in certain instances, unfertilized eggs to develop (parthenogenesis). (7) It must, in the cases of fertilization, allow both parents to perpetuate their peculiarities in varying degrees.

The earlier theories ignored one or more of these conditions. Thus Democritus (about 400 B. C.) claimed that all parts of the body contributed to the "seed" (cf. Darwin's theory of pangenesis, below), and as a result the offspring was similar to the parent. In the eighteenth century came the older "evolution" theories of Bonnet and Haller (or as they may be termed, in order to avoid confusion with the later use of the word evolution, preformation theories), by which it was held that in the egg or spermatozoön was contained a minute but perfect repetition of the parent, and that the development of the embryo was but the expansion or "evolution" of this germ. Space will not permit a review of the controversy between the "ovulists" and "spermists," but the above statement, as far as it goes, covers both sides. This theory of preformation of course accounts perfectly for heredity, but it is self-destructive, for it logically follows that in this minute but perfect germ there must be the germs of the next generation, and so on, *ad infinitum*. The advocates of the theory in the eighteenth century figured out that there must have been 200,000 million germs in the ovum of Mother Eve. The theory became a veritable box-in-box conception, and would have fallen from its own weight were it not that it was soon shown by the observations of the earlier embryologists that it was contrary to fact. They showed that there was no such expansion of a minute germ, but that the embryo was gradually built up from apparently homogeneous materials. Nor is the process a direct one. It is not merely the laying down of foundations and then adding other parts, as a builder constructs a house. There is rather a constant building and tearing down, with a rearrangement of parts and changes in the shape and function of those that persist.

After these early attempts no theory of heredity was advanced until the last half of the nineteenth century. During these hundred or more years every one was content to regard the phenomena as "simply natural," without any attempt to explain the method in which they were brought about. Soon after the publication of Darwin's *Origin of Species* several theories were advanced to account for heredity, among which may be mentioned Spencer's *Physiological Units*, Darwin's *Theory of Pangenesis*, the "plastidule" theories of Elsberg and Häckel, and Jäger's "flavor-and-odor-substance" theory. As these all resemble one another in certain features, and are all based upon the assumption of infinitesimally minute particles, it will be sufficient to give a brief outline of Darwin's theory.

In his *Provisional Theory of Pangenesis* (1868) Charles Darwin for the first time takes into consideration all the limitations outlined above, as well as the other view, then accepted without question, that the effects of use and disuse, etc. (Weismann's "acquired characters"), may be transmitted to subsequent generations. (See Evolution.) He assumes that minute particles—"gemmules"—are constantly thrown off from every cell of the body, not only in the adult but in every stage of growth; and that these gemmules retain the impressions not only of the cells from which they come, but of the various conditions to which they have been exposed. These gemmules circulate freely through the system, and by their union are formed the sexual elements. "Hence, speaking strictly, it is not the reproductive elements nor the buds which generate new organisms, but the cells themselves throughout the body."

Assuming the existence of these gemmules, this theory as expanded by Darwin would account for most of the phenomena of heredity. It would allow of parthenogenesis, alternation of generations, atavism, and it would account for the inheritance of acquired characters, mutilations, and the like. It was soon tested in a practical way by Francis Galton. He proceeded upon the idea that if these gemmules are constantly given off by the cells, if they circulate freely through the system, and if the reproductive elements are formed from their union, then the introduction of gemmules of another kind will necessarily modify the offspring. He therefore infused into the bodies of eighteen silver-gray rabbits—a variety which breeds true as to color—the blood of other kinds of rabbits, in some instances replacing half the blood. These eighteen rabbits produced eighty-six young, and in not one was there any tendency toward the other varieties, but all were pure silver gray.

To avoid this and other difficulties, Prof. W. K. Brooks proposed certain modifications of the theory. He assumes (1) that the egg is an accumulation of characteristics which are represented by minute particles (Darwin's gemmules) derived from the ancestors, and these, unless something prevents, will reproduce the parent in all particulars. (2) All cells of the body have the power of throwing off these gemmules, but exercise it only when placed in unusual conditions as in the process of change from use or disuse, in alteration of environment, or the like. (3) These gemmules may penetrate the ovum, but their main seat is the spermatozoön, a view which explains the fact that in many cases the male is the variable factor. As will be seen, this theory avoids the difficulties of Galton's transfusion experiments, and it explains or accounts for the variability of the male; but like Darwin's theory it is weak, in that it assumes the existence of gemmules of the existence of which we have no other evidence.

In 1883 Prof. August Weismann began to publish a series of articles in which are included a new theory of heredity, differing in almost every feature from all its predecessors. It is based upon the facts recently discovered regarding the structure and physiology of the cell; and to understand and appreciate it one needs a knowledge of the wonderful series of facts presented by cells in division and by the reproductive products in the processes of maturation and union. (See Mitosis.) In the briefest outline Weismann's views are as follows: Inheritance in the many-celled animals (Metazoa) and multicellular plants takes place through the germ-cells—the egg and spermatozoön in animals, the corresponding cells, known under various names, in plants. Since the offspring may inherit from either parent, the means for transference of ancestral traits must be the same in both the male and the female sexual products. Careful analysis of these products shows that, apparently, there is but a single substance present in them which fulfills all conditions, and which can serve as the physical basis of heredity. This is that peculiar substance known to science as chromatin, or chromoplasm, so called from its property of taking up the coloring-matter of certain staining fluids (Gr. χρῶμα, color). Chromatin forms an essential part of the nucleus, not only of the sexual cells, but of all cells of both animals and plants. In all cases of the division of cells (mitosis) the chromatin is divided between the daughter nuclei by a peculiar process, which is apparently adapted to secure an equal division, so that each half shall exactly resemble the other. The impregnation of the egg, on the other hand, is the reverse of this. There is a union of the chromatin of the male and female cells to form nuclear material for the germ which is about to develop. Hence it follows that when development begins each cell of the body shares equally in the chromatin of the germ-cells of both parents, because all of those cells are derivations by equal division of the compound or impregnated cell. In the whole process of develop-

ment there is a constant division of nuclear material, and at no time, except in impregnation, is there a union of chromatin from two cells. The diminution of chromatin, which is the consequence of division, is made good only by the assimilation and metabolization of nonchromatin material. It therefore follows that the chromatin of the germ-cells (the germ-plasm of Weismann) is not and can not be derived from any part of the body, but is rather a direct descendant of the germ-plasm of the parent germ-cells. This view receives further confirmation from the fact that in many animals the tissue which later is to give rise to ova and spermatozoa is differentiated in the earliest stages of the egg before the outlining of any other organs or tissues. These cells are therefore set apart from all other cells of the body for the perpetuation of the species. They can transmit nothing to the next generation except what they have received from their parents, or what may originate in themselves.

This so far forms a theory of heredity as complete as that of Bonnet and Haller, in that it accounts perfectly for the repetition of all the characteristics of the ancestor in the succeeding generations. It reduces the whole question of heredity to one of growth. The germ-cells form a continuous line from which at intervals the body grows up, lives its life and dies, in a manner analogous to the development of the fronds of the fern from the underground rhizome. Weismann's theory has a corollary of the greatest interest. If the facts upon which he relies be true, it necessarily follows that there can be no inheritance of those variations caused by use and disuse, environment, mutilation, and the like. For since these variations occur during growth or in the adult, that is, *after* the separation of the germ-cells from all the other cells of the body, there is no conceivable way in which the germ-plasm can participate in these modifications. The changes affect the cells of other parts, but there is no way in which the germ-plasm of the germ-cells can be correspondingly modified.

Yet variations constantly occur in both animals and plants which are transmitted to succeeding generations. Weismann points out that there are two kinds of variations to be recognized, those proceeding directly or indirectly from external causes, and those which arise within the germ-plasm itself. The variations of the first class (which produce what he terms "acquired characters") are, he claims, never transmitted; those of the second class—"congenital variations"—are the sole factors in evolution. They alone can be transmitted to succeeding generations, and it is by the cumulative effects of the continued inheritance of these, under the action of natural selection, that new varieties, species, and higher groups have been brought into existence.

Space will not allow any discussion of the causes of congenital variation. We can only say that Weismann points out the bearings of the wonderful phenomena connected with the maturation and impregnation of the germinal cells, and attempts to show that here lies an efficient cause. He claims, in fact, that there is no essential difference between the male and female sexual cells, and that the sole reason for this union is that variations may occur. He further takes up and explains, as in full accord with his views of the germ-plasm, the phenomena of reversion, parthenogenesis, similar and dissimilar terms, and the like. He also analyzes the cases of superfœtation, inheritance of acquired characters and of mutilations, and claims to show that there is not sufficient evidence to require their acceptance, but we must refer the reader to his works for details on these and other points.

Weismann's theory has been productive of more discussion than any biological speculation since the appearance of Darwin's *Origin of Species*. The denial of the possibility of the inheritance of acquired characters (the whole of the evolution of Lamarck) was by many deemed only less iconoclastic than would be the denial of evolution itself. The question must be regarded as far from being settled, and the philosophical naturalists are arranged in two hostile camps, the neo-Darwinians, and the neo-Lamarckians. At present the burden of proof seems to be in favor of the former side, and it is incumbent upon the neo-Lamarckians to show some way in which acquired characters may be transmitted, or some flaw in the logic of Weismann. On the other hand, they can point out many facts, chiefly from the fields of botany and palæontology, which are seemingly easiest explained upon the hypothesis of the transmissibility of acquired characters. It is worthy of being pointed out that in not a few cases the failure to accept Weismann's views results from a failure to appreciate the limitations which Weismann gives to the term which has been rendered by the rather unfortunate expression "acquired characters." Still it must not be understood that either side denies the truth of evolution. Both fully believe that all existing forms of life have been evolved by the action of variation, inheritance of variation, and the survival of those forms best fitted by variation for the conditions in which they are placed. The sole dispute is as to what kinds of variation can be inherited.

The reader is referred to the articles CELL, DARWINISM, EVOLUTION, MITOSIS, and PARTHENOGENESIS. The literature of heredity is already large, most of it being in German. Many of Weismann's essays have been collected and translated in his *Essays on Heredity* (2 vols., London, 1888–92); *The Germ-plasm* (London, 1893). Also see Darwin, *Variation of Animals and Plants* (1868); Brooks, *Heredity* (Baltimore, 1883); Galton, *Natural Inheritance* (London, 1889); Eimer, *Organic Evolution*; and numerous essays in *Nature*, *The Popular Science Monthly*, and *The American Naturalist* since 1883. J. S. KINGSLEY.

Her'eford: city of England; the county town of Herefordshire, on the Wye; 144 miles by rail W. N. W. of London (see map of England, ref. 11–F). It is the see of an Anglican bishop; has a noble cathedral begun in 1079 and finished in 1248, but with numerous additions belonging to the next five centuries, a hospital, a grammar school, a free library, a corn exchange, some manufactures of gloves and flannels, a large trade in agricultural produce, and a large cattle-fair. Pop. (1891) 20,267.

Herefordshire: county of England; situated between South Wales and the counties of Worcester and Gloucester. It contains 534,823 acres, consisting of a heavy red loam, and has an undulating surface, which toward the west rises into the Black Mountains (2,631 feet), and toward the east into Malvern Hills. Wheat, barley, oak-bark, and apples are the principal products; 20,000 hogsheads of cider of superior quality are made annually, and there are quarries of limestone, sandstone, and marble. Herefordshire belonged to the old province of Mercia, and is rich in interesting ruins dating back to the times of the Saxons. The county is famous for its fine breed of cattle. Two members are sent to the House of Commons. Pop. (1891) 115,986.

Her'ero: another name for Damara. See DAMARALAND.

Heresy [M. Eng. *heresie*, from O. Fr. *heresie* > Fr. *hérésie*: Ital. *eresia* < Lat. *hæresis* = Gr. *αἵρεσις*, heresy, sect, liter., a selecting, taking; deriv. of *αἱρεῖν*, take, mid. *αἱρεῖσθαι*, take for one's self, select, choose]: choice, preference, chosen way of life, of belief, doctrine, or teaching; a sect, school, party in philosophy, medicine, literature, or religion; the doctrine of such a party; hence discord, separation, faction as the result of such views. In the New Testament *hairesis* means sect and faction. The *hairetikos* (Tit. iii. 10) is a fomenter of divisions, whether by false doctrines or factious practices. Nearly all the languages of Christian nations have terms derived from the Greek *hairesis*. In its later sense, heresy involves an idea unknown to the classic religions. In this now universally prevalent sense, heresy is a doctrine in conflict with what is believed to be important truth. In the Church it is a doctrine perversely held by nominal Christians in conflict with one of the ARTICLES OF FAITH (*q. v.*). *Blackstone*: "Heresy consists not in a total denial of Christianity, but of some of its essential doctrines, publicly and obstinately avowed." (*Comm.*, iv., 4.) *Carpzov*, the jurist: "A pertinacious error in articles of faith." *Sir Matthew Hale*: "An opinion concerning divine things devised by the human mind, publicly taught, and pertinaciously defended." *Jäger*: "In its broader sense, every doctrine which indeed on one side still retains the Christian religious character, but on the other embraces elements which logically carried out destroy the principle of Christianity and its absolute force." (Herzog's *R. E.*, v., 453.)

As the term is relative, all enumerations of heresies are relative. That is considered heresy on one standard which is accepted as sound belief on another. Heresy may be the opinion of individuals unorganized, or it may be the doctrinal basis of *heretical sects*. Such were the GNOSTICS and MANICHEANS (*qq. v.*). That is heresy by the general judgment of the great body of the Christian world which is in conflict with the three general creeds. (See CREED.) The Roman Catholic Church and Greek Church consider as heresy all doctrines conflicting with the general creeds and their own confessional standards. *Hilgers*: "Heresy is a dogma or sys-

tem claiming to be Christian, in opposition to the definitively expressed, universal faith of the Catholic Church." (J. Aschbach, *Kirchen-Lexicon*, iii., 172.) Among evangelical Protestants the term heresy is used to mark all doctrines in conflict with FUNDAMENTALS (*q. v.*), as defined in the confessions of particular Protestant bodies. A heretic is a fundamental errorist. The term is less and less used. From fixing odium, it has, by reaction produced by its abuse, become odious. Men dislike the term, and have become careless about the thing. Heresy is allied to heterodoxy, but is a narrower and harsher term. Infidelity rejects and SCEPTICISM (*q. v.*) doubts revealed truth. Schism or sectarianism rends the Church on questions which really belong to her liberty. Heresy corrupts what it professes to accept. Schismatists separate from the Church, and heretics are cast out of it. Simple error may be no more than a mistake of the intellect; heresy involves a voluntary and persistent perversion of the truth; blasphemy is reproachful language against God or divine things. *Gerhard*: "Four things are necessary to constitute heresy: (1) Error in the understanding; (2) in conflict with the faith, for not every error is heresy; (3) conjoined with pertinacity in the will; (4) membership in the Christian Church by baptism." (*Loci* (ed. Cotta), xi., 231.) The heresies of an age are usually the shadows of its characteristic truths. The entire body of opinions seems to need shaking to bring truth to the top. When the human mind is attempting to settle in some finality of decision, all the theories which can test that decision or help to make it up become prominent. When God was manifest in the flesh the crisis of demon-power was also manifest in the flesh. The ultimata of orthodoxy and the counter-assertions of heterodoxy came to ripeness together. In the same age arose Arius and Athanasius, Pelagius and Augustine.

The infirmities of the human mind and character, the vast and profound problems involved in religion, the obscurities of the language interpreted and of the language interpreting, the extravagant development of isolated parts of a truth, the tardiness of pace on the part of some who remain behind in a position once general, but afterward abandoned (such was MONTANISM, *q. v.*), the influences of education, of special mental types, of speculative and practical systems, the passions of men, the love of novelty, and the overbearing of a blind conservatism, and many of the best principles of our nature, mistaken, distorted, or perverted, are among the causes of heresies. Many heresies are mere blunders of phraseology, and the wars in them have been wars of words.

The *treatment* of heresy in the Church has been very varied. In the early Church, not merely from the necessity of her condition, but from principle, the means of correcting it were purely moral. Not until admonition, reproof, and instruction were exhausted did the Church resort to excommunication and anathema. The early Church was averse to capital punishment in general. Irenæus (d. 202) and Tertullian (d. before 240) were among the earliest authors of treatises against heresies. NOVATIANISM (*q. v.*) was punished by deposition (251). With the conjunction of Church and state heresy came to be regarded as also a civil offense, in the nature of a double treason, and was punished by the magistracy with forfeiture of office and dignities, deprivation of the right of bequeathing and receiving bequests, with confiscation of property and death. The first instance of the infliction of death on heretics was the beheading of Priscillian and two of his adherents (385). It was brought about by some of the Spanish bishops, but was offensive to the larger part of the Church, and was protested against, among others by Pope Siricius (384–398), though he had been specially active in repressing Priscillianism. From the twelfth and thirteenth centuries the treatment of heresy was one of general persecution, leading to bloody wars. Courts for the trial of heresy were established throughout Western Christendom, with a body of *judges* of heresy, presided over by *masters* of heresy. These courts formed the INQUISITION (*q. v.*). They made decisions involving the property, freedom, and life of all who were charged with deviation from the faith of the Roman Catholic Church. The first great official voucher for an important change from this state of things was the Peace of Westphalia (1648), according to which the three Confessions, the Roman Catholic, the Lutheran, and the Reformed, were acknowledged as in all civil respects non-heretical. The pope issued a bull declaring the provisions of the instrument of this peace null and void. In Rome, on Thursday of Holy Week, there was until Clement XIV. (1769–74) a public reading of the bull IN CŒNA DOMINI (*q. v.*), in which there is an enumeration and anathematizing of heresies. A similar document is read in the Greek Church by the Patriarch of Constantinople on Quadragesima (hence called Orthodox) Sunday. In the Church of England the third collect for Good Friday embraces a prayer for all heretics.

In the earlier Reformed views of the treatment of heresy there was a concurrence in general with the principle that it should be dealt with by the civil magistracy. Calvin (1554) and Beza wrote in defense of the right and duty of putting heretics to death, and this was almost unchallenged among the earlier Protestant divines. It is the influence of association with this style of thought which accounts for the fact that Melanchthon, contrary to his gentle spirit and the judgment of all the German divines, concurred in the righteousness of the execution of SERVETUS (*q. v.*). In England under the statute "De hæretico comburendo" (1401), many of Wiclif's followers were burned to death. Under Henry VIII. offenses against the see of Rome ceased to be heresy, but (1539) the Six Articles, all of them asserting distinctive parts of the Roman Catholic doctrine, were set forth, and the penalty of death attached to the rejection of any of them. They were repealed in the first year of Edward VI. (1547). The law under which heretics were burned to death was abolished under Charles II. (1676). The last person put to death in Great Britain for heresy was Thomas Aikenhead, a young student of divinity, executed in Edinburgh (1696), under a statute against blasphemy. (See Macaulay's *History of England* (New York, 1856), iv., 621, and Hugh Miller's *Macaulay on Scotland*, a critique from *The Witness*.) The statute was repealed under George III. The Arminian divines of Holland favored the milder judgment and treatment of heresies. (See Curcellæus, *Opera* (1675), 81, 579–595, 830.) It may now be regarded as a fixed principle of nearly the entire Protestant world that civil government has no right to interfere with the mere holding of religious opinions, however wrong, nor to repress any publication of them or acting upon them which does not interfere with the civil order and law of the land.

Heresy has given us a number of terms: *Heretic*, one who holds a heresy; *heretical*; *heresiarch*, a leader in heresy; *arch-heretic*, one who is prominent as a representative of heresy; *heresio-mastix*, a scourger of heresy; and the now obsolete *hereticate*, to stamp as heresy.

The literature of heresy embraces works on its general character (see Danz, *Universal-Wörterbuch*, s. v. Ketzerei); heresiology, the polemical works which discuss the various forms of heresy (see POLEMICS); works on its general history (such as Mosheim, 1748–50; Walch, 1762–85; Baumgarten, 1766; Fuessli, 1770–74; Von Einem, 1789); history of particular heresies (see under the special articles ALBIGENSES, APOLLINARIS, ARIUS, etc.). The best histories of the Church and of dogma in general also embrace the history of heresies (see CHURCH HISTORY). The bibliography will be found in Buddeus's *Isagoge*; Walch's *Bibliotheca Th. Sel.*; Winer, *Handbuch d. Theol. Lit.*; and in Hagenbach, *Encykl. u. Methodol.* (9th ed. 1874; 244, 275–277; 12th ed. 1889, p. 330, *sq.*).

In the Protestant world the most interesting trials for heresy have been in the Presbyterian Church, and have turned upon the question whether a professor of theology could hold the so-called critical views as to the Bible and still retain his ministerial standing and his professorship. In the Free Church of Scotland Prof. William Robertson Smith was tried by the Assembly of 1880 and acquitted by a majority of 7 in a court of nearly 600 members, but was removed from his chair by the Assembly of 1881; in the Presbyterian Church in the U. S. Prof. Charles Augustus Briggs was tried by the Assembly of 1893, and condemned by a vote of 379 to 116, whereupon he was suspended from the ministry.

Revised by S. M. JACKSON.

Hergenröther, hār'chen-rö-ter, JOSEPH: author and theologian; b. at Würzburg, Bavaria, Sept. 15, 1822. He studied theology in his native town, at Rome, and at Munich, and was in 1852 appointed Professor of Canon Law and Church History in the University of Würzburg. In 1867–69 he published the classical work *Photius Patriarch von Konstantinopel*. He was one of the German divines invited by Pius IX. to take part in the various labors preparatory to the Vatican Council, and after the promulgation of the dogma of papal infallibility he took an active part in its defense, vehemently attacking Dr. Döllinger. His *Antijanus* (a defense of this doctrine) was translated into English (1870), also his *Catholic Church and Christian State*, a series of essays on the re-

lation of the Church to the civil power (2 vols., London, 1876). His *Church History* (3 vols., 3d ed. 1884) is looked on by Roman Catholics as the best modern work of the kind. He is the author of the ninth volume of the second edition of Hefele's *History of the Councils*, and began the *Leonis X. Regesta*, interrupted by his death. On May 12, 1879, he was made a cardinal. D. at Bregenz, Switzerland, Oct. 7, 1890. Revised by J. J. KEANE.

Her-Hor, or **Hir-Hor** (the *Smendes* of Manetho): the first king in the twenty-first dynasty of Egyptian history, and founder of the priestly line of sovereigns, about 1100 B. C. Under Ramses XIII., the last king of the twentieth dynasty, he was chief priest of Amon, and even during the lifetime of that king he succeeded in concentrating in himself a power superior to that of the monarch. Upon his accession to the throne he assumed the usual royal title, "King of both lands," Upper and Lower Egypt, and he boasted of his prowess in repulsing his enemies and of receiving foreign tribute. His activity as a builder was mainly in Karnak, where he extended the temple of Khonsu, leaving inscriptions which constitute the main materials for the reconstruction of the history of the time. His main service was his hiding of the remains of his predecessors so securely that they were not found till 1881, when the mummies of Aahmes I., Amenophis I., Thothmes I., II., III., Ramses I., II., Seti I., and other rulers and princes, were recovered by Emil Brugsch Bey from a subterranean chamber in the mountain W. of Thebes. CHARLES R. GILLETT.

Hering, hā'ring, EWALD, M. D., Ph. D., member of the Vienna Academy of Sciences: physiologist; b. in Neugersdorf, Saxony, Aug. 5, 1834; educated at University of Leipzig; practiced medicine in Leipzig 1860–65; tutor in Medicine, University of Leipzig, 1862–65; professor in Vienna 1865–70; Professor of Physiology in University of Prague since 1890. He has investigated especially psychophysics and the theory of color. The dominant theory of color-vision goes by the name of Hering, since in its original form it was proposed by him and rests principally upon his experiments. Among his principal works are *Beiträge zur Physiologie* (Leipzig, 1861–64); *Ueber den Bau der Wirbelthierleber* (*Proceedings* Vienna Academy 1866); *Die Lehre vom binocularen Sehen* (Leipzig, 1868); *Zur Lehre vom Lichtsinne* (six communications to the Vienna Academy 1872–74); *Beiträge zur allgem. Nerven- u. Muskelphysiologie* (*Proceedings* Vienna Academy 1879–84); *Der Raumsinn und die Bewegungen des Auges* in Hermann's *Handbuch der Physiologie* (1879); *Der Temperatursinn* in Hermann's *Handbuch der Physiologie* (1880); *Das Gedächtniss als eine allgemeine Funktion der organisierten Materie* (2d ed. 1876); *Von den Beziehungen zwischen Leib und Seele* (1875). J. MARK BALDWIN.

Her'ing, RUDOLPH: civil engineer; b. in Philadelphia, Pa., Feb. 26, 1847; graduated at the Polytechnic School in Dresden, Germany. He has been engineer in charge of surveys and preliminaries for the new water-supply of Philadelphia; chief engineer of the drainage and water-supply commission in Chicago; and consulting engineer for numerous cities on works for water-supply, sewerage, and paving. In 1881 he prepared for the National Board of Health a comprehensive report on the sewerage of European cities. In conjunction with J. C. Trautwine, Jr., he translated and supplemented Ganguillet and Kutter's *Flow of Water in Rivers and Channels* (1889).

Her'iot, GEORGE: founder of the Heriot Hospital and Heriot Schools of Edinburgh; b. in that city in June, 1563. Having been appointed goldsmith to the king and the queen, he removed to London when James VI. became King of England, and here he accumulated a large fortune, of which he left the greater part on his death, Feb. 12, 1624, to the town council and ministers of Edinburgh to found a hospital or school in that city for the maintenance and education of the sons of poor, deceased, or decayed burgesses. As in the course of time the revenues considerably exceeded the expenditures, several schools, in which free instruction is given to poor children, were added to the hospital in 1837. In 1885 the hospital was reconstituted as a science and technical school, and the free schools were closed. The Heriot-Watt College, providing the same kind of instruction for older students, at moderate fees, was also subsidized from the Heriot trust, the annual revenue of which yields over £30,000.

Heriot, JOHN: author; b. at Haddington, Scotland, Apr. 22, 1760; studied at the University of Edinburgh; entered in 1778 the Royal Marines, and became a lieutenant; was put on half-pay in 1791, and started, on the suggestion of Burke, *The Sun* in 1792 and *The True Briton* in 1793, which were published to counteract the influence of the French Revolution. In 1809 he received an office as paymaster, and in 1810 as controller at the Chelsea Hospital. D. June 30, 1833. He wrote also romances. Among them were *The Heart-broken* and *The Half-pay Officer*.

Herisau, hā'rĕe-sow: an old, beautifully situated town in the canton of Appenzell, Switzerland; 5½ miles by rail S. W. of St.-Gall (see map of Switzerland, ref. 3–I); capital of the Outer Rhodes; on the Glatt. Pop. 12,937.

Herkimer: village; capital of Herkimer co., N. Y.; on the Mohawk river, the Erie Canal, and the N. Y. Cent. and Hudson River and the Mohawk and Malone railways; 81 miles N. W. of Albany (for location, see map of New York, ref. 4–H). It is in a noted dairy and cheese region; is connected by street-railways with Mohawk, Ilion, and Frankfort; and contains 8 churches, 2 union schools, the Folts Mission Institute (founded in 1892), 2 banks, and 3 weekly newspapers. There are manufactures of knit goods, airguns and rifles, office-desks, furniture, spring beds and mattresses, and paper. Pop. (1880) 2,359; (1890) not separately returned; (1894) estimated, 4,450.

EDITOR OF "HERKIMER CITIZEN."

Herkimer, NICHOLAS: soldier; b. about 1720; became a militia lieutenant 1758, and commanded at Fort Herkimer on the Mohawk (now in German Flats, N. Y.) in that year, at the time of the French and Indian attack. He soon afterward lived in the Canajoharie district, now in Montgomery County; became colonel of militia for Tryon County 1775; appointed brigadier-general by the State convention 1776; marched against Sir John Johnson's Tories and Indians 1776; led an expedition to the relief of Fort Stanwix (now Rome, N. Y.), then besieged by St. Leger; was ambuscaded by the Indians, defeated, and wounded in the leg, at Oriskany Aug. 5, 1777; suffered unskillful amputation, and died in consequence Aug. 17, 1777, at Danube, N. Y., where he resided. Congress voted (Oct., 1777) to erect a monument to "Brigadier Harkemer," but the monument was not erected until 1884, when it was completed by the efforts of the Oneida Historical Society of New York.

Herkomer, hār'kō-mer, HUBERT: portrait and genre painter; b. at Waal, Bavaria, May 26, 1849. He was taken to the U. S. by his father, a wood-carver, in 1851, but returned to Europe in 1857 and entered the art school at Southampton, England; became a pupil of Frederick Walker at the South Kensington Art Schools in 1866; member British Institute of Water-color Painters 1871; Royal Academician 1879; took the medal of honor, Paris Exposition, 1878; first-class medal, Paris Exposition, 1889; became Slade Professor of Art, Oxford University, 1885; is a member of the Berlin Academy 1885; an etcher of decided ability, and has some reputation as a writer on art and other subjects. He established an art school at Bushey, Hertfordshire, England, in 1881, and is a popular instructor. His best work is *The Last Muster—Chelsea Hospital*, painted in 1875, which attracted much attention at the Paris Exposition of 1878. He visited the U. S. in 1882–83, and again in 1885, painting portraits in New York, Boston, and other cities. Studio at Bushey.

WILLIAM A. COFFIN.

Hermandád [Span., brotherhood, deriv. of *hermáno*, brother < Lat. *germa'nus*, full brother]: a general name for the leagues entered into by the Spanish cities in the Middle Ages for the preservation of public order and the defense of private property. The most celebrated (called Santa Hermandád, or Holy Brotherhood) was organized in Aragon about the middle of the thirteenth century, and was established in Castile in 1282. Another, of thirty-five towns in Castile and Leon, was organized in 1295. Kindred societies throughout Spain soon followed. Their laws were codified in 1485, and published in 1527. In 1488 the Holy Brotherhood was reorganized, and in 1496 it was extended over a great part of Spain. Ferdinand and Isabella, in their policy of consolidating and centralizing the Spanish state, allied themselves with the Holy Brotherhood against the nobles, but in 1498 they reduced it from its high office of conservator of the peace and defender of popular rights against the feudal nobility, and it became an organized police force or militia. In 1520–21 the Hermandád of Valencia rose in insurrection against the Government.

Hermann: town; capital of Gasconade co., Mo. (for location of county, see map of Missouri, ref. 5-H); on the Missouri river and the Mo. Pac. Railway: 81 miles W. of St. Louis. It is in a noted viniculture region, and manufactures wine, beer, cigars, flour, saws, knives and wrenches, and foundry products. It has three weekly newspapers. Pop. (1880) 1,314; (1890) 1,410.

Hermann [whence Lat. *Armĭnius*, whence Eng. *Arminius*]: a German chieftain of the Cherusci; a son of Sigimer; b. 18 B. C.; entered the Roman service, and became an equestrian. In 9 A. D., when Germany was groaning under the oppression of Varus, Hermann ambuscaded the Romans in the Teutoburger Forest, and almost all the Romans, Varus included, lost their lives. He fought Germanicus (14–16 A. D.), with disadvantage; defeated Marbodacus, King of the Suevi, 17; and was probably put to death by his own kinsmen in 19 A. D., on the ground that he was aiming at absolute power, but his name continued to live on among the German tribes as a symbol of independence.

Hermann (Germ. pron. hār'măn), Friedrich Benedict Wilhelm, von: political economist; b. Dec. 5, 1795, at Dinkelsbühl, Bavaria; studied at the Universities of Erlangen and Würzburg, and became privat docent in the former in 1823; afterward taught mathematics at the gymnasium and polytechnic school in Nuremberg, and a few years later became Professor of Political Science in the University of Munich. In 1832 he published his chief work, *Staatswirthschaftliche Untersuchungen* (*Economic Researches*), a contribution of high value to the science of pure economics. He rose in the state service of Bavaria to a position of high rank, and in 1848 sat as member for Munich in the Frankfort Assembly, where he was one of the organizers of the "Great German" party. His active life gave him little time for the further study of the theory of economics, but essays by him on the practical questions of the day appeared in the *Münchener Gelehrte Anzeigen* from 1835 to 1847, and his annual reports as head of the bureau of statistics of Bavaria are valuable, especially as showing the growth of population. D. Nov. 23, 1868. F. M. Colby.

Hermann, Johann Gottfried Jakob: Greek scholar; b. in Leipzig, Nov. 28, 1772. Instructed by Ilgen and Reiz, he matriculated at Leipzig at the early age of fourteen and devoted himself originally to the study of law and Kantian philosophy, but soon exchanged this for the study of the classics. He was privat docent at Leipzig in 1794; professor extraordinary of Philosophy 1798; full professor of Eloquence 1803, of Poetry 1809. An unusually inspiring teacher, an eloquent lecturer, and a brilliant Latin stylist, he exerted an incalculable influence which lasted long after his death. Hermann is the foremost representative of the grammatico-critical school of philology, which regards the complete understanding of the authors themselves as its chief, if not its only aim, laying special stress upon a thorough knowledge of grammar and versification as a means to this end; the other side, known as the historico-antiquarian school, is headed by P. A. Böckh. They and their respective followers were long engaged in polemical encounters, but the two great antagonists finally became reconciled on recognizing that neither method is exclusive of the other, but that both must go hand in hand, each being indispensable to the other. Of the very numerous of Hermann's contributions to philology, almost wholly confined to Greek poetry, the following only can be here mentioned: *Elementa doctrinæ metricæ* (1816), in which the ancient theory of versification was evolved not out of historical evidence, but upon the basis of the Kantian theory of categories. He edited nearly all of the plays of Euripides, Sophocles, Aristophanes's *Clouds*, the Orphic and Homeric hymns, Æschylus (a posthumous publication issued by M. Haupt), Plautus's *Trinummus* and *Bacchides*, and Aristotle's *Poetics*. His theories on criticism, hermeneutics, grammar, etc., are contained in numerous reviews and dissertations collected in his *Opuscula* (8 vols., 1877). See H. Köchly, *Gottfried Hermann* (Heidelberg, 1874); Bursian, *Gesch. der class. Philol. in Deutschl.* (p. 575 ff., 665–687). D. at Leipzig, Dec. 31, 1848. Alfred Gudeman.

Hermann, Karl Friedrich: classical scholar; b. in Frankfort-on-the-Main, Aug. 4, 1804; studied in Heidelberg and Leipzig; privat docent in Heidelberg 1826; professor ordinarius in Marburg 1832; librarian 1833; called to Göttingen in 1842, where he died Dec. 31, 1855. Author of a standard work on Greek antiquities (*Staatsalterthümer*, 1875, 5th edit.; *Gottesdienstliche Alterthümer*, 1858, 2d edit.; *Privatalterthümer*, 1882, 3d edit.), and a complete edition of Plato with scholia (6 vols., 1839), of Juvenal and Persius (1854). See C. Halm, in *Allgem. deutsch. Biographie*, xii., 182 ff. Alfred Gudeman.

Hermann, Ludimar, M. D.: physiologist; b. in Berlin, Oct. 21, 1838; professor in University of Zurich since 1868; author of *Grundriss der Physiologie* (10th ed. 1892); *Lehrbuch der experimentellen Toxikologie* (1874); *Untersuchungen zur allgemeinen Muskel- u. Nervenphysiologie* (1867–68); *Handbuch der Physiologie* (with others, 1879–83).

C. H. T.

Hermann-Léon, Charles: animal and genre painter; b. at Havre, France, July 22, 1838. Pupil of Fromentin and Philippe Rousseau; third-class medal, Salon, 1873; second-class medal, Salon, 1879; paints hunting scenes with fine vigor and solid technical methods. *Action* (1878) is in the Morlaix Museum; *Wolf!* (1881) is in the Havre Museum. Studio in Paris. W. A. C.

Her'manstadt: town; in the province of Transylvania, Hungary; on the Zibin; 370 miles S. E. of Pesth (see map of Austria-Hungary, ref. 8-L). It is a beautifully situated and well-built town, the residence of the governor of the province and of a Greek archbishop, metropolitan of Transylvania. Pop. 21,500.

Hermaph'rodism, or **Hermaph'roditism** [deriv. of *hermaphrodite*, from Lat. *Hermaphroditus* (*q. v.*)]: the union of the characteristic organs of each sex in one individual. This union of the male organs (producing sperm-cells) and female (producing germ-cells) in one and the same organism is the normal condition in the great majority of plants and in many of the lower animals. Though the higher forms of radiates, mollusks, and Arthropoda all have the sexes quite distinct, except in abnormal instances, many of the inferior types of each are always hermaphrodites. Such, for instance, are the common snail and the earthworm. No insect hermaphrodites (unless the Tardigrades are insects) are known, except in abnormal instances. Siebold found hermaphrodites among honey-bees, but he records the fact that the workers threw them out of the cells, and that they speedily perished. It has been suggested that this hermaphrodism in bees may exist normally in some slight degree, and that it may give rise to the parthenogenesis of male bees, for it is well known that queen bees will produce male offspring without coitus with the male.

Hermaphrodism has not been observed with certainty in vertebrates, except perhaps in eels and fishes of the family *Serranidæ*. It has been stated with considerable force that the homologies existing between the male and female organs prevent any possibility of hermaphrodism in the higher vertebrates; but there is no apparent reason why of bilateral or double organs one side should not assume the male and the other the female development. Thus there might, it would appear, be one ovary and one testis—a condition analogous to what is often seen in the lower animals; but, as a matter of fact, there is not yet a single recorded case of true hermaphrodism in the human species—that is to say, functionally active sexual glands of opposite sexes in one individual. Dual development of the rest of the genital apparatus is by no means unknown. For a classification of these cases, see Teratology.

Many of the lowest forms of hermaphrodite plants and animals are self-fertilizing—that is, reproduction takes place without the sexual union of two individuals. But in very many plants which have both kinds of reproductive organs in one flower, fertilization is accomplished by means of insects, which carry the pollen of one flower to the pistil of another, nature having prevented self-fertilization by wonderfully ingenious yet often very simple means. Many bisexual animals, like the snail, conjugate for mutual fertilization. Spurious hermaphrodism, in which the characteristic organs of one sex assume, from incomplete or abnormal development, something of the appearance of those of the opposite sex, has been often observed. Under this head must be placed all of the recorded instances of hermaphrodism in the human species. The true hermaphrodism is *double* sex; spurious hermaphrodism is *doubtful* sex.

Revised by Barton C. Hirst.

Hermaphrodi'tus [Lat. = Gr. Ἑρμαφρόδιτος: Ἑρμῆς, Hermes + Ἀφροδίτη, Aphrodite]: a son of Hermes and Aphrodite, who inherited the beauty of both of his parents. Once, when he was bathing in the fountain of Salmacis, near Halicarnassus, in Caria, Asia Minor, the nymph of the fountain

fell in love with him and prayed to the gods that she might remain united with him forever; and when he ascended from the bath he was changed so that he was neither man nor woman, but both. The idea of this myth is of Asiatic origin. In the Hellenistic period Greek sculpture often represented Hermaphroditus, the upper part of the body female, the nether male. He is represented either as standing or as lying asleep upon his right side with his arms beneath his head, and his face turned toward the right. The best standing statue was unearthed at Pergamon, and is preserved in the museum of Constantinople. The sleeping Hermaphroditus is voluptuous and sensual. A number of such statues exist: in Rome, Paris (two), St. Petersburg, Florence, Athens, etc. A large number of monuments represent Hermaphroditus grouped along with the Bacchic train. Revised by J. R. S. STERRETT.

Hermas: the author of a religious romance, *The Shepherd*, which was for two hundred years widely read among Christians, quoted as "Scripture" by Irenæus (*Adv. Haer.*, iv., 20); by Clement of Alexandria accepted as inspired (e. g., *Stromata*, ii., 1, 9, iv., 9); as also by Origen (in Rom. xvi. 14; in Matt. xix. 7, and frequently), and by Eusebius (*H. E.*, iii., 3) stated to have been publicly read in the churches. Origen hazarded the guess that he was identical with the Hermas mentioned in Rom. xvi. 14, and Eusebius repeats it (*H. E.*, iii., 3), but there appears to be no better proof of it. Another opinion which counts the author of the so-called "Muratorian Fragment" in its favor is that Hermas was the brother of Pius, Bishop of Rome (142–157), for he says: The *Pastor*, "moreover, did Hermas write very recently in our times, in the city of Rome, while his brother, Bishop Pius, sat in the chair of the Church of Rome. And therefore it also ought to be read; but it can not be made public in the Church to the people, nor placed among the prophets, as their number is complete, nor among the apostles to the end of time." A third opinion is that Hermas was a contemporary of Clemens of Rome, and therefore lived about the end of the first century, because he says that he was told to write two books and "send one to Clemens and the other to Grapte" (book i., vis. ii., 4), which Clemens is identified with Clemens Romanus. The latter opinions agree in giving Rome as the place of composition. As for the book, it is called *The Shepherd*, or in Latin *Pastor*, and divided into three parts, "Visions," "Commandments," and "Similitudes." The visions were apparently in part real dreams, but the rest of the book is plainly a deliberate composition. The third part is an allegory, which made it the *Pilgrim's Progress* of the early Church, but to a modern reader the whole book is dull and stilted. It is probable that it was originally written in Greek and in Latin, as the citation already quoted (i., ii., 4) seems to show. The Greek text was, however, early lost, and until the nineteenth century the Latin text alone was known to the Western Church. In 1860, at Leipzig, an Ethiopic translation was published (cf. G. H. Schodde, *The Ethiopic Version of Pastor Hermas Examined*, Leipzig, 1876). The Greek text has been edited by A. Hilgenfeld (Leipzig, 1887); Eng. trans. in *Ante-Nicene Christian Library*, vol. ii. (New York); cf. S. P. Lambros, *Collation of the Athos Codex of the Shepherd of Hermas* (Cambridge, 1888), translated by J. A. Robinson. Of treatises, see that by T. Zahn, *Der Hirt des Hermas* (Gotha, 1868).

SAMUEL MACAULEY JACKSON.

Hermeneu'tics [plur. of *hermeneutic*, from Gr. ἑρμηνευτικός, pertaining to interpreting or to an interpreter; deriv. of ἑρμηνευτής, interpreter, deriv. of ἑρμηνεύειν, interpret]: the science and art of interpretation, or of ascertaining the meaning of an author from his language. It is closely allied to grammar, logic, and rhetoric, and presupposes them. Its aim is to reduce interpretation to fixed laws and principles, and to the precision of an exact science, so far as the elastic nature of thought and language will permit. The business of *exposition* often has been confounded with *imposition*, whereby all sorts of arbitrary subjective fancies are introduced into the text of which the writer never dreamed. The work of interpretation requires intellectual and moral qualifications, natural and acquired—viz., a full knowledge of the author's original language, historical situation, mental status, and range of ideas, and an appreciating sympathy with his spirit and aim.

Biblical hermeneutics is general hermeneutics applied to the sacred Scriptures. It has been most cultivated on account of the vast importance and general interest of these books. It may be traced to the Jews and to Philo of Alexandria, who reduced the allegorical method of interpretation to a system, which through Origen (d. 254) passed into the Christian Church. Origen of Alexandria distinguished a threefold sense of the Scriptures, corresponding to the tripartite nature of man (a somatic or literal, a psychic or moral, and a pneumatic or mystical sense). The grammatical school on the other hand, which was best expressed among the Fathers by Chrysostom and Jerome (though by no means consistently), adhered to the natural and literal sense as the only one which the writer had in view. Assuming the last principle to be correct, there are still three legitimate kinds of interpretation, which, however, must harmonize with each other, and together give the one full meaning of the text: (1) The *philological* (also called *literal* or *grammatico-historical*) exegesis is concerned with the body or letter of the text, with verbal, critical, and antiquarian questions. It brings out the meaning of words and phrases according to the general rules of grammar, the particular idiom and vocabulary of the author, his age, nation, and country, and clears up all references to contemporaneous history and antiquities. It deals with the literary and human aspects of the Scripture, with the earthly form into which its divine contents are cast. It is the basis of all sound exegesis. It has been successfully cultivated during the nineteenth century in Germany and England by Winer, de Wette, Lücke, Bleek, Meyer, Ewald, Dillmann, Alford, Ellicott, and Lightfoot. (2) The *theological* (or *doctrinal* and *ethical*) interpretation deals with the divine thoughts and spiritual truths of the Bible, and explains them in connection with its general teaching and according to the analogy of faith; but it ought not to be fettered by dogmatic prejudice or made subservient to sectarian interest, as was done in the scholastic periods of theology during the Middle Ages and the seventeenth century, when the Bible was used simply as a repository of proof-texts for certain tenets of orthodoxy and against heretical opinions. Among the most distinguished theological expounders are Augustine, Luther, Calvin, Olshausen, Tholuck, and Hodge. (3) *Practical* and *homiletical* exegesis applies the text to the wants of the human heart, and draws from it lessons of wisdom and comfort for the battle of life. It belongs properly to the pulpit and to popular works. Of this character are the exegetical homilies of Origen, Chrysostom, Augustine, and other Fathers, and the commentaries of Matthew Henry, Burkitt, Doddridge, and Starke.

LITERATURE.—J. A. Ernesti, *Principles of Biblical Interpretation* (in Latin, 5th ed. Leipzig, 1809; Engl. transl. by C. H. Terrot, London, 1843); C. G. Wilke, *Hermeneutik des N. T.* (2 vols., Leipziz, 1844); J. L. S. Lutz, *Biblische Hermeneutik* (2d ed. Pforzheim, 1861); J. E. Cellerier, *Manuel d'Hermeneutique* (Paris, 1852; abridged Eng. trans. by C. Elliott and W. J. Harsha, *Biblical Hermeneutics*, New York, 1879); Patrick Fairbairn, *Hermeneutical Manual* (Edinburgh, 1859); H. A. Immer, *Hermeneutics of the N. T.* (Wittenberg, 1873; Eng. trans. by A. H. Newman, Andover, 1877); M. S. Terry, *Biblical Hermeneutics* (New York, 1883; rev. ed. 1892).

PHILIP SCHAFF.

Her'mes (in Gr. Ἑρμῆς, Ἑρμέας, Ἑρμείας): son of Zeus and Maia, a daughter of Atlas. He was born in a cave of Mt. Cyllene, and while still an infant went to Pieria and stole the cattle of Apollo and invented the lyre. Apollo knew who had stolen the cattle, and, as he failed to get satisfaction from the baby thief, he carried him to Olympus and accused him of the theft before his father Zeus, who compelled him to restore the cattle to Apollo. While on the road to the place where he had hidden the cattle he showed his lyre to Apollo, who was so pleased with its music that he presented Hermes with the cattle in return for the lyre. Later on, when Hermes had invented the flute, he gave it to Apollo in return for the golden caduceus and prophetic powers. The story of Hermes's birth and his early adventures is told by Apollodorus, but more delightfully in the Homeric hymn to Hermes. Hermes was worshiped all over Greece. He had a number of widely different attributes, as might be expected from the many-sidedness of his character. He was the go-between in all the intrigues of the gods; it was he who guided the souls of the dead down to the house of Hades; he was the swift and trusty messenger and herald of the gods; he invented weights and measures and taught how commerce might bring gain and how to lie and steal; his readiness of speech and his plausibleness made him the inventor of oratory and the patron of orators; besides the lyre and the flute he also invented the syrinx, and, according to some, also lan-

guage, mathematics, astronomy, and writing; he was the patron of gymnastics and agonistics; he was the promoter of fertility in plants and animals; he was the god of chance. He is represented in art with the caduceus (herald's staff), the petasus (winged hat) and winged feet, both indicative of his swiftness. This manifold nature of Hermes has been explained in a variety of ways, although Roscher's interpretation of him (*Hermes der Windgott*, Leipzig, 1878) as the wind-god bids fair to gain the day. The Greek artists never tired of making statues of Hermes, and they were used as landmarks, they stood in caves, on mountains, at fountains, by the roadside, at the city gates, in the streets, in front of houses, in houses, in the agora, in the gymnasium and palæstra, on graves. The finest statue of him is that found by the Germans in their excavations at Olympia. It is an original work of Praxiteles.

Literature.—Roscher, *Hermes der Windgott* (Leipzig, 1878); Scherer's article in Roscher's *Lexicon*; Baumeister, *Denkmaler*, under *Hermes*; Preller-Robert, *Griechische Mythologie* (Berlin, 1888). J. R. S. Sterrett.

Hermes, hār'mes, Georg: a German theologian who endeavored to carry out the doctrine of unity by forming a common basis for Protestantism and Roman Catholicism; b. in Dreierwald, Westphalia, Apr. 22, 1775; studied theology at Münster; became professor there in 1807 and at Bonn in 1819. D. at Bonn, May 26, 1831. "He had found," says Binder, "the futility of the attacks of Kant and Fichte on Christianity, and the truth of Roman Catholicism." He busied himself for many years, however, in trying to base the principles of the latter on those of the former, setting forth his views in the *Einleitung in die Christ-katholische Theologie* (Introduction to the Catholic Christian Theology, Münster, 1819) and *Christ-katholische Dogmatik* (Münster, 1834). His work was not in any respect heretical, but confined itself to negativing the arguments of those who declared the instability of the Catholic dogma. He founded a school or doctrine termed Hermesianism, and his followers, the Hermesianer, occupied many important positions as preachers and teachers in Germany. He maintained that the principle of *pure reason*, which, as Kant teaches, is innate in every soul, enabling it to decide on all principal truths, should be applied to religion; or rather that the Church should teach its doctrines on this basis; but this principle was disapproved of at Rome, and a papal letter was directed against it (Sept. 16, 1835) by Pope Gregory, beginning with the words *Dum acerbissimus*. During the life of Hermes his school had great influence and made many converts. Binder attributes the delay in proceeding against it to the usual system of formalities followed at Rome in such cases. The fundamental principle of the Hermesian doctrine is that human reason can grasp the truth, and that religion, being true, is or may be based on this "natural sense"; but the Roman Church holds a directly different doctrine, and does not look up to philosophy or science to authorize her doctrines, as the Roman Catechism declares "the mysteries which are contained in God's holy Church are to be understood only by faith, and not by reason." Hermes did in fact quite unconsciously seek to put the Catholic Church on that Protestant foundation of independent reason which from Luther to Döllinger has been so strongly characteristic of the Teutonic mind. Among the principal works referring to Hermesianism are the following: *Hinweisungen auf den Grundcharakter des Hermesischen Systems*, by J. B. Baltzer (Bonn, 1832, 8vo); *Blätter zur Orientirung in Sachen des Hermesianismus* (Treves, 1838), by F. X. Blumde and J. J. Rosenbaum; *Acta Romana*, by J. W. J. Braun and P. J. Elvenich (documents relating to the condemnation by the pope of G. Hermes (Hanover, 1838, 8vo); *Acta Hermesiana*, by A. J. Elvenich (Göttingen, 1836); *Novæ Annotationes*, by F. Lange (Mainz, 1839); *Apologie des Hermesianismus*, by J. B. Lutterbeck (Münster, 1835); *Ueber Glauben*, by J. J. Rosenbaum (Treves 1838, 8vo); *Der Hermesianismus und Joh. Perrone* (Breslau, 1844). Revised by Samuel Macauley Jackson.

Hermes, Johann Timotheus: author; b. at Petznick, near Stargard, Prussia, May 31, 1738; studied theology at Königsberg; became superintendent and Professor of Theology at Breslau. He was an ardent admirer of the English novelist Richardson and of Wieland, and imitated their styles. His most popular works were *Geschichte der Miss Fanny Wilkes* (1766; 3d ed. 1781); *Sophiens Reise von Memel nach Sachsen* (1770–73; 3d ed. 1778); *Für Töchter edler Herkunft* (1787). D. in Breslau, July 24, 1821. B. B. H.

Hermesi'anax: poet; b. at Colophon, Asia Minor; lived in the times of Philip and Alexander the Great, and died before the destruction of his native city by Lysimachus in 302 B. C. Of his elegiac poem in three books to his mistress Leontium, a large part of the third book has been preserved by Athenæus (lib. xiii.), in which the wildly fabulous love-stories of poets and sages are not ungracefully told. It has been separately published by J. Bailey (London, 1839), together with a critical epistle by G. Burges. Text in Bergk's *Anthologia Lyrica*. See Couat, *La Poésie Alexandrine* (pp. 80–98); Susemihl, *Geschichte der griechischen Litteratur in der Alexandrinerzeit* (vol. i., pp. 184–187).

Revised by B. L. Gildersleeve.

Hermesianism: the religious philosophy taught by Georg Hermes (*q. v.*).

Her'mes Trismegis'tus [Lat. = Gr. Ἑρμῆς Τρισμέγιστος; Ἑρμῆς, Hermes + τρίς, thrice + μέγιστος, greatest, superl. of μέγας, great, mighty: Eng. *may, might*]: the name applied by the Greeks to the Egyptian god Thoth (*q. v.*) of Hermopolis as early as the time of Plato. The title *Trismegistus* is variously explained. Probably it was derived originally from the form in which the name of Thoth appears in the hieroglyphic writing as "twice-great" or "thrice-great," the latter being found especially in Nubia. Thoth was the reputed author of the secret sacred books of the Egyptians. In the second and third centuries after these books were lost, others were prepared which pretended to be reproductions of the originals, and, being in Greek, were put forth under the name of Hermes. For the most part they were mere jumbles of crude philosophical and theosophical ideas. Later writers also continued this new application of the name, and imposed fanciful explanations which accorded with the changed usage. Since Thoth was the patron of literature and the inventor of writing, Hermes, the Greek equivalent, was chosen as a sort of pseudonym under which a considerable literature appeared during the second and succeeding centuries, which from its general nature has been called "Hermetic," and which is almost entirely Egyptian in its origin. In general these books contained matter of a religio-philosophical sort, and under the influence of Neo-Platonism their purpose was to crush the rising Christianity. But later the name was applied to a large range of writings which endeavored to use the neo-Platonic philosophy, some of the doctrines of Gnosticism, Philonic Judaism, and cabalistic theosophy to form a substitute for Christianity either directly or indirectly, by introducing modifications of it while ostensibly defending its tenets. Much of it appears to be a modified Judaism. The main works extant are *Asclepius, or Dialogue concerning the Nature of the Gods*; *Poemander* (the Shepherd of Men), *concerning the Power and Wisdom of God*. The number of astrological books is quite large. A number of works written in the Middle Ages by alchemists, and in later times perhaps by the Rosicrucians, profess to have been written by Hermes Trismegistus. The Zabians of the East have writings in Greek which they ascribe to Hermes. See Pietschman, *Hermes Trismegistos* (1875), and any of the various books on Egyptian mythology. For translations, L. Menard (Paris, 1867); Chambers, *Works of Hermes Trismegistos* (Ante-Nicene Library, Edinburgh, 1882); lists of books, Fabricius, *Bibliotheca Græca*, i., pp. 46–94, 1790; and Baumgarten-Crusius, *De Libr. hermeticorum* (Jena, 1827). Charles R. Gillett.

Hermi'as (in Gr. Ἑρμείας): a eunuch and slave in the household of Eubulus, tyrant of Atarneus and Assus, in Mysia, Asia Minor. He gained his master's confidence, was made free, traveled to Athens, where he heard Plato's lectures in company with Aristotle, and succeeded Eubulus on the throne of Atarneus in 347. Aristotle spent several years at his court, but had to flee when Artaxerxes, King of Persia, sent an army to reduce all the petty tyrants in Asia Minor. Hermias was captured and sent to the Persian court, where he was crucified, but Aristotle raised a statue at Delphi in honor of him, and married his daughter.

Revised by J. R. S. Sterrett.

Hermi'one (in Gr. Ἑρμιόνη): in Greek mythology, the daughter of Menelaus and Helen. While still under the walls of Troy Menelaus promised her in marriage to Neoptolemus, in spite of the fact that she had been betrothed to her cousin Orestes before the Trojan war. After the return of the heroes from Troy Neoptolemus married her in Sparta, and when Orestes, whom Hermione loved, demanded her, he was rudely repulsed. Hermione, the barren wife,

hated Andromache (Hector's widow), the fruitful concubine of Neoptolemus, and sought to kill both mother and son when Neoptolemus was absent in Delphi, whither he had gone to consult the oracle with reference to the cause of Hermione's barrenness. She was hindered by Peleus from carrying her design into execution, and Molossus lived to become King of Epirus. But Neoptolemus was slain by Orestes in Delphi, and Hermione willingly married her first love, though he was the murderer of her husband.

J. R. S. Sterrett.

Hermip'pus [Lat. = Gr. Ἑρμίππος, having a Hermes-horse, or a horse swift as Hermes; Ἑρμῆς, Hermes, ἵππος, horse]: (1) Of Athens; a writer of comedies, in which he attacked Pericles and Aspasia, whom he accused of atheism. One of his comedies contained many parodies on Homer. (2) Of Smyrna; a pupil of Callimachus, and hence called the Callimachean, in order to distinguish him from Hermippus of Berytus. As a sequel to the great work of Callimachus (Πίνακες τῶν ἐν πάσῃ παιδείᾳ διαλαμψάντων καὶ ὧν συνέγραψαν, i. e. a list of all Greek writers, giving the exact titles of their works, the number of pages, and their date), he wrote a similar work (Βίοι τῶν ἐν παιδείᾳ διαλαμψάντων) containing the biographies of all the Greek philosophers, historians, and poets. The work itself is lost, but it is frequently quoted by subsequent writers, and seems to have enjoyed a great reputation in antiquity. The fragments of his work may be seen in Müller's *Historicorum Græcorum Fragmenta* (Paris, 1868–83). (3) Of Berytus (Beirut), in Syria, and called the Berytian in order to distinguish him from Hermippus of Smyrna. As a sequel to the work of the Callimachean Hermippus, he wrote a similar work (Περὶ τῶν ἐν παιδείᾳ διαλαμψάντων δούλων) containing the biographies of slaves who had become prominent in literature.

J. R. S. Sterrett.

Hermit [M. Eng. *hermit*, from O. Fr. *hermite* > Fr. *ermite* < Low Lat. *eremita* = Gr. ἐρημίτης, hermit, deriv. of ἐρημία, desert, wilderness, deriv. of ἔρημος, desolate, solitary]: a person who retires from human society and dwells alone; a title given especially to religious recluses, and particularly to those who do not live in common with others. So also the Augustinian monks, though living in monasteries, are called hermits, being accustomed to spend a part of their time in solitude. There are many other monastic congregations called hermits, notably certain lay members of the third order of St. Francis, who, being married before taking their vows, can not be received in full into the order.

Hermit-crab: See Crab.

Hermodac'tyl [liter., Hermes-finger; from Gr. Ἑρμῆς, Hermes + δάκτυλος, finger]: a bulbous root formerly used in medicine. Some hermodactyls are produced from *Iris tuberosa*, and others from *Colchicum variegatum*, European and Asiatic plants. The ancients used hermodactyls for gout, but they are nearly or quite inert.

Hermog'enes [= Gr. Ἑρμογένης, born of Hermes; Ἑρμῆς + -γενης, born]: orator and rhetorician; b. at Tarsus in Cilicia; flourished at Rome in the reign of Marcus Aurelius. He was noted for the early development of his oratorical powers, so that he attracted the attention of the emperor, who listened to his extemporaneous discourses with great pleasure. When seventeen he became a public teacher of rhetoric, and at eighteen or twenty composed his rhetorical system, which was for centuries the standard text-book. Hermogenes was no genius, but he had the sense to make use of good authorities, and his works retain, and will always retain, a certain value for the student of oratory and of literary style in general. In his twenty-fifth year he lost his memory, and sank into imbecility, but survived his faculties many years. Five of his works, forming a τέχνη ῥητορική (System of Rhetoric), are extant: (1) On points at issue in lawsuits; (2) on invention; (3) on the forms of oratory; (4) on the method of acquiring effectiveness in oratory; (5) preparatory exercises (προγυμνάσματα). This last work was abridged by Aphthonius (A. D. 315), and was thus in time superseded. The extant works of Hermogenes may be found in the *Rhetores Græci* of Walz (Stuttgart, 1832–36) and of Spengel (Leipzig, 1853–56. 3 vols.). See Nicolai, *Griechische Litteraturgeschichte*, vol. ii., p. 441 foll.

B. L. Gildersleeve.

Hermon, Mount: the highest elevation of the whole Syrian system of mountains, and the northern boundary of the land of Israel. It is formed by a spur from Anti-Lebanon, which, separating the valley of Cœle-Syria from that of the Jordan, unites to the W. with the range of Lebanon. Great Hermon, or Mt. Hermon proper, is 9,200 feet high. Its top is generally covered with snow, and is visible from Tyre and Damascus. Its sides are clad with white poplars. The Psalms speak of the "dew of Hermon," and modern travelers say that during the night their tents become as wet with dew as by a rainstorm. The summit is a plateau covered with snow during winter and spring, but bare in summer and autumn, the snow melting away even in the ravines. The foot of the mountain is occupied by luxuriant vineyards and orchards; the middle belt of the slope by dense forests. The view from Mt. Hermon is very extensive, embracing all Lebanon and the plains E. of Damascus, with Palestine as far as Carmel and Tabor. On a clear day Jaffa may be seen. It was probably the scene of the Transfiguration (Matt. xvii.). To the Druses it is a sacred mountain, and by them called "Mountain of the chief" (head of the Druses).

Revised by Samuel Macauley Jackson.

Hermon'this (Greek name of *On*, distinguished from On-Heliopolis, as the city of the god *Mont*; modern *Erment*): an Egyptian city of the Old Kingdom; located on the west bank of the Nile, 9 miles S. of Thebes, in the third nome of Upper Egypt. It existed and was an important center before Thebes became the national capital, and it regained its importance after the fall of Thebes. It contained a temple 195 feet long, most of whose stones have been used in the construction of a modern sugar-factory. In early times it was, with Heliopolis, a seat of the sun-worship, and hence was of importance in Egyptian mythology. The deity of Hermonthis was Mont, the god of war, a local form of Amon, who was at a later date conceived as united with Ra, the sun-god, as Mont-Ra. A local belief is said to exist according to which Hermonthis was the birthplace of Moses.

Charles R. Gillett.

Hermop'olis Mag'na [Lat. *Hermo'polis* (= Gr. Ἑρμόπολις, city of Hermes or Thoth; Ἑρμῆς, Hermes + πόλις, city) + *Mag'na*, great, mighty: Eng. *might*, *may*]: an ancient city, called *Chmunu* (modern *Ashmunen*); capital of the fifteenth (Hermopolitan) nome of Upper Egypt; existing as early as the time of Khafra in the fourth dynasty; situated in 27° 45′ N. lat. It was one of the places at which Pianchi, the Ethiopian invader, achieved a victory over the Egyptian forces in the twenty-fourth dynasty. Legend locates there the delivery of the "children of the rebels" to the sun-god, Ra, after he had victoriously assumed the rule of the world. It was the "City of the Eight" aboriginal divine powers of the world with Thoth at the head, whose sanctuary was here. At the beginning of the nineteenth century there were at Ashmunen remains of a Ptolemaic portico 125 feet long, containing two rows of six columns each, 55 feet high. Later the material was used for building purposes. The necropolis of Hermopolis was opposite at Bersheh.

Charles R. Gillett.

Hermosillo, hār-mō-see'yō [Span., dimin. of *hermoso* < Lat. *formo'sus*, beautiful]: capital and principal city of the state of Sonora, Mexico; near the confluence of the rivers Sonora and San Miguel; on the Sonora Railway, and 90 miles by that line N. of the port of Guaymas (see map of Mexico, ref. 2–C). It is in a beautiful and fertile plain, nearly surrounded by mountains, and is the center of an important wheat, corn, and wine district. The climate is warm, but dry and healthful. Hermosillo is the old *presidio* of Pitic. The city has a mint and assay office, established in 1803. Pop. (1889) about 15,000. Herbert H. Smith.

Hermou'polis: the chief town on the island of Syra, one of the Cyclades, Grecian Archipelago. It is on the east coast of the island, and is a stopping-place for steamers from the west or south going to Smyrna or Marseilles. Pop. (1889) 21,998. M. W. H.

Hernandez de Cordova, Francisco: See Cordova.

Hernandez de Oviedo y Valdés, Gonzalo: See Oviedo y Valdés.

Her'nia [= Lat. *her'nia*, rupture > Fr. *hernie*]: the protrusion of a viscus from the cavity to which it normally belongs; but the term is generally used to express the protrusion of an abdominal viscus; and when we speak of other forms of hernia we express it thus: hernia cerebri, hernia cornæ, etc. The common term for hernia is rupture. The predisposing cause of hernia is a weakness of some portion of the abdominal walls, and there are certain parts which are naturally weaker than others, as the inguinal, umbilical, and femoral regions. This weakness very often exists congenitally, and may be increased or produced by injury, dis-

ease, or pregnancy. Among the exciting causes may be mentioned violent muscular exertion, jumping, straining from lifting heavy weights or at stool, playing on wind instruments, etc. The same causes may, however, when less decided, act as predisposing causes, by gradually inducing changes in the abdominal walls or in the mesentery. The usual contents of a hernial sac form a portion of the small intestine, or the omentum, but portions of any of the viscera may be found in it, especially when the abdominal walls are congenitally weak. The sac is formed of peritoneum, which is covered by the integument and subjacent fasciæ.

Hernia is generally divided in two ways: 1, according to its situation, as inguinal, femoral, umbilical, phrenic, etc.; 2, according to the condition of the protruded viscus, as reducible, irreducible, and strangulated. Reducible hernia is that variety in which the contents of the sac may be returned into its normal cavity without recourse to a surgical operation. It sometimes disappears spontaneously when the patient seeks the recumbent position, but more often needs a greater or less amount of pressure made in the proper direction. The symptoms of it are the appearance of a soft and compressible swelling at some portion of the abdominal wall, which increases when the patient stands up and diminishes when he lies down; by placing the hand upon the tumor and directing the patient to cough a distinct impulse is imparted. The treatment usually adopted consists of the reduction of the contents, and the application of a suitable truss to prevent the reprotrusion. If the patient is young, this method will occasion changes in the tissues at the weakened portion, and may thus effect a radical cure in time, but in the adult recourse must be had to an operation to effect this.

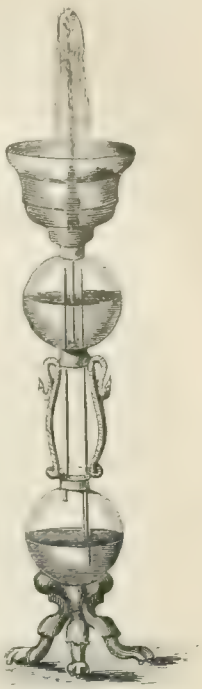
Irreducible hernia differs from reducible in that the protruded viscus can not be returned into its normal cavity. The general causes of it are adhesions between the sac and its contents, the growth of membranous bands across the sac, or inflammatory enlargement of the contents. It is much more troublesome than the preceding variety; in the first place, it is much more inconvenient, and is always exposed to the danger of strangulation; the patient suffers from indigestion, constipation, colic, flatulence, and dragging pains in the loins. In old men irreducible and neglected hernias of the inguinal region often grow larger and larger, until they reach enormous proportions. In such cases the hernial sac is formed by the cavity of the scrotum, which becomes excessively dilated. The treatment of this variety must be generally palliative, and consists of the patient's avoidance of all violent exercise; regulation of the bowels, which should never be allowed to become confined; and the wearing of a support to protect the tumor.

Hernia is said to be strangulated when it is constricted in such a way that the contents of the protruded bowel can not be propelled onward, and the circulation in it is obstructed by pressure at the opening in the abdominal wall through which the hernia projects. The causes of this condition are sudden enlargement of the contents of the sac by fæces or gas, or congestion or swelling of the neck of the sac. The symptoms are pain, flatulence, a desire to go to stool, constipation, nausea, and vomiting, the vomited matter after a time becoming stercoraceous. The tumor is hard, and can not be replaced in the abdominal cavity, and there is very little impulse transmitted to the hand when the patient coughs. The pain in the tumor continues to increase, and extends over the whole of the abdomen; the countenance assumes an anxious expression; the pulse becomes small and weak, and the skin cold and clammy. Should the pain cease, and the tumor feel doughy and crepitate when handled, we may be sure that the intestine has mortified; when this happens, there is very little hope for the patient. The object of treatment is to return the intestine into its cavity. When this can not be accomplished by manipulation, or manipulation combined with warm baths and the administration of ether—the patient having first been placed in such a position that all the parts in the neighborhood of the trouble shall be completely relaxed—recourse must immediately be had to an operation. This consists of enlarging the constricting portion, so as to allow of the return of the gut, and consists of cutting down to the sac, and then either opening it and dividing the stricture, dividing the stricture without opening the sac, or by merely incising the neck of the sac.

Revised by WILLIAM PEPPER.

Hero: See HEROIC AGE.

He'ro, or **He'ron** (in Gr. Ἥρων): an ingenious mechanical philosopher of Alexandria; pupil of Ctesibius; he lived about 285–222 B. C., famous for an acquaintance with the principles of pneumatics and hydraulics quite in advance of his age. He wrote a number of books and invented a variety of machines, two of which, the ÆOLIPILE (*q. v.*) and the fountain which bears his name, are still among the familiar forms of illustrative apparatus in the physical lecture-room. Hero's fountain is shown in the annexed figure, in which it is seen that the elastic force of a confined body of air, increased by hydraulic pressure and reacting upon the surface of water in a closed reservoir, produces a jet which may rise (theoretically) above that surface to a height equal to the effective height of the pressing column.



Hero's fountain.

Revised by J. R. S. STERRETT.

Hero: a priestess of the temple of Aphrodite at Sestos, on the coast of Thrace; loved by Leander, a native of Abydos, on the opposite shore of the Hellespont. Guided by the light of the torch which Hero planted on the cliffs of Sestos, Leander used to swim across the sea to meet her, but one night the storm put out the torch, and when next morning Hero discovered the corpse of her lover floating on the waves, in despair she threw herself from the cliff into the sea. There is a Greek epic poem by Musæus (translated by Sir Edwin Arnold and others), a ballad by Schiller, and a drama by Grillparzer on this subject, and it has been painted many times by the disciples of the school of David.

Revised by J. R. S. STERRETT.

Herod: I. HEROD THE GREAT, King of the Jews; b. at Ascalon, in Judæa, in B. C. 62; was of Idumean descent. When in B. C. 47 his father, Antipater, was made procurator of Judæa by Julius Cæsar, he himself received the government of Galilee, although only fifteen years of age, to which was shortly afterward added that of Cœle-Syria, and in B. C. 42 the tetrarchate of Judæa. He was expelled from Judæa in the next year by Antigonus, the nephew of Hyrcanus II. and the representative of the Asmonean dynasty, but in Rome, whither he fled, he succeeded in gaining the favor of Antony; not only were his claims recognized by the senate, but the title of King of Judæa was conferred on him (B. C. 40). He established himself by force in Jerusalem with Roman help (B. C. 37), was confirmed in his place by Augustus (B. C. 31), who enlarged his domains the next year by giving him the province of Trachonitis and the district of Paneas. He maintained his power by atrocious cruelty. All members of the old dynasty, even his own wife, Mariamne, the daughter of Hyrcanus II., and the three children he had by her, were executed. And the older he grew the more suspicious and atrocious he became. The slaughter of the infants at Bethlehem, of which we are told in Matthew ii. 16, was so common and insignificant an affair that Josephus does not mention it. Their number was not likely to have been more than a dozen, as Bethlehem was a small village. A few days before he died he had his son, Antipater, strangled. But, although cruel, his government was vigorous and brilliant. He was highly esteemed by Augustus. There was peace in Judæa; commerce and industry prospered; literature and art flourished. His buildings were especially magnificent; he founded Cæsarea, rebuilt Samaria under the name of Sebaste, and adorned Jerusalem with numerous splendid structures. Especially noteworthy was his rebuilding of the Temple. The Jews, however, found in his government a leaning toward Rome, which humiliated them, and a general tendency toward Roman civilization, which they hated; and the latter part of his life was much troubled by conspiracies and riots. He was ten times married, and died between Mar. 13 and Apr. 5, a few weeks after the birth of Christ, of a horrible disease, the same that killed Sulla and Philip II. of Spain.—II. His son, HEROD ANTIPAS, by his wife Malthace, a Samaritan, was by his will appointed tetrarch of Galilee and Peræa. He divorced his first wife, the daughter of Aretas, King of Arabia

Petræa, and married Herodias, the wife of his half-brother Herod Philip I., and when John the Baptist remonstrated against this incestuous connection, he had him put to death. Aretas revenged the insult to his daughter by a successful attack upon Antipas. During a visit to Jerusalem for the purpose of celebrating the passover, Christ appeared before Antipas, sent by Pilate as a former resident of his tetrarchate. In 42 A. D. he made a journey to Rome in order to obtain the royal dignity, but, through the intrigues of Herod Agrippa I., he was exiled by Caligula (39 A. D.) to Gaul (probably to Lugdunum Convenarum on the borders of Spain), where he died. It is much to her credit and shows her affection for him that his wife voluntarily shared his exile.—III. Herod Agrippa I., son of Aristobulus, brother to Herodias, and grandson of Herod the Great; was educated in Rome, and received from Caligula the tetrarchate of Judæa with the title of king (37 A. D.), and after the banishment of Herod Antipas, Claudius gave him all the old provinces of Judæa. He was much liked by the Jews, especially for his vigorous measures against Christians; he had the apostle St. James the Greater beheaded and St. Peter thrown into prison. He died early (44 A. D.). Cf. Josephus, *Antiq.*, xix., 8, § 2, with Acts xii. 21–23.—Herod Agrippa II., a son of the preceding, was, like his father, educated in Rome, and resided there, at the court of Claudius, at the death of Agrippa I. He did not inherit his father's dominions, however; they were made a Roman province, and Herod Agrippa II. obtained at first (50 A. D.) only the small kingdom of Chalcis. Abilene and Trachonitis were subsequently added. In 60 A. D., when he went down to Cæsarea to compliment Festus, the Roman governor, the apostle St. Paul appeared before him. In the Jewish war he sided against his countrymen, and after the destruction of Jerusalem (70 A. D.) he resided in Rome, where he died in 100 A. D. For Herod the Great's son, Archelaus, see Archelaus.—IV. Herod Philip I., son of Herod the Great and Mariamne; married Herodias, by whom he had a daughter, Salome. (See Herod Antipas.) He was remanded by his father's will to private life.—V. Herod Philip II., son of Herod the Great and Cleopatra; became on the death of his father tetrarch of Iturea and Trachonitis (Luke iii. 1); ruled well, and seems to have been by far the best of the Herodian family. He built Cæsarea Philippi. He married Salome, the daughter of Herod Philip I., and died in Bethsaida, 34 A. D. Revised by Samuel Macauley Jackson.

Hero'des At'ticus: Greek orator; b. at Marathon in 104 A. D., and died at Athens in 180. M. Antoninus was one of his pupils, and during his reign he held public offices. He was immensely wealthy, as was his father before him, who left an annuity to each Athenian citizen. Famous for his liberality, he was still more famous for his eloquence. He was called the "tongue of Greece," and his speeches were compared to silver streams running in golden beds. The only one of his speeches that has come down to us (Περὶ πολιτείας, edited by Bekker in his *Oratores Attici*, vol. v.; special ed. by Hass, 1880) is a poor thing, and it is a compliment to call it, as it has been called, a tenuous tissue of reminiscences from Demosthenes.

Revised by B. L. Gildersleeve.

Hero'dians: a Jewish party in the time of Christ; first mentioned in Mark iii. 6. They were partisans of the Herod family, whose tyranny they preferred to that of the Romans. They appear to have been mostly Sadducees.

Herodia'nus: Greek scholar of the second half of the second century A. D.; son of Apollonius Dyscolus (*q. v.*). Born at Alexandria, he went early to Rome, where he enjoyed the favor of Marcus Aurelius. Among the vast mass of his grammatical treatises, which were remarkable for their learning, accuracy, and system, especially conspicuous was his work on accent (Καθολικὴ προσῳδία). The only tract that has come down to us entire deals with anomalous forms (περὶ μονήρους λέξεως), but much of him survives in extracts and abstracts, and has been diligently brought together by Lentz in his *Herodiani technici reliquiæ*, 3 vols., Leipzig, 1867. B. L. Gildersleeve.

Herodianus: a Greek by birth; lived for a long time in Rome, and wrote in the Greek language a work in eight books on the history of Rome from the death of M. Aurelius (180 A. D.) to the accession of Gordianus III. (238 A. D.), narrating events, as he informs us, which had occurred in his own lifetime. Herodian is an honest soul, too much given to moralizing on the corruption of his times, but his lack of historic insight is not singular, and he tells his story in a very interesting way. Edited with copious notes by Irmisch in five volumes, 1789–95. Recent critical edition by Mendelssohn, 1883. B. L. Gildersleeve.

Herodio'nes [Mod. Lat., from Gr. ἐρωδιός, a heron]: an order of birds containing the herons, storks, and ibises. The palate is desmognathous, basipterygoid processes are lacking. The nostrils are holorhinal in the herons and storks, schizorhinal in the ibises. Angle of the jaw truncate in herons and storks, produced backward in the ibises. The toes are long and but little webbed, the bill straight and pointed in the storks and herons, blunt and curved in the ibises. These last-named birds differ from the others in so many points that it would seem almost necessary to eliminate them from the order. Two curious, aberrant members of the group are the African shoebill, or whale-headed stork (*Balæniceps rex*), and the small shadow-bird (*Scopus umbretta*). The term is the equivalent of *Herodii*, *Pelargiformes*, and *Pelargomorphæ* of various naturalists. See Bittern, Boatbill, Heron, Ibis, Night-heron, Shadow-bird, Shoebill, Spoonbill, and Stork. F. A. Lucas.

Herod'otus [Lat. = Gr. Ἡρόδοτος]: the Father of History, as he has been called since Cicero's time; son of Lyxes; b. in Halicarnassus, a Doric city of Caria, 484 B. C. He belonged to a wealthy and prominent family, and Panyassis, the restorer of the epos, was a kinsman of his. Lygdamis, either a grandson or more probably a younger son of the famous Artemisia (*q. v.*), was a bitter enemy of the house of Herodotus, put Panyassis to death, and forced the future historian to withdraw, probably about 460 B. C. A few years afterward Lygdamis fell, and Herodotus, who had conspired against him, was restored; but, in consequence of new troubles at home, he again withdrew and joined the colony of Thurii in Lower Italy, where he died, probably about 424 B. C. Much of his life was spent in travel; in fact, at that time, travel was indispensable for the collection of material; and attempts have been made to trace his itinerary in his work. Asia Minor he must have known, and with Athens he was familiar, for it was at Athens that he read aloud a portion of his history and received a public reward for the praise of the city or the praise of its constitution. Lower Italy he knew, for it became his home, but the problem of his travels into still more distant lands has been seriously complicated by modern criticism, which declines to accept the statements of Herodotus as so many evidences of personal knowledge, and which limits his exploration of the Persian empire and his range of travel in Egypt. Something he owes to his predecessors beyond a doubt, but how much it is impossible to determine, so that some of the most important questions must remain in abeyance, with the balance on the whole in the historian's favor. Herodotus marks the passage from logography (see Logographers) to history, and is recognized on all hands as the first true historian. What the logographers lacked, a developed prose style, organic unity of theme, critical spirit, all these were his, but in what degree is open to dispute. Of the beauty of his style, of its limpid clearness, its steady flow, its ineffable grace, there is nothing but praise—nothing but praise of his picturesque narrative, of his dramatic impersonation; and yet the impression is produced by this very praise that Herodotus represents a less perfect development of prose. His art has only too effectually concealed his art. It is true that when he wrote in Ionic he was writing in what might be called his own tongue, for Ionic had become the speech of the city of which he was a native; but it was, after all, a literary dialect that he wrote and not the speech of the people, so that his language is of itself an artistic problem almost hopeless of solution. Nor are we to accept without reserve the statement that he had not attained to the periodic structure of the sentence, that he could not go beyond the "strung on style" (λέξις εἰρομένη), in which the words follow each other like beads in a rosary. Here as elsewhere in Herodotus we find that he has not availed himself of all his resources, and has reserved his power in the interest of his art. In respect of the second element which distinguished his history from logography—unity—there is a diversity of views. To some scholars the unity of the work of Herodotus seems manifest enough. His history is the story of the long struggle between East and West, culminating in the liberation of West from East, of Greece from Persia. To others the references to stories that are never told, to persons that never recur, seem convincing proof that the work is a congeries of monographs that were never molded into a real unity. It matters little, however, whether the unity was an

after-thought or not; it is essentially there, and the introduction to the final struggle, long as it may seem, and all the episodes, however they may appear to diverge from the main theme, only serve to enhance the effect of the narrative of the Persian war, which from the seventh book on moves forward unhasting and unresting until the aggressive power of the Persian empire is broken. Whether the work is complete or not is another question. If not complete it at least makes a happy pause, and ends with a moral which sums up the meaning of the conflict and echoes in true Greek fashion the prophetic warning of the first great King of Persia. We may add here that the division into nine books, like so many of the traditional divisions of antiquity, is singularly inapt and confusing, and has done harm to the work, not compensated by the doubtless late compliment of calling each book after the name of a Muse. The critical spirit, the third element of historiography as distinguished from logography, is not fully accorded to Herodotus, in spite of the many proofs of that spirit he has given throughout the work which he himself has rightly entitled the *Setting Forth of Investigation* (ἱστορίης ἀπόδεξις), and in spite of his many discriminations between personal knowledge and mere hearsay. Even in antiquity his veracity was questioned, sometimes on points about which he was evidently right, and the indolent skepticism of the Greek Renascence classed him among the foremost liars of the world. Modern criticism has not spared him, and yet the worst outcome of modern criticism is that he was, as most Greek travelers were, at the mercy of dragomans; but in spite of that, such was his insight, such his power of observation, that he has often given the substantial truth, where those who had access to native documents have only woven about the facts a tissue of native absurdities. Exposed as he was to the currents of a skeptical age, Herodotus preserved his religious temper and preserved it in distinct antagonism to the spirit of his time. He believed in the gods; he believed in signs and wonders. To him there was a divine purpose that runs through the ages, and the principle of compensation that "resisteth the proud but giveth grace unto the humble" appears in him as the "envy of the gods." Nor does he make any concealment of his political views. An enthusiastic partisan of Athens, he pleaded the cause of popular government, and his politics as well as his religion tinge the current of his narrative. And yet he is not unfair. His view of the historian's calling was broad and penetrating, and his picture of the world as he saw it, or conceived it, is, for all the errors in drawing, beyond all price. Edited by Wesseling (Amsterdam, 1763); Schweighäuser (Strassburg, 1816), with a *Lexicon Herodoteum* by the same; by Gaisford (3d ed. Oxford, 1849); by W. Dindorf (Paris, 1844, in Didot's *Bibl. Græca*); by J. C. F. Bähr (2d ed. Leipzig, 1856–61); by Blakesley (Cambridge, 1854); by Krüger (1866); by Stein (critical ed. Berlin, 1869; school ed. in Weidmann's Collection, 5th ed. 1883); by Abicht (school ed. in Teubner's Collection, 4th ed. 1884); critical ed. by Holder in the Schenkl Collection (1888). Sayce's ed. of books i.–iii. (1883) is a formal indictment of the historian. Noteworthy is a valuable edition of the second book (on Egypt), with notes by A. Wiedemann (1890). Translated into English by Rawlinson, with valuable notes (2d ed. 1876), and by G. C. Macaulay (1890). Lange's German translation (Berlin, 1824) well reproduces the tone of the original in style. Saliat's fine French translation (1575) was republished with corrections by Eugène Talbot in 1864. B. L. GILDERSLEEVE.

Heroic Age: the more than half-mythical age of Grecian history preceding the true historic period. In it the heroes, who were often of half-divine descent—great warriors, kings, navigators—are the central figures. "In these myths," says Ernst Curtius, "the people recalls to its mind, in their full life, those times when the monotonous existence of the old Pelasgians was interrupted, and new forms of worship, new openings for popular activity, new ways of life, continuing ever after with abundance of great fruits, were called into existence. These founders are figures like those of living men, but greater, nobler, nearer the immortals. They are no empty creations of the fancy, but in them the real deeds of the early times are illustrated and endowed with life. The tales of the heroes contain a certain documentary truth." In later times the heroic age furnished abundant material for dramatic and epic poetry, and the heroic character afforded many noble examples of fortitude, piety, purity, and justice which the Greek people too generally failed to imitate.

Heroic Meter: in English verse, the unrhymed iambic pentameter, known as blank verse. In Greek and Latin poetry it is the common hexameter verse, in which the *Iliad* and the *Æneid* are written. German and Italian heroic verse is of the same meter as the English. The French heroic is an iambic hexameter. The name is given because these meters are deemed appropriate to lofty themes.

Herold, ā'rōld', LOUIS JOSEPH FERDINAND: composer; b. in Paris, Jan. 28, 1791; studied with Cherubini, and with distinction at the Paris Conservatoire, and finally in Italy. His first pieces, which were comic and very successful in their day, are obsolete. *Zampa* (1831) and *Le Pré aux Clercs* (1832), his greatest operas, still hold the stage in Europe, but are unknown in the U. S. except by fragments. D. near Paris, Jan. 19, 1833.

Heron [M. Eng. *heroun*, from O. Fr. *heron* > Fr. *héron*, with augmentative suffix *-on* from O. H. Germ. *heigir*, heron]: any wading bird of the family *Ardeidæ*, a group containing the majority of species of the order HERODIONES (*q. v.*). The heron has a sharp-pointed bill, longer than the head, the toes long, all on the same level, and fitted for perching. The wings are ample and rounded, and flight is performed with deliberate wing-beats. Herons nest as a rule in colonies, usually on trees and bushes in swampy localities, and feed on fish, frogs, small reptiles, young birds, and even small mammals. They are found throughout the temperate and tropical regions of the globe, in swamps, by the borders of lakes and rivers, and along the seashore. Herons are remarkable from the great development of the powder-down tracts, these being patches of downy, matted feathers, which grow continuously and are covered with a scurfy dust. Two patches of these feathers are immediately over the hips, two on the belly below the hips, and two on the breast. Their use is unknown. It has been suggested that they have some connection with the freedom of these birds from vermin, and it has also been asserted that they emit a pale phosphorescent light which attracts fish. Many species are adorned, during the breeding season, with crests and some with loose flowing plumes covering the back. These latter species are commonly termed egrets, but the name does not, as is sometimes supposed, have any exact signification. Some of the species have two distinct phases of plumage among the adults, as is the case with the little blue heron (*Ardea cærulea*), which may be pure white or slaty blue. The common European heron (*Ardea cinerea*) is gray above, white beneath, the breast is black with a white patch, and there is a crest of pendant black feathers. This bird was anciently esteemed for the table, and was the most noble game of the falconer, the more that the falcon was sometimes impaled on the sharp beak of his would-be quarry. The great blue heron of the U. S. is very similar to this European species. The great white heron of the Southern U. S. (*Ardea occidentalis*) is one of the largest and finest of the group. It has two phases of plumage, the one, as the name implies, pure white, the other, formerly known as *Ardea wurdemanni*, bearing a general resemblance to that of the great blue heron, except that the crest is white. The little green heron (*Ardea virescens*) is a small species about 18 inches long, of a general lustrous green above, ashy below, varied with white, and purplish-chestnut neck. It is found throughout the length and breadth of the U. S. The night-herons and the bitterns, which belong in the heron family, are described under their respective titles. Numerous genera, such as *Herodias*, *Garzetta*, *Dichromanassa*, *Florida*, etc., have been made for various species, but the tendency now is toward uniting the greater number in the one genus *Ardea*.

Purple heron.

Herons are often popularly called cranes, but they are only distantly related to those birds, from which they may be distinguished at a glance by having the top of the head completely feathered, and by having the hind toe long and on a level with the others. See EGRET and HERODIONES.

F. A. LUCAS.

Heron, MATILDA: actress; b. in Labby Vale, Drapers-town, Ireland, Dec. 1, 1830. Her parents emigrated to the U. S.

when she was a child, and settled in Philadelphia, where she studied for the stage, and in 1851 made her *début* as Bianca in *Fazio*. She performed in the principal cities of the U. S.; was married to Robert Stoepel 1857, and divorced 1862. Her principal *rôles* were Camille in *La Dame aux Camélias* and Ulah in *De Soto*. She left the stage in 1876 and became a teacher of elocution. D. in New York, Mar. 7, 1877. Revised by B. B. Vallentine.

Herondas, or **Heródas**: Greek poet of uncertain period, probably of the second half of the third century B. C., of uncertain locality, not improbably of the island of Cos. Up to 1891 only a few verses of Herondas were known (see Bergk's *Poetæ Lyrici Græci*, 4th ed., vol. ii., pp. 509–12), but in that year the publication of the mimes (*Mimiambi*) of Herondas, by F. G. Kenyon, after an Egyptian papyrus, revealed to the modern world not only a lost author, but also a lost department of Greek literature. Seven of the poems are tolerably complete, and give a clear view of the character of Herondas's poetry and his sphere of work. They are dramatic in form, and present scenes from every-day life in the most realistic fashion, too realistic sometimes for translation into English. The style of Herondas is hopelessly common as his themes are hopelessly common; and he may be called a Theocritus of the alley, though he is none the less interesting and valuable. The mimes are composed in choliambic verse and in the Ionic dialect, with dashes of Doric, and the language presents many difficulties and many traps into which scholars have fallen and are still falling. A provisional translation into Latin has been made by Bücheler (1892). Valuable contributions to the elucidation of Herondas by O. Crusius, *Untersuchungen zu den Mimiamben des Herondas* (1892). B. L. Gildersleeve.

Heroöp'olis: an Egyptian city in the eastern Delta region; mentioned in the Septuagint version of the Old Testament (Gen. xlvi. 28) as the place where Joseph met Jacob. In the same passage the Coptic version reads *Pethom*, corresponding to the Hebrew *Pithom* (Ex. i. 11), one of the "store-cities" built for Ramses II. by the Israelites. It had been long known from Egyptian geographical lists that Pithom, "House of Tum," lay in the land of *Theku-t*, a name identified by Brugsch with Succoth, the second station in the Exodus route of the Israelites (Ex. xii. 37, xiii. 20). The city is mentioned by Strabo (*Geogr.*, xvi., iv., 2, xvii., iii., 20, xvi., iv., 4–5, xvii., i., 26) as being at the head of navigation on the Red Sea, one branch of which he calls the "Heroöpolitan Gulf." The statements of Philostorgius (*Eccl. Hist.*, ii., 6) and Epiphanius (*Adv. Haer.*, ii., p. 618) confirm the view. Maps made previous to 1880 frequently placed the city near the present Suez on the authority of this testimony. The excavations of Naville, under the auspices of the Egypt Exploration Fund, in 1883, resulted in the discovery of the site of Pithom and Succoth, and in the recovery of a mile-stone which gave the distance between Heroöpolis and Clysma as 9 miles. The mound thus excavated was at Tell el-Maskhutah, about 12 miles W. of Ismailiah, on the line of the Suez Canal. Here, then, was the store-city Pithom and the head of Red Sea navigation. It is necessary, therefore, to assume that down to the beginning of our era the Red Sea extended farther to the N. than now, and that the place of the crossing of the Israelites may have been far to the N. of the traditional place at Suez.

Charles R. Gillett.

Heroph'ilus [Lat. = Gr. Ἡρόφιλος, liter., dear to Hera; Ἥρα, Hera + φίλος, dear, beloved]: surgeon; b. at Chalcedon, in Bithynia, about 300 B. C.; studied medicine under Praxagoras, one of the successors of Hippocrates; removed to Alexandria in Egypt, and was one of the founders of the famous medical school of that city; was a distinguished surgeon, and the most celebrated anatomist and zoötomist of antiquity. It is also stated (with probable truth) that he practiced vivisection upon human beings, probably condemned criminals. Tertullian says he dissected no less than 600 living persons. It is to be remembered that the ancients regarded the dissection of the dead body as something almost impious, because the soul was mutilated along with the body, while they had comparatively few scruples with regard to inflicting pain upon the living. His fame is commemorated by the *torcular Herophili* (the name of the place where the superior longitudinal sinuses of the *dura mater* join the lateral sinuses). He was one of the fathers of what is called heroic practice, in which excessive doses of powerful drugs were used; and he did much to introduce the useless compounding of many drugs in one prescription—a custom which lasted till the nineteenth century. Of his writings only fragments remain. See Surgery.

Revised by J. R. S. Sterrett.

Heros'tratus (in Gr. Ἡρόστρατος): an Ephesian, who in 356 B. C., on the same night in which Alexander the Great was born, set fire to the temple of Diana at Ephesus, one of the most magnificent buildings of antiquity, in order to make his name immortal by destroying one of the Seven Wonders of the world. He succeeded, though the Ephesians passed a decree that he should never be named. His name was divulged by Theopompus.

Revised by J. R. S. Sterrett.

Her'pes [: Fr. *herpès* = Lat. *herpes* = Gr. ἕρπης, liter., a creeping, deriv. of ἕρπειν, creep]: a name applied to several skin diseases, characterized by the development of a series of vesicles or clusters of vesicles, which generally run a definite, self-limited course. By far the most important of these diseases is *Herpes zoster*, *zona*, or "shingles," as it is called. This may surround one thigh or one arm with a band of vesicles, or more frequently it starts from the backbone and follows an intercostal space half round the body. More rarely it goes half round the neck or half across the face. Usually there is some neuralgic pain, and sometimes considerable fever. The disease must depend upon some abnormality in the nervous action, as it frequently maps out upon the surface the part of the integument supplied by some one branch of a nerve. The vulgar have a great dread of "the shingles," and believe that when it so extends as to completely girdle the patient he will die. But, in the first place, it almost never does go more than halfway around the body, and, what is more, there would be no danger if it should, for the disease is a self-limited or cyclical one, and the patient is sure to get well if let alone. A very common form of *herpes* is that which appears about the mouth, and is commonly called "fever blisters." There are usually seen a few vesicles containing clear or turbid fluid, which do not rupture, but after a short time dry up and disappear. They usually occur with slight fevers, "cold," or digestive disturbance. Similar herpetic eruption may accompany many of the severer fevers. Revised by William Pepper.

Herpetol'ogy [Gr. ἑρπετόν, creeping beast, reptile (deriv. of ἕρπειν, creep) + -λογος, describing, telling about, deriv. of λέγειν, say, tell]: that branch of zoölogy which is dedicated to the natural history of Amphibia and Reptilia (*qq. v.*). Referring to those articles for information respecting the characters of the several groups, this article will be confined to the indication of the growth of our knowledge and the best sources of information respecting them.

Little information existed among ancient or mediæval naturalists respecting the forms in question. In Aristotle are found isolated anatomical details respecting some species, but he did not recognize the group as a whole, combining the footed forms with mammals as oviparous quadrupeds, and isolating from them the serpents, with which he even, at least provisionally, combined some eels; he nevertheless appreciated the resemblance between the serpents and saurians, and once defines the former as land animals. Pliny, with less exact information, mixes much fable. No mediæval writer is worthy of mention. Gesner (1554), Aldrovandi (1640), and Jonston (1653) were compilers. Ray (1693) published the first attempt at a systematic arrangement, in which, although nominally confounding the reptilian quadrupeds with the mammalian quadrupeds, he recognized the serpents as related, and combined them in an unnamed group, distinguished by having a heart with a single ventricle. Linnæus (1735–68) first introduced an essential reformation, definitely combining the oviparous quadrupeds (tortoises, lizards, etc.) and serpents in a single class, which he called Amphibia, and placed between the birds and fishes. He distinguished this class by the naked or scaly body, acuminate teeth, and absence of rayed fins; and, subsequently and erroneously, by the unilocular and uniauricular heart. He distributed its members into two orders: (1) Serpentes, without feet, and (2) Reptilia, with feet. Later, he made the class more heterogeneous by the addition of the branchiostegous fishes, being misled by the erroneous observations of Dr. Garden, of South Carolina. He failed to notice any distinction between the true amphibians and reptiles, and even confounded the salamandroids and crocodilians with the typical saurians in one genus, *Lacerta*. His several combinations and divisions into forms without feet and with feet showed also an utter want of appreciation of the value of morphological characters in this group. Gmelin

(1788), in his edition of the *Systema Naturæ*, removed from the class the branchiostegous fishes, and restricted it to the limits originally recognized by Linnæus. In the last edition of the *Systema Naturæ* published by Linnæus 213 species were recognized, distributed among the following groups: (1) *Testudo*, 15; *Rana*, 17; *Draco*, 2; *Lacerta*, 47 (not 49); (2) *Crotalus*, 5; *Boa*, 10; *Coluber*, 97; *Anguis*, 16; *Amphisbæna*, 2; and *Cæcilia*, 2. In the edition of the *Systema Naturæ* published by Gmelin, 365 species were recognized, apportioned to the same genera; many of the additional species are spurious. Laurenti in 1768 made a decided advance. He recognized a class, Reptilia, in which he included all the reptiles but the tortoises (which he did not mention) and amphibians. These he divided into three orders: (1) *Salientia*, including the frogs, toads, etc.; (2) *Gradientia*, including the salamandroids and saurians; and (3) *Serpentia*, including the serpents, as well as serpentiform saurians and pseudophidian amphibians. He recognized four genera of *Salientia*, 13 of *Gradientia*, and 15 of *Serpentia*. Lacépède in 1788 and 1790 divided the same animals into four "classes": (1) Oviparous quadrupeds which have tails; (2) those which have none; (3) reptiles with two feet only, which may be either in front or behind; and (4) serpents or footless forms.

Brongniart in 1799 made another decided advance: he characterized the class better than any of his predecessors, and apportioned its representatives among four orders: (1) Chelonians, including the tortoises; (2) Saurians, comprising the lizards and crocodiles; (3) Ophidians, comprising the serpents; and (4) Batrachians—i. e. the present class of amphibians, less the Cæcilians. He was doubtful respecting the systematic relations of the Cæcilians, but placed them provisionally with the Ophidians. The great advance in his work is evinced in his recognition of the orders, and more especially in the segregation of the forms combined under the name of Batrachians. This classification came into vogue particularly among French writers, Daudin (1802–03), Cuvier (1817–29), and Duméril and Bibron, among others, having made it the basis of their respective works.

Merrem in 1800 and 1820 published editions of a system of amphibians in which he recognized two classes: (1) Pholidota, equivalent to reptiles proper, and (2) Batrachia or amphibians. Among the Pholidota three orders were recognized—*Testudinata*, *Loricata* (i. e. crocodiles), and *Squamata* (i. e. saurians and serpents). Among the Batrachia also three orders were established: (1) *Apoda*, (2) *Salientia*, and (3) *Gradientia*. De Blainville in 1816 recognized two classes among the amphibians of Linnæus: (1) the "Reptiles" or "Squamifères ornithoïdes," scaly; and (2) "Amphibiens" or "Nudipellifères," naked. The reptiles were divided into three orders: (1) Cheloniens, (2) Emydo-Sauriens or Crocodiliens, and (3) Saurophiens or Bipéniens, including two sub-orders: (A) "Sauriens" and (B) "Ophidiens." The amphibians were distributed among four orders: (1) the "Batraciens" (*Salientia*), (2) "Pseudo-Sauriens" (*Gradientia*), (3) "Sub-Ichthyens" (Proteus and Sirens), and (4) "Pseudophydiens" (*Cæcilidæ*).

Merrem and de Blainville thus advanced far ahead of their predecessors; they were also the first to include definitely the Cæcilians among the amphibians.

Thus the *general system* of herpetology had assumed nearly all the characteristics which now mark it. The details of the system were gradually improved by scientific zoölogists, with the aid of anatomical investigations; and among the most notable in this work may be mentioned Johannes Müller, Stannius, Owen, Cope, and Huxley. A discovery was made by Günther (1867) in a curious New Zealand lizard-like reptile (*Sphenodon punctatum*), which strongly illustrated the insufficiency of external characters as evidence of the relations of these forms. That animal very closely resembles in its external appearance the agamoid lizards; its anatomy, however, indicated that it was in nowise related to the *Agamidæ* or other typical lizards with which it had been associated, but that it was really the representative of a peculiar order of reptiles, for which the name *Rhynchocephalia* was proposed. It has also been demonstrated by Prof. Cope and others that to this same order belonged species which had lived in the older ages of the globe, and as far back as the Devonian period.

While these improvements in the system of the living reptiles were being effected, palæontological investigations were rapidly bringing to light many remarkable types of the past world, which were found to have remarkable relations with the living members of the class. The gigantic swimming reptiles of the Triassic seas were first confounded together in a peculiar order by geologists under the name *Enaliosaurians*, but subsequent observations indicated that they should be separated into two widely distinct orders, and several others were from time to time constituted for the reception of various species. The comparative examinations of the living and extinct forms naturally reflected mutual light upon each other. The herpetological system is thus now tolerably understood. Much, however, remains to be done to establish the exact mutual relations of the several orders. As yet, nothing can be predicated as to the degree of generalization of the known forms; and the sequence in the list of orders which is here appended must be considered entirely as a provisional arrangement, subject to great modifications hereafter.

The orders now generally adopted for the inclusion of all these various members of the classes in question, recent and fossil, are as follows:

Class Amphibia or Batrachia.

Order *Stegocephali* (extinct).
" *Urodela* (salamanders, etc.).
" *Anura* (frogs, toads, etc.).
" *Gymnophiona* (Cæcilians).

Class Reptilia.

Order *Ichthyopterygii* (extinct whale-like reptiles).
" *Testudinata* (turtles and tortoises).
" *Theromorpha* (extinct).
" *Plesiosauria* (extinct swimming reptiles).
" *Ornithosauria* (extinct flying reptiles).
" *Dinosauria* (extinct).
" *Rhynchocephalia*.
" *Crocodilia* (crocodiles).
" *Saurii* (lizards).
" *Ophidia* (snakes).

Investigations have rendered it more and more evident that the amphibians and reptiles, notwithstanding their external resemblances, have very little true affinity with each other, and that, indeed, the closest relations of such are with other types; thus (1) the amphibians are so closely connected with the fishes that by many (e. g. Huxley) they are combined in one peculiar group under the name *Ichthyopsida*; while, on the other hand, the reptiles and birds agree so thoroughly, and when the extinct forms are recalled differ in so few characters, that they are also united in a special group, the *Sauropsida*.

It only remains to add references to the principal authorities which the student can most advantageously use. The volumes and articles published have been very numerous, but only the following need be specially named: *Erpétologie générale*, by Duméril and Bibron (9 vols., Paris, 1834–55); *The Catalogue* of Shield Reptiles*, by Dr. J. E. Gray: (Part I., *Testudinata*, London, 1855; Supplement, 1870; Appendix, 1872; Part II., *Emydosaurians*, *Rhynchocephalia*, and *Amphisbænians*, London, 1872); *Catalogue of the Specimens of Snakes in the Collection of the British Museum*, by Dr. J. E. Gray (London, 1849); *Catalogue of Colubrine Snakes in the Collection of the British Museum*, by Dr. Albert Günther (London, 1858); *Catalogue of the Specimens of Lizards in the Collection of the British Museum*, by G. Boulenger (3 vols., London, 1885–87); *Catalogue of the Batrachia Salientia in the Collection of the British Museum*, by G. Boulenger (London, 1882); Boulenger, *Catalogue of Chelonians, Rhynchocephalians, and Crocodiles* (London, 1889). The principal authorities on the American reptiles and batrachians are Holbrook (*North American Herpetology* (5 vols., Philadelphia, 1836–43); Baird and Girard (*Catalogue of North American Reptiles*, Part I., *Serpents*, Washington, 1853, etc.); Agassiz (*Contributions to the Natural History of the United States of America*, first monograph, *Testudinata*, Boston, 1857); Garman (*Reptiles and Batrachians of North America*, Part I., *Ophidia*, *Mem. Mus. Comp. Zoöl.*, Cambridge, 1883); and Cope (*The Batrachia of North America*, *Bulletin United States Nat. Mus.*, No. 34, 1889; *The Snakes of North America*, *Proceedings U. S. Nat. Mus.*, xiv., 1892); and in numerous memoirs in the *Proceedings* and *Transactions of the Academy of Natural Sciences of Philadelphia*, etc.

Revised by Theodore Gill.

* The "catalogues" enumerated are really descriptive monographs of all the known species, whether in the museum or not.

Herrera, Fernando, de: Spanish lyric poet; b. in 1534 at Seville; d. in 1597. Almost nothing is known of his life beyond the fact that he was an ecclesiastic. He was a friend of Garcilaso de la Vega (*q. v.*), whose works he edited in 1580 with a learned contemporary. He seems to have been known and admired by all the best spirits of his time. He is called by Ticknor one of the two greatest lyric poets Spain has ever produced. We know that what is left us of his verse is far from being all he wrote. A number of longer poems in particular are probably irretrievably lost. He appears in what is left as distinctly under the influence of the Italian poets, often excessively so. When he is at his worst he has the vices of the rhetoricians of the Renaissance. At his best, however, he has a noble and truly imaginative style. Particularly fine are two or three of his sixteen *canciones*, especially that on the victory of Lepanto and that on the death of Sebastian of Portugal. Herrera's poems were first published by himself in 1582, then with some additions by his friend Pacheco in 1619. Another edition is in vols. iv. and v. of Ramón Fernández, *Poesías castellanas* (1808). The latest edition is in vol. xxxii. of the *Biblioteca de autóres españoles* (Madrid, 1872). A. R. Marsh.

Herrera, ār-rā'rāă, Francesco: called the *old* to distinguish him from his son; painter; b. at Seville, Spain, 1576. He studied under L. Fernandez. His work is very bold and powerful; he had immense facility. His *Last Judgment*, painted for the Church of St. Bernardo, is an important work, showing anatomical knowledge and great power of color and of design. He was also a skillful worker in bronze. Being accused of forging money, he took refuge in the Jesuits' College, where he painted a St. Hermengilde. He was pardoned by Philip IV., who could not believe any ill of a man capable of painting such a picture. He then opened a school of painting at Seville, where Diego, Velasquez, and his own sons studied art; but being robbed by his son Francesco, he abandoned forever his native city, and went to Madrid, where he died in 1686.—His son Francesco (b. 1622 at Seville; d. 1685) also was a distinguished painter. W. J. Stillman.

Herrera, or **Herrera y Tordesillas**, Antonio: Spanish historian; b. in the village of Cuéllar, Segovia, in 1559 (other accounts say 1549 or 1565). He studied in Spain and Italy, and in the latter country became secretary of Vespasiano de Gonzaga, brother of the Duke of Mantua, whom he followed to Navarre. Gonzaga recommended him to Philip II., who made him *cronista mayór* or chief chronicler of America, and one of the chroniclers of Castile; he retained these positions under Philip III. and IV. Herrera received a liberal salary, and had access to all public documents. His greatest work, *Historia general de los héchos de los castellános en las islas y Tierra Firme del Mar Océano*, was first published at Madrid in 1601 (4 vols. fol.). It is a general history of America from 1492 to 1554, in the form of annals, and on that account tedious and dull; but it is an almost inexhaustible mine of information, generally correct and well selected, and it has been the principal fount from which later writers on the subject have drawn their information. Herrera also published a *Historia general del mándo del tiempo del Señor rey D. Felipe Segúndo*, and various other historical works. D. at Madrid, Mar. 27, 1625. Herbert H. Smith.

Herrick, Robert: poet; b. in London, England, Aug. 20, 1591; was educated at Trinity Hall, Cambridge; took orders and became vicar of Dean Priors, Devon, 1629; and died there in Oct., 1674. He is one of the most charming of English lyric poets. He was ejected from his living by the Long Parliament in 1648, but restored in 1660. His chief publication was the *Hesperides* (1647–48), poems treating of love, rustic life, parish festivals, etc. Revised by H. A. Beers.

Herrig, Hans: poet; b. in Brunswick, Germany, Dec. 10, 1845; studied law in Berlin and Göttingen; took his doctor's degree in 1868 and began the practice of law, but soon dropped it for more congenial literary pursuits, and became associate editor of the *Deutsches Tageblatt*. His works show earnestness of purpose and fine literary taste, but are too pessimistic in their tone to strike the popular fancy. He published the dramas *Jerusalem* (1874); *Alexander der Grosse* (1872; 2d ed. 1879); *Kaiser Friedrich der Rothbart* (1873; 2d ed. 1880); *Der Kurprinz* (1876); *Konradin* (1881; 3d ed. 1885); *Drei Operndichtungen* (1881); *Nero* (1883); *Martin Luther* (1883; 3d ed. 1886); and the poems *Die Schweine* (1876); *Mären und Geschichten* (1879); *Der dicke König* (1885). D. in Weimar, May 4, 1892.

Herring [M. Eng. *hering* < O. Eng. *hæring*: O. H. Germ. *haring* (> Mod. Germ. *häring*), whence Fr. *hareng*, herring]: the common name of the very important food-fishes of the genus *Clupea*. There are several species, the chief of which are the *C. harengus* of Northern Europe and America, and the *C. mirabilis* of the Pacific coast of North America. The celebrated whitebait is the young of the herring. The herring-fisheries of North America are prosecuted chiefly along the New England coasts, and especially in British American waters. In Europe the great herring-fisheries are those of Great Britain, Ireland, Scandinavia, the Netherlands, and the north of France. Herrings at tolerably regular periods visit extensive lines of coast. They are generally caught in gill-nets or scoop-nets. The annual catch of herrings must amount to many hundreds of millions. A large part of the so-called herring caught in the U. S. are alewives, which are in nowise inferior to the real herring, which they much resemble. Herrings are smoked and dried, pickled, or eaten fresh.

The most important herring of the Pacific coast of North America is *C. mirabilis*, which in size, appearance, and habits resembles the common herring. It can be taken in very large quantities, and its fishery may become an object of importance. The name herring is also applied to the alewife (*Clupea pseudoharengus*) and to other species of migratory *Clupeidæ*. The "herring" of the Great Lakes is *Coregonus artedi*, a sort of whitefish, having little in common with the true herring. See Fisheries and Whitebait. Revised by David S. Jordan.

Herring-gull: a large gull (*Larus argentatus*) common on the western shores of Europe, and occasionally found on the eastern coast of North America, although the common American herring-gull is a slightly larger variety, separated as a sub-species under the name *Larus argentatus smithsonianus*. The back and upper part of the wings are pearl blue, primaries crossed with black and tipped with white, head, neck, tail, and under parts pure white. Young birds are gray with blackish wings and tail. Length about 2 feet, spread of wings 54 to 58 inches. This gull breeds from New England and the Great Lakes northward, and is common along the Atlantic coast from fall to spring, where it may be seen flying along the shore or circling among the shipping in search of food. At or near low tide these gulls frequently gather in great flocks on some sand-spit, to rest and to preen their feathers. Closely related species are found in the North Pacific. F. A. Lucas.

Herrnhut, hārn'hoot [Germ., shelter of the Lord; *Herrn*, gen. of *Herr*, Lord + *hut*, shelter, protection]: town in the kingdom of Saxony, Germany; 18 miles S. E. of Bautzen, on the Löbau-Zittau Railway (see map of German Empire, ref. 5–G). It was founded in 1722 by a colony of Moravian Brethren, who were driven from their homes by the Jesuits, but were received and established here by Count Zinzendorf. The town has only 1,200 inhabitants, but is well built and enjoys a comparatively great reputation as the assembling-place or metropolis of the United Brethren, whose life commands respect for its simplicity, honesty, purity, and vigor. The colored paper and the linen fabrics manufactured here are celebrated.

Her'ron, Francis Jay: soldier; b. at Pittsburg, Pa., Feb. 17, 1837; graduated at the Western University of Pennsylvania 1853; entered the U. S. army Apr., 1861, as captain First Iowa Volunteers, and engaged in the battles of Dug Springs, Ozark, and Wilson's Creek; promoted to be lieutenant-colonel Ninth Iowa Volunteers, and in command of the regiment through campaigns in Missouri, Arkansas, and Indian Territory; engaged in the battle of Pea Ridge, where he was severely wounded. He was appointed brigadier-general of volunteers July, 1862, and in command of the Army of the Frontier at battles of Prairie Grove and Van Buren; for conduct at former promoted to be major-general of volunteers July 29, 1862, and was in command of the left wing of investing forces at Vicksburg, and of the army and navy expedition that captured Yazoo City. In May, 1865, he negotiated, and in June received, the formal surrender of the Trans-Mississippi army and all Confederate forces W. of the Mississippi. He was appointed one of the commissioners to negotiate treaties with Indian tribes July, 1865; resigned commission as major-general June 7, 1865, and Indian commissioner Aug., 1865; was U. S. marshal district of Louisiana 1867–69, and Secretary of State of Louisiana 1870–72.

Herschel, hér'shel, Caroline Lucretia: astronomer; b. in Hanover, Germany, Mar. 16, 1750; went to England to

live in 1772. She was appointed assistant astronomer to George III. of England in 1781, with a moderate salary. She attended her brother, Sir William Herschel, in all his night-watches, which generally lasted till morning; wrote from his dictation, as he swept the heavens with his telescope, his observations; noted the clocks; reduced and arranged his journals; prepared the zone catalogues for his sweeps, and performed for him all the laborious mathematical calculations necessary for the reduction of his observations. She discovered independently eight comets, besides numerous nebulæ and clusters of stars. At the death of her brother in 1822 she returned to her native city, where she spent the remainder of her life with her only remaining brother, honored and beloved by all. She was elected member of the Royal Astronomical Society in 1832, and received a gold medal from the King of Prussia in 1846. D. in Hanover, Jan. 9, 1848. See *Memoir and Correspondence of Caroline Herschel* (1876).

Herschel, Sir John Frederick William: astronomer; the only son of Sir Frederick William Herschel; b. at Slough, England, Mar. 7, 1792. He was educated at home under the guidance of his parents and his aunt. He went direct from his home to Eton, and from there to St. John's College, Cambridge, where he graduated in 1813 as senior wrangler and Smith prizeman. In the same year he read a mathematical paper before the Royal Society, and was elected a fellow at the age of twenty-one. In 1831 William IV. bestowed upon him the Hanoverian Guelphic order, and five years later, at the coronation of Victoria, he was created baronet. Several gold medals were awarded to him by the Royal Society and the Astronomical Society of London, and he was made D. C. L. by the University of Oxford. He was successively elected rector of Marischal College, Aberdeen, president of the Astronomical Society, and finally permanent master of the mint, a position which his enfeebled health forced him to resign in 1855. He was honorary or corresponding member of the academies of Brussels, St. Petersburg, Vienna, Göttingen, Turin, Bologna, Naples, Copenhagen, Stockholm, and others, besides being chevalier of the Prussian order of Merit. In 1829 he married Margaret Brodie, daughter of Rev. Dr. Alexander Stewart, by whom he had nine daughters and three sons. From 1813 to 1822 he devoted himself to mathematics, chemistry, and optics, as his memoirs testify. He then began his astronomical work in earnest. In 1825 he began, in connection with Sir James South, a series of very important observations. Though his especial tastes lay in the direction of physics, his filial devotion determined his lifework. He passed in review the nebulæ discovered and catalogued by his father; while engaged in this work he catalogued between 2,000 and 3,000 double stars. In order to perfect the work begun by his father, he went, at his own expense, in 1833, to the Cape of Good Hope. That the results might be accurately comparable, he took telescopes of the same size as those used by his father. He spent four years at the Cape, observing, and five years more reducing and arranging his observations, which appeared in 1847 under the title *Results of Astronomical Observations made during the years 1834–38 at the Cape of Good Hope, being the completion of a Telescopic Survey of the Whole Visible Heavens, commenced in 1825*. This included seven treatises upon—1, nebulæ; 2, double stars; 3, apparent size of stars; 4, distribution of stars and constitution of Milky Way; 5, Halley's comet, etc.; 6, satellites of Saturn; 7, solar spots. While in South Africa he originated a valuable system of simultaneous meteorological observations, and instituted a fine public-school system. He prepared two elaborate and exhaustive treatises upon *Light* and *Sound*, for the *Encyclopædia Metropolitana* (1830–31), and wrote for Lardner a treatise upon the study of natural philosophy, which gave a strong and immediate impulse to the study of natural science in England; also a treatise upon astronomy, which was afterward expanded into his *Outlines of Astronomy*. In all Sir John added to the 2,500 nebulæ discovered by his father 2,208 of his own discovery, the whole number known being 5,200. He performed a great service to photography by the discovery of a process for making the impressions permanent. Not the smallest part of his work was that of popularizing without falsifying science. These discoveries, together with those recorded in 131 papers contributed to various scientific societies, compose the results of fifty-eight years of labor, included between the day of his graduation and the day of his death. The entire labor of this enormous work was performed by himself, except that which was purely mechanical in the use of his instruments. D. at Collingwood, Apr. 13, 1871.

Herschel, Sir Frederick William, generally known as Sir William Herschel: astronomer; son of a bandmaster; b. in Hanover, Germany, Nov. 15, 1738. Besides music, to which he was educated professionally, he received instruction in French and metaphysics in his early years. At the age of fourteen, being forced to earn his own bread, he became a member of the band of the Hanoverian Guards; in this capacity he went to England in 1759, where the story of his life for some years is a record of bitter privation silently and heroically endured. Herschel became successively master of a military band, organist at Halifax, and organist at the Octagon chapel at Bath. In spite of innumerable professional duties, he pursued his abstract studies with ardor, sometimes going to them after fourteen hours of professional labor. He learned Latin, Italian, a little Greek, with no aid but that of a grammar and dictionary, and mastered alone an obscure mathematical treatise upon music. The harmony of sound soon led, by the way of optics, to a study of the "harmony of the spheres." A small Gregorian telescope fell into his hands, and waked into passionate life the longing which determined his future career. Finding the most ordinary telescope beyond his means, he determined to construct one. The fact that he made and polished 200 metal specula before he succeeded to his own satisfaction reveals the secret of his successful life. In 1781 he discovered, by the aid of one of his own telescopes, a new planet, called by him Georgium Sidus, by his contemporaries Herschel, but now known under the name of Uranus. This brought him under the notice of George III., who bestowed upon him the position of special astronomer to the king, also a pension of 300 guineas a year, and a residence at Slough, near Windsor. He married, in 1788, Mrs. Mary Pitt, by whom he had one son, John F. W. Herschel. He was made member of the London Royal Society, of the Academy of Sciences, Paris, and president of the Royal Astronomical Society, London. The Hanoverian Guelphic order was bestowed upon him by the regent, and the title of LL. D. by the University of Oxford, besides other distinctions. He died at Slough, Aug. 23, 1822. His disposition was marked by sweetness and benevolence; his character by directness and simplicity, by untiring patience and indomitable energy; and his mind by breadth of view and extreme caution. His work is comprehended, in great part, in memoirs presented from 1780 to 1822 before the Royal Society of London, which "constitute," says Arago, "one of the principal riches of the celebrated collection known under the title of *Philosophical Transactions*." The front-view telescope suggested by Jacques Lamaire was perfected by Herschel; the mechanical contrivances, by means of which he mounted and adjusted his 40-foot telescope, with its speculum weighing a ton, showed him to be possessed of high mechanical genius. In optics he investigated the dark heat-rays of the solar spectrum, and made many experiments upon radiant heat, upon Newton's rings, and upon the illuminating power of the various prismatic rays. In his researches upon the solar system he made many remarkable observations upon the physical constitution of the sun; he discovered the planet Uranus and two of its satellites, as well as two satellites of Saturn. He added much to the subject of the form, time of rotation, and physical aspects of the planets. He discovered that the moon possessed no atmosphere, and made many valuable observations upon comets. But the real work of the Herschels, father and son, lay beyond the limits of our system in the sidereal depths. Sir William made many and accurate observations upon variable and binary stars; in his investigations upon sidereal parallax, though he failed to find it, he made the astounding discovery that the sun, with all its attendant planets, is rushing on through space toward a point situated in the constellation Hercules. By means of a 20-foot telescope he made a survey of the whole of the northern heavens, enumerating the stars as they came within the telescopic field. As a result of this survey he made the first attempt to assign the form of the universe of stars, which he conceived to be of the form of a flattened cylinder. To the known nebulæ, 500 in number, he added 2,500 of his own discovery, and under his trained eye and powerful telescopes numbers of what had been considered nebulæ resolved themselves into clusters and systems of self-luminous suns. See Holden, *Life and Works of Sir William Herschel* (New York, 1881).

Revised by S. Newcomb.

Herschell, Farrer, Lord: lawyer and politician; b. in England in 1837; educated at University College, London, and the University of Bonn; called to the bar 1860, and became Q. C. 1872; recorder of Carlisle 1873; in Parliament 1874–85, representing Durham city as a Liberal; knighted in 1880, and made Solicitor-General in Mr. Gladstone's ministry; raised to the peerage and became Lord High Chancellor 1886; again became Lord High Chancellor in Gladstone's administration 1892.

Hersek: See Hellenopolis.

Hersent, ãr'sãañ', Louis: painter; b. in Paris, Mar. 10, 1777; one of the most characteristic representatives of French painting during the Restoration. He was one of David's most distinguished pupils, and obtained the Prix de Rome in 1797. In 1802 he exhibited for the first time in the Salon (*Metamorphosis of Narcissus*), and in 1831 for the last (portraits of Louis Philippe and Queen Amélie). His pictures were generally of historical subjects, and several of them are in the national picture gallery at Versailles. D. in Paris, Oct. 2, 1860.

Hersent-Hildevert, ãr'sãañ'-ēld'e-vãr', Pierre: civil engineer and contractor; b. at La Vacherie, Eure, France, May 4, 1827; constructor of a very great number of important works in France, Belgium, Algeria, Austria, and elsewhere, many of them extraordinary by reason of their dimensions or the difficulties attending them. Among the most prominent are the dry docks of Toulon and of Saigon (Cochin-China), the harbor works of Antwerp, the port of Lisbon, the regulation of the Danube at Vienna, etc.; the foundation of the first named being the largest area ever sunk by compressed air in one caisson. Author of numerous papers descriptive of works constructed by himself, chiefly in the *Mémoires* of the Société des Ingénieurs Civils of France, and of an illustrated work in folio upon the same subjects. He was president of the Société des Ingénieurs Civils in 1886; received the Nozo prize in 1882; the grand prize of the Société d'encouragement in 1880; the medal of progress at Vienna 1873; the diploma of honor at Antwerp 1878; grand prizes at Paris 1878 and 1889; also the decorations of the Legion of Honor, the Iron Crown, of the Bust of Bolivar, of the order of Leopold, and of Cambodia.

Wm. R. Hutton.

Herstal, ãr'staal': town of Belgium; province of Liège; on the Meuse; forms now nearly a suburb of Liège, and is mostly inhabited by mechanics and workingmen (see map of Holland and Belgium, ref. 11-G). Is the seat of great manufacturing establishments, especially in iron and steel, and was the birthplace of Pepin, founder of the Carlovingian dynasty. Pop. 11,726.

Hertford: county-town of Hertfordshire, England; on the river Lea; 26 miles N. of London by rail (see map of England, ref. 11-K). It has a grammar school, several charity schools, including the Greencoat school, a preparatory school for Christ's Hospital London, an infirmary, a corn exchange, and free library. There are breweries, iron-foundries, and a trade in wheat, malt, and flour. Pop. (1891) 7,232.

Hertfordshire, or **Herts**: county of England; bounded by the counties of Essex, Middlesex, Buckingham, and Bedford. It contains 391,141 acres of fertile and well-cultivated land, consisting of chalk overlaid with gravel and loam, and presenting a pleasantly undulating surface. The products of its meadows and orchards are taken to the London market. Malt is a very important product. County-town, Hertford. Pop. (1891) 220,125.

Hertz, hãrts, Heinrich: electrician; b. at Hamburg in 1857; took his doctor's degree in physics at Berlin in 1880; became assistant to Prof. von Helmholtz in the physical laboratory of that university, and was a docent at Kiel (1883–85). After serving for four years as professor in the polytechnicum in Carlsruhe, he was elected to the chair of Physics in the University of Bonn, a position previously occupied for many years by Clausius, and left vacant by the death of that savant. Hertz's chief work consists in the experimental demonstration of the important fact, previously theoretically established by Maxwell, that electro-magnetic induction is propagated through space at the velocity of light by means of a wave-motion in all respects identical with that by means of which radiant energy is transmitted. His researches, first published in Wiedemann's *Annalen*, have since been collected into a volume entitled *Die Ausbreitung der elektrischen Kraft*. E. L. Nichols.

Hertz, Henrik: poet; b. at Copenhagen, Denmark, Aug. 25, 1798, of Jewish parents. With the exception of a tour through Germany, France, Switzerland, and Italy in 1833–34, he spent his life in his native city in a quiet way, devoting himself exclusively to literary work. In 1832 he was baptized, and his earliest comedy, *Hr. Burkhardt og hans Familie* (Mr. Burkhardt and his Family), was published under his own name, and the authorship of his other works was acknowledged. Several of his works caused a great commotion, especially his *Poetical Epistles from Paradise* (1830), a defense of Heiberg's system, whose satire and criticism made his opponents furious, though at the same time they could not help being charmed by the wit, elegance, and freshness of the style. He has written other poems, satirical, lyric, and epical, and also some novels; but his talent was eminently dramatic. He used to write a new drama every winter, and many of them have become very dear to his countrymen, such as his tragedy *Svend Dyrings Huus* (Svend Dyring's House, 1837); his character comedies *Sparekassen* (The Savings-bank, 1836) and *Et Offer* (A Sacrifice, 1853); his romantic comedies *Ninon* (1848) and *Den Yngste* (The Youngest, 1854). Some of them have been performed in the principal theaters of Germany, France, and England, such as *Kong Renés Datter* (King René's Daughter, 1845), twice translated into English. His general character as an author shows a perfect training—he never failed in what he undertook to do; and a perfect veracity—not one adjective in all his volumes was ever allowed to tell a lie. D. Feb. 26, 1870.

Revised by D. K. Dodge.

Hertz, Martin Julius: classical scholar; b. in Hamburg, Apr. 7, 1818; studied in Berlin and Bonn; privat docent in Berlin; professor ordinary in Greifswald 1855, and since 1862 in Breslau; editor of Priscian in Keil's *Grammat. Latini*; Vols. ii., iii. of Livy (4 vols., 1863); of Horace (1893); biographer of K. Lachmann (1851). Chiefly noted as the author of the standard edition of Aulus Gellius. A. Gudeman.

Hertz, Wilhelm: poet; b. in Stuttgart, Germany, Sept. 24, 1835; studied philology in Tübingen, and in 1858 went to Munich, where he published a volume of *Gedichte* (1859). In 1869 he was appointed professor in the Munich Polytechnicum. The deep spiritual insight and perfect mastery of diction displayed in his short poems are equally manifest in his more ambitious efforts. Among these are the epics *Lanzelot und Ginevra* (1860); *Hugdietrichs Brautfahrt* (1863); *Heinrich von Schwaben* (1869); the paraphrases *Rolandslied* (1861); *Tristan und Isolde* (1877); and the critical works *Deutsche Sage im Elsass* (1872); *Aristoteles in den Alexanderdichtungen des Mittelalters* (1890).

Hertz-effect: a name given to an important phenomenon in electro-magnetic induction, the existence of which was first experimentally verified by Prof. Heinrich Hertz. Whenever in any circuit electro-magnetic changes are brought about, as when an induction coil is in action, the disturbances are transmitted in all directions, bringing about similar changes in all conductors in the neighborhood. Hertz's work consisted in showing that these disturbances are transmitted by means of vibrations of the luminiferous ether and in determining the character and measuring the velocity of these waves (frequently termed *Hertzian waves*). The result of his researches has been to place the electro-magnetic theory of light upon a well-established experimental basis. E. L. Nichols.

Hertzen, hãrt'sen, Alexander: journalist and political writer; b. at Moscow, Russia, Mar. 25, 1812. Shortly after completing his education he was imprisoned for his outspoken liberal ideas, and banished for a time to Viatka, then to Vladimir, although he was allowed to enter the service of the government. On his return he devoted himself to literature. In 1842 his *Dilettantism v Naukie* (Dilettanteism in Science) attracted much attention; but in the same year, for criticising the police too freely, he was ordered to live in Novgorod. In 1847, however, obtaining permission to travel, he sold his property, and left his country forever. In 1851 he settled in London, where he set up a "Free Russian Press" to attack the Russian Government, and to edit works of all kinds forbidden in his native land. His most famous enterprise was his weekly paper *Kólokol* (The Alarm-bell, started in 1857), whose influence was immense. Thousands of numbers were smuggled into Russia, where they were eagerly read by all classes, from the emperor down. In some mysterious manner Hertzen kept himself marvelously well informed, exposed countless abuses, and revealed state secrets. In 1859 he published the *Mémoires de l'Impératrice*

Catherine, écrits par elle-même, which had been carefully kept private by her imperial descendants. After the great reforms of Alexander II., Hertzen lost much of his influence, and he forfeited the rest by his sympathy with the Poles in their insurrection of 1863. He transferred his *Kólokol* to Geneva, where it continued to exist as an obscure revolutionary sheet until about a year before his death in Paris, Jan. 21, 1870. As a writer Hertzen was both romantic and skeptical, eloquent and satirical. He had an impressionable nature and a keen intelligence. Perhaps the best of his purely literary efforts, most of which appeared under the pseudonym of *Iskandar*, are his novels *Doctor Krupov* and *Kto Vinovat?* (Whose Fault is it? both in 1847), and his *Prervannye Razskazy* (Interrupted Tales, 1854). Among the most noteworthy of his political productions, many of them written in English, French, or German, are *Du Développement des idées révolutionnaires en Russie* (1851); *Baptized Property* (i. e. serfs, 1853); *Tiurma i Ssylka* (Imprisonment and Exile, part of which was translated by the author under the misleading title of *My Exile to Siberia*—he never was in Siberia). His complete works were published in 1875 (Basel, 11 vols.). Biography by J. Eckhardt (Leipzig, 1871). See also *European Republicans*, by J. W. Linton (1892). A. C. Coolidge.

Her'uli: a Germanic race who first appear in history in the third century A. D. on the shores of the Euxine. They were conquered by the Ostrogoths under Hermanric in the fourth century, and bands of Heruli appear after this in all parts of Europe. They swelled the train of Attila, and are later found among the enemies of the Huns. In the valley of the Theiss, on the lower Danube, and in Illyria they founded governments, and were everywhere among the bravest and most barbarous and unruly of the Germanic peoples. Odoacer was called King of the Heruli, but was not of this race. After the fall of the Western empire (476 A. D.) the Heruli became one of the dominant races, but the subject Lombards rose and almost annihilated them about 512 A. D. From that time they were important only as soldiers in the service of the more powerful tribes.

Hervás y Panduro, ār'vaas'ee-pān-doo'rō, Lorenzo: Jesuit philologist; b. at Cuenca, Spain, May 20, 1735; studied at Alcalá de Henares; taught philosophy at Madrid, and spent some years in America. After 1767 he resided mainly in Italy, where he devoted himself to mathematical and linguistic studies. He published in Italian several important works on comparative philology, most of which were republished in Spanish. His *Idéa del' Universo*, a cosmographical work in 21 vols., appeared between 1778 and 1787, and he wrote various books on astronomy, physics, etc. In 1804 he was made director of the Quirinal Library at Rome. D. at Rome, Aug. 24, 1809. H. H. Smith.

Hervé, ār'vā', Aimé Marie Édouard: journalist; b. in 1835 at St.-Denis (Réunion island); after brilliant studies in colleges entered the famous Paris Normal School, where he had as fellow mates Prévost-Paradol, About, Sarcey, Weiss, and Taine. Hervé contributed to many Paris journals, and with Weiss founded in 1869 the *Journal de Paris*, which was replaced in 1873 by the *Soleil*, both in support of the cause of a liberal constitutional monarchy modeled after the British constitution. In 1881 he was elected a member of the municipal council of Paris, but his subsequent attempts to secure a seat in the national legislature were unsuccessful. He was chosen a member of the French Academy in 1886. Hervé is the author of *Une page d'histoire contemporaine* (1869), a history of the liberal ideas in England, and a work on the history of Ireland, entitled *La crise irlandaise depuis la fin du XVIII^e^ siècle jusqu'à nos jours*.

Hervey, hēr'vē, James: author; b. at Hardingstone, Northamptonshire, England, Feb. 26, 1713; studied (1731–37) at Lincoln College, Oxford, where, from his acquaintance with John Wesley and from Zimmerman's writings, he received strong religious impressions. He took orders in the Anglican Church and held various rectorships, notably that of Weston-Favell (from 1752), where he died Dec. 25, 1758. Author of *Meditations and Contemplations among the Tombs* (1746 and 1747, latest edition 1875), which became exceedingly popular, and, notwithstanding its turgid and extravagant style, found many admirers, attracted partly by the devout spirit of the author (vol. i. contains the *Meditations among the Tombs*, by which title it is almost exclusively known); of *Theron and Aspasia* (3 vols., 1755), consisting of dialogues upon religious topics—a work which called forth replies from Robert Sandeman and John Wesley; and other works, among them posthumous *Letters to John Wesley* (1766), which, it is believed, suffered much from the reckless interpolations of Hervey's editors. He was a man of learning, but not of intellectual power. See the complete edition of his *Works* (Edinburgh, 1769; latest ed. 1834).

Hervey Islands: See Cook's Islands.

Herwarth von Bittenfeld, her'vārt-fŏn-bit'en-felt, Karl Eberhard: field-marshal; b. at Grosswerther, Prussian Saxony, Sept. 4, 1796; entered the army in 1811. He took part in the campaign against France in 1814, and captured two hostile pieces at the storming of Montmartre. In 1847 he received the command of the First Regiment of the Guard, in 1850 of the Sixteenth Brigade of Infantry, in 1854 of the confederate fortress of Mentz, in 1860 of the Seventh Army-corps. In 1863 he became a general of infantry, and commanded in 1864 the Prussian troops against Denmark under Prince Frederick Charles, who was commander-in-chief of the allied Austrian-Prussian force. June 20 he took the island of Alsen. After the peace of Vienna he was appointed chief commander in the duchies of the Elbe, and in 1865 he received the command of the Eighth Army-corps. In 1866 he was commander-in-chief of the Army of the Elbe, gained victories in the encounter at Hünerwasser and Münchengrätz (June 26 and 28), and played a very conspicuous part in the battle of Königsgrätz by crossing the Biestritz and attacking the villages of Problus and Prune. The Austrian left wing rested on these two points, and by storming and taking them he completely destroyed this wing of the enemy. In 1870, in the war against France, he was appointed governor-general on the Rhine and of all the western provinces, which difficult and responsible position lost a great deal of its importance, as the war was carried on in the enemy's country. On Apr. 8, 1871, Herwarth retired from active service as field-marshal-general. D. in Bonn, Jan. 14, 1884.

Herwegh, hār'vāch, Georg: poet; b. at Stuttgart, Germany, May 31, 1817; studied at Tübingen, was drafted into the army, quarreled with his lieutenant, and fled to Switzerland, where (at Zurich), in 1841, he published his *Gedichte eines Lebendingen* (11th ed. 1891), a collection of political poems or songs full of enthusiasm for liberty and equality, fresh, vigorous, and beautiful. The book met with immense success, and the poet returned to Germany in 1842; but a virulent letter he wrote to the King of Prussia caused him to retire a second time to Switzerland, where he married the daughter of a Jewish banker. He took an active part in the revolution in Baden in 1848, and published several minor collections of poems, but passed the latter part of his life in Southern France, almost in obscurity. D. at Baden-Baden, Apr. 7, 1875.

Herzberg, hārts'bārch, Ewald Friedrich: statesman and author; b. at Lottin, in Pomerania, Sept. 2, 1725; studied law at the University of Halle, and entered in 1747 the service of the Prussian Ministry of Foreign Affairs. He wrote in 1756 the famous *Mémoire raisonné*, founded on papers stolen from the archives of Dresden, and intended to defend the invasion of Saxony by Frederick II.; he also wrote a memoir in defense of the first partition of Poland in 1772; and the peace of Hubertsburg in 1763, as well as the formation of the so-called Fürstenbund in 1785 against Austria, was his work. Frederick II. appreciated him very much, and made him first Minister of State, but after the king's death Herzberg's influence soon decreased, though Frederick William II. made him a count and president of the Academy of Science of Berlin. The convention of Reichenbach in 1790 proved a failure, and Herzberg retired. In 1793, when the second division of Poland and the unfortunate war against France had brought Prussia into a critical position, he offered his services once more, but the offer was not accepted, and the old man felt this disappointment so keenly that he fell sick and died shortly after, May 25, 1795.

Herzegovina, hārt-se-gō'vee-nāa: province occupied by Austria-Hungary; bounded N. by Bosnia, S. W. by Dalmatia, and E. by Montenegro. Peopled largely by Slavic races; occupied by the ridges and valleys of the Dinaric Alps; produces much grain, tobacco, and honey. Capital, Mostar. For statistics, etc., see Bosnia, with which Herzegovina forms practically a single province.

Herzen, Alexander, M. D.: Professor of Physiology at Lausanne, Switzerland; b. at Vladimir, Russia, June 25,

1839; educated in England; studied medicine at Berne; assistant for several years to the physiologist Schiff in Florence; called to Lausanne in 1881. The works of Herzen are principally on topics in physiology and physiological psychology—i. e. *Expériences sur les centres modérateurs de l'action réflexe* (Turin, 1864); *Analisi fisiologica del libero arbitrio umano* (Florence, 1870, with two later editions; French translation, 1874); *The Brain and its Functions* (in French, *Le cerveau et l'activité cérébrale*, Paris, 1886; German translation, *Grundlinien einer allgemeinen Psychophysiologie*, Leipzig, 1887); also several studies on educational topics, mainly of Swiss interest. J. MARK BALDWIN.

Herzog, hăr'tso*k*h, JOHANN JAKOB: b. at Basel, Sept. 12, 1805; studied theology in his native city and in Berlin 1823–29; and was Professor of Theology at Lausanne 1835–45; in Halle 1847–54; in Erlangen in 1854–77, when he retired upon a pension. He wrote *J. Calvin* (Basel, 1843); *Das Leben Œkolampadius's* (1843, 2 vols.); *Die romanischen Waldenser* (Halle, 1853); *Abriss der gesammten Kirchengeschichte* (3 vols., Erlangen, 1876–82; supplement, 3 vols., on the nineteenth century, by G. Koffmane, 1887; 2d ed. of vols. i.–iii., by G. Koffmane, 1890–92), etc.; but his chief work was his *Real-Encyklopädie* (Hamburg and Gotha, 1853–68, 22 vols.; 2d rewritten, Leipzig, 1877–88, 18 vols.): a condensed translation with much new matter was prepared by Philip Schaff, Samuel Macauley Jackson, and David Schley Schaff (3 vols., New York, 1882–84)—a vast storehouse of German learning and speculation. D. at Erlangen, Sept. 30, 1882.
Revised by S. M. JACKSON.

He'siod (in Gr. Ἡσίοδος): next to Homer the oldest of the Grecian poets whose works are known to us. From his poem, *Works and Days*, we learn that his father came from Cyme, a town of Æolis in Asia Minor, and settled at the foot of Helicon in the wretched village of Ascra. At Ascra Hesiod was born, and by Helicon he tended his flock. After his father's death Hesiod was defrauded of a part of his inheritance by his brother Perses, who had bribed the judges; but Perses's foul play brought him no luck, and the lazy cheat undertook to sue his wronged brother again. Hereupon Hesiod left Ascra in disgust, and seems to have become a strolling minstrel with homes at Naupactus and Orchomenus. A passage of doubtful genuineness in *Works and Days* tells us how he went to Chalcis in Eubœa in order to take part in a poetical contest at the funeral celebration in honor of King Amphidamas, and how he won a tripod as the prize, which he dedicated to the Muses. Hence the story of the *Contest between Homer and Hesiod* (Ἀγὼν Ὁμήρου καὶ Ἡσιόδου), still extant, and often printed with the works of Hesiod. According to a tradition, the poet was murdered at Oeneon in Ozolian Locris by two brothers, who suspected him unjustly of having seduced their sister. He was buried in Locris, where his poetic school flourished, but the bones of the poet were afterward removed by command of an oracle to Orchomenus, where a tomb was erected to his memory, and where he was honored as a hero. As to the age of Hesiod there is a conflict of authorities. Herodotus makes him a contemporary of Homer, and puts them both 400 years before his time—i. e. about 840 B. C. Ephorus makes Hesiod older than Homer, Eratosthenes and Aristarchus make him younger. (See Clinton, *Fasti Hellenici*, vol. i., pp. 359–361.) The internal evidence seems to point to the early Olympiads as the time of Hesiod. The chief works attributed to him are, 1, the *Works and Days* (Ἔργα καὶ Ἡμέραι), according to local tradition the only genuine work of Hesiod. It is called *Works* because of the directions given for various kinds of labor, *Days* because of an appendix which contains a calendar of the days of the month on which certain tasks are to be undertaken. 2. The *Theogony* (Θεογονία), an attempt to systematize the world of Hellenic deities, and to make the old gods of the soil receive into their ranks the new importations from foreign parts. In this strange performance ritual and hymn are blended with theosophic and cosmogonic speculation. The poem closes with a long list of the daughters of Zeus, who condescended to bear children to mortal men. This prepares the way for 3, a *Catalogue of Women* (κατάλογος γυναικῶν), which has been lost. A subtitle, or a title of part of the work, was Ἠοῖαι μεγάλαι, a versified history of heroes in short paragraphs mechanically strung together, each beginning with ἢ οἵη, "or such a dame," which gave the title to the poem. From this work is borrowed the proëm to 4, the *Shield of Hercules* (Ἀσπὶς Ἡρακλέους), an imitation of the shield of Achilles in the *Iliad*. Hesiod is the representative of the Bœotian and Locrian school, as Homer is the representative of the Ionian school of epic poetry. A sober, homely nature, observant and reflective, he shared the peculiarities of his Bœotian countrymen, their heavier mental build, their slower intellectual motion. What Hesiod has to say rather than to sing consists largely of wise saws and useful precepts. He gives us a housekeeper's companion, a farmer's calendar, a nautical almanac, a handbook of mythology. He is a plain man addressing plain men, and hence it is not surprising that Cleomenes called Hesiod the poet of the Helots, whereas Homer was the poet of the Spartan warriors. Nor is it surprising that when purple patches in the way of episodes are let into the homespun fabric of Hesiod's poems modern critics should suspect diversity of authorship. In its external form the poetry of Hesiod resembles that of Homer. The meter is the hexameter. The dialect is substantially the same, though it shows here and there a local strain, which has led Fick to rewrite Hesiod in Æolic. (See Fick, *Hesiods Gedichte*, 1887.) There is a vast decline in art from the airy heights and the fairy splendor of Homeric poetry. True, Homer is melancholy at times, but the melancholy of Hesiod has a mediæval grimness and a modern cynicism that are almost startling. Still the Greek valued Hesiod as he valued Homer for his moral lessons, and the homely preacher of the Gospel of Labor was a power in Greek education, and in certain forms of reflective poetry a power in Greek literature. The best editions are by Th. Gaisford in *Poetæ Minores Græci*, vol. i.; by Göttling (Gotha, 1878, 3d ed.); by Van Lennep (Amsterdam, 1843–47, 3 vols.); by F. A. Paley (London, 1861): critical editions by Schömann (1869), Köchly-Kinkel (1870), Rzach (1884), Sittl (1889). Chapman has translated the *Works and Days* into English under the title *Hesiod's Georgics and Book of Days*, and Elton has given the entire poems. See Müller, *Hist. Greek Lit.*, vol. i., p. 77; Mure's *History of Greek Literature*; Grote's *History of Greece*, vol. i.; Bähr, in *Pauly's Real-Encyklopädie*. B. L. GILDERSLEEVE.

Hesper'ides [Lat. = Gr. Ἑσπερίδες, liter., daughters of Hesperus; Ἕσπερος, Hesperus + patronymic ending, *-ίδες*, plur. of *-ίς*, daughter of]: in Greek mythology, daughters of Atlas and Hesperis, the Night, or of Zeus and Themis, or of Phorcys and Ceto. On the occasion of the marriage of Zeus and Hera all the gods brought gifts. As her gift to Hera, Gaea brought golden apples, which Hera planted in the garden of the gods in the farthest west, on an island on the other side of Oceanus where Day and Night meet. The children of the Night, the Hesperides, were set to watch the garden and the golden apples. The Hesperides were fond of the apples and plucked them; so Gaea was forced to send Ladon, the hundred-headed dragon and son of Typhon and Echidna (or of Phorcys and Ceto), to watch the Hesperides and the golden apples. Heracles was sent by Eurystheus to fetch three of the golden apples to him at Mycenæ. By the help of ATLAS (*q. v.*) he secured the apples, but they were finally restored to the garden of the gods by Athene to whom Heracles had given them. The golden apples are emblematic of love and fruitfulness, over which the children of the Night keep watch. The Atlantides (so called from their father, Atlas) or Pleiades (so called from their mother, Pleione) were half-sisters of the Hesperides. J. R. S. STERRETT.

Hesperor'nis [Gr. ἕσπερος, west + ὄρνις, bird]: an extinct genus of birds belonging to the sub-class *Odontornithes*, and found in the Cretaceous of Kansas. These birds had the legs fitted for swimming, and closely resembling those of the modern divers, but the sternum was destitute of a keel, as in apteryx and the ostrich, and the diminutive wings were incapable of supporting the body in flight. The most remarkable feature was, however, the presence of well-developed teeth both above and below. These teeth were not set in sockets, as in Ichthyornis, but in a groove, as in Ichthyosaurus. Other reptilian characters were shown in the skeleton, but the vertebræ are of the true bird type. *H. regalis* was nearly 6 feet in height. See also ODONTORNITHES.
O. C. MARSH.

Hesse, hes (Germ. *Hessen*; cf. Lat. *Chatti*, *Catthi*): a mountainous territory in the western part of Central Germany; situated between 7° 51′ and 9° 39′ E. lon., and 49° 24′ and 50° 50′ N. lat., between the Neckar, Rhine, Main, Lahn, and Fulda. It was inhabited by the tribe of the Catti at the time of Germanicus, but the Catti became lost as an individual tribe among the Franks, and when these emigrated to Belgium and France the Hessian territory became nearly depopulated. Meanwhile the Saxons pushed into the coun-

try from Thuringia, and for a period Hessia was united with the Thuringian principality; but at the death of Henry Raspe in 1247 a war of succession broke out between his nephew, Henry of Misnia, and his niece, Sophia, married to Henry, Duke of Brabant, which ended in 1263 in a separation of the two countries. Sophia obtained Hessia, and her son, Ludwig the Child, was acknowledged as landgrave, took up his residence at Cassel, and founded the Hessian dynasty. One of his descendants, Philip the Magnanimous, divided his land at his death in 1567 between his four sons, William IV., Ludwig IV., Philip II., and George I. But Ludwig IV. died in 1604 and Philip II. in 1583, without children, and thus only two branches of the family were continued—that of Hesse-Cassel, descending from William IV., and that of Hesse-Darmstadt, descending from George I. In the time of the Revolution in North America (1775) the Grand Duke of Hesse-Cassel held his subjects as mercenaries, and sold to George III. of England the service of 22,000 Hessian troops with which the British army in North America was reenforced. In the time of the Napoleonic wars Hesse-Cassel, under William I., fought now on one side and now on another. Under William II. the discord between monarch and subjects became dangerous, and when in 1830 a revolution actually broke out, he followed his father's example: he promised everything on one day, and broke his promises the next. Still worse was Frederick William I., who succeeded his father Nov. 20, 1847. When the revolution of 1848 came the elector consented to some important reforms, but his attempt to return to the former policy of the government caused a popular commotion, and he was forced to retire to Wilhelmsbad. Austria and the Diet came to his aid, and in spite of the menacing attitude of Prussia enforced the obedience of his subjects. A period of reactionary government followed, but in 1866 Hesse-Cassel, having joined Austria against Prussia, was conquered by the latter power, and has since been a government district of the Prussian province of Nassau.

In Hesse-Darmstadt, or Hesse proper since the Prussian conquest of Hesse-Cassel in 1866, an excellent constitution was adopted in 1848, and this was modified in 1862 and 1872. Under the revised constitution the executive authority is vested in the grand duke, who is supported by a ministry that is divided into three departments—that of Foreign Affairs, that of the Interior and of Justice, and that of Finance. The legislative branch of the Government consists of an Upper Chamber, composed of nobles and twelve members elected for life, and a Chamber of Deputies, 48 in number. According to the census of 1890 Hesse had an area of 2,965 sq. miles and a population of 992,883, of whom 666,118 were Protestants and 293,651 Roman Catholics. Pop. (1895) 1,039,020. The country is mountainous or hilly, covered by the Vogelsberg range, the Odenwald, and spurs of the Taunus and Westerwald, but the soil is very productive and well cultivated. Wheat, barley, oats, potatoes, fruit, and tobacco are raised; iron, salt, and brown coal are mined; linen and woolen fabrics, leather and straw goods are manufactured; the carriages from Offenbach are celebrated. The largest town is Mainz, with a pop. of 72,059. The university at Giessen had in 1892 574 students. Revised by C. K. Adams.

Hesse-Nassau: province of Prussia (formed in 1866 of portions of the electorate of Hesse-Cassel, the duchy of Nassau, the landgraviate of Hesse-Homburg, and the free city of Frankfort); situated between Hesse, Bavaria, and the provinces of Saxony, Hanover, Rhenish Prussia, and Westphalia. Area, 6,055 sq. miles. The surface is occupied by the Spessart, Rhön, Westerwald, and Taunus Mountains, but the soil is very fertile and well cultivated. Agriculture, cattle-raising, and manufacture of cloth, iron, jewelry, and pottery are the chief occupations. Much excellent wine is produced. Mineral springs are numerous, and the watering-places of Ems, Wiesbaden, Schlangenbad, and others are celebrated. Pop. (1895) 1,756,802.

Hessian-fly [so called because believed to have been brought by the Hessian troops during the Revolution]: the *Cecidomyia destructor*, a dipterous insect which is very destructive to wheat in parts of the U. S. In spring and autumn the larvæ crawl in between the stalk and the sheath of a leaf, and remain near the ground, head downward, sucking the juice. In five or six weeks they enter a semi-pupa or flaxseed state, from which they go into the pupa, and then become perfect insects. They are destroyed in great numbers by insect parasites, and burning the stubble in the autumn will destroy a great proportion of their larvæ. See Cecidomyia.

Hes'tia (in Gr. Ἑστία): the first-born daughter of Cronus and Rhea. According to the etymology of the word now generally accepted (i. e. from the Indo-European root *vas*, which means to glow or burn, and not from another root *vas*, which means to dwell) she was the fire-goddess, though even in very early times the word ἑστία came to mean hearth, and then tropically house or dwelling. Hestia was averse to the works of Aphrodite, and when she was wooed by Apollo and Poseidon, she swore by the head of Zeus that she would always remain a virgin. The virginity of the goddess and the purity of the hearth were necessitated by the purity of fire. Instead of marriage Zeus granted her the right to sit in the center of the house, to receive the fat of victims, to be honored in the temples of all the gods, and to be esteemed by mortals as the eldest born and most venerable of all the gods (Hom., *Hymn. in Venerem*, 22 ff.). In spite of the fact that she has no myths and is not mentioned in *Iliad* or *Odyssey*, she was not a post-Homeric deity. She was a virgin because fire is pure and purifying. When defiled by contact with impurities fire had to be extinguished and then be relighted from pure fire. But Hestia received the fat of victims not only in family sacrifices but also in public sacrifices. A kind of grace was acted by pouring a libation upon the hearth before beginning a feast or even an ordinary meal. There was a proverbial phrase, ἀφ' Ἑστίας ἄρχεσθαι (to make the beginning with Hestia), that applied to sacrifices, libations, treaties, oaths, compacts, etc., though it is impossible to say whether sacrifice was offered first to Hestia in *all* public and private ceremonies. The thought underlying the custom was first to offer sacrifice to the sacred sacrificial Fire itself, the fire in which the offerings to the other gods were to be burned, and secondarily only to the goddess herself, for it must be remembered that it was through the instrumentality of the ascending flame and smoke that the gifts of man were carried up to the gods, and to Zeus in especial. Zeus was closely allied to Hestia, as such epithets as ἐφέστιος show. Hestia was the goddess not only of sacrificial fire, but she was the goddess of the hearth, which unites and binds together the family, and is really the center of the family life. Hestia appears rarely in art as she does in myth. She is represented occasionally in archaic vase-paintings, but nothing typical can be gathered from them. It is not certain that any statues of Hestia have come down to us, though the archaic statue in the Torlonia Museum may represent the goddess.

Literature.—Preuner in Roscher's *Lexicon*, under *Hestia*; Frazer, *The Prytaneum*, *The Temple of Vesta*, *The Vestal Perpetual Fires* in *The Journal of Philology*, vol. xiv., p. 169 ff.; Planck, *Die Feuerwerkzeuge der Griechen und Römer, und ihre Verwendung zu profanen und sakralen Zwecken* (Stuttgart, 1884); Petersen, *Der Hausgottesdienst der alten Griechen* in the *Zeitschrift für Alterthumswissenschaft* (1851, p. 196); Hagermann, *De Græcorum prytaneis* (Breslau, 1881); Preller-Robert, *Griechische Mythologie* (Berlin, 1888).

J. R. S. Sterrett.

Hes'ychasts [from Gr. ἡσυχασταί, plur. of ἡσυχαστής, hermit, quietist, hesychast, liter., one who remains still or quiet; deriv. of ἡσυχάζειν, be still or quiet, deriv. of ἥσυχος, still, quiet]: a body of mystics in the Greek Church, who professed that by retirement and contemplation they could come to behold the divine glory (called the "Taboritic light," because it was regarded as the same as that which shone at Christ's transfiguration on Mt. Tabor). They believed that the best position they could assume for beholding this light was to sit and gaze upon their navels. They flourished in the fourteenth century among the monks of Mt. Athos, but the leaven of their doctrine is not yet extinct in the East. Barlaam was their great opponent, but he was condemned in a synod in Constantinople (1341), and ten years later (1351) the doctrines of the Hesychasts were declared orthodox by another synod in Constantinople. See von Stein, *Studien über die Hesychasten des 14. Jahrhunderts* (Vienna, 1873).

Revised by S. M. Jackson.

Hesych'ius (in Gr. Ἡσύχιος): a grammarian of Alexandria, under whose name a valuable Greek lexicon has come down to us. Nothing is known of his life, and his date is so uncertain that critics vary in regard to it from 390 A. D. to the tenth century. The former is more generally accepted, and the forms and references which imply a later date are believed to be interpolations. The work is based on the earlier lexicon of Diogenianus, and is valuable as containing explanations of words and forms and literary and archæological information derived in part from writers now lost. The ex-

planations of words from the Scriptures and from Christian writers are the additions of later hands. The best editions are by Alberti and Ruhnken (Leyden, 1746–76, 2 vols. fol.), and by M. Schmidt (4 vols. 4to, Jena, 1858–61); smaller ed. 1867, in which an attempt is made to sift out the articles by Diogenianus; the *Glossa Sacra* separately by Ernesti (Leipzig, 1785). See Ranke, *De Lex. Hesych. vera origine*, etc. (Quedlinburg, 1831). Revised by B. L. Gildersleeve.

Hesychius: of Miletus; a philosopher and historian, surnamed Ἰλλούστριος (*illustris*); lived in the sixth century A. D. under the Emperor Justinian. He wrote a synoptical history of the world, in six parts, from Belus, King of Assyria, to the death of Anastasius I. Of the sixth part a portion, relating to the origin of Constantinople, is extant. He was also the author of a dictionary of authors (Ὀνοματολόγος ἢ πίναξ τῶν ἐν παιδείᾳ ὀνομαστῶν), extracts from which have been preserved by Suidas. Best edition of both treatises by Orelli (Leipzig, 1820); of the latter by Flach (Leipzig, 1882).

Revised by B. L. Gildersleeve.

Hetæ'ræ (in Gr. Ἑταῖραι): a euphemistic name given in Greece to the better class of prostitutes. In Corinth prostitutes were connected with the worship of Aphrodite; they were introduced into Athens by Solon, who thought thereby to prevent the Athenian families from being ruined by the licentious young men of Athens. Originally these prostitutes were slaves owned by the state, which derived a revenue from them. They were intended by Solon for the use of unmarried men exclusively, for in his time married men were required to live up to their marriage vows. But about the time of Pericles men began to entertain lax views with reference to the sanctity of the marriage relation, and we begin to hear of the hetæra, or friend. The hetæra was not a common prostitute; she was usually a foreigner, and she sought to please men not only by her personal charms, but also by the brilliancy of her intellect and conversation. The greatest and best men of Greece were attracted by them, and Pericles was so fascinated by Aspasia, a gifted hetæra of Miletus, that for her sake he abandoned his legal wife and lived openly with Aspasia. Many of these hetæræ won immortal fame; some of them amassed huge fortunes; and some even reached the royal purple, and had temples erected in their honor. Some of the most distinguished were Thais, Myrrhina, Lamia, Læna, Theodota, Thargelia, and Phryne. Phryne, the beautiful, who served as model for Praxiteles, offered to rebuild the walls of Thebes provided the Thebans would agree to place upon the walls the inscription, "Alexander destroyed them and Phryne, the hetæra, rebuilt them."

J. R. S. Sterrett.

Hetæria [Gr. Ἑταιρία φιλική, friendly association]: a society having for its original object the promotion of science and literature in Greece, but chiefly concerned during the early years of the nineteenth century with the project of Greek independence. Founded in the latter part of the eighteenth century, it was a flourishing organization at the time of the Congress of Vienna (1814–15), and soon numbered among its members the ablest Greeks of all classes, though at first it was recruited mainly from the Greeks of foreign countries, especially Russia and the Danubian principalities. Its purposes were akin to those of the Carbonari, the Burschenschaft, and the Spanish Freemasons, and it sought to realize them by the same means, i. e. revolution. Ypsilanti, the leader of the ill-starred revolt in Wallachia and Moldavia in 1821, was the head of the Hetæria which supported that movement, as well as the more successful attempt in Greece proper. When by the intervention of the great powers Greek independence had been achieved (1828), the society ceased to be an important factor in Greek politics.

Hetchel: See Hackle.

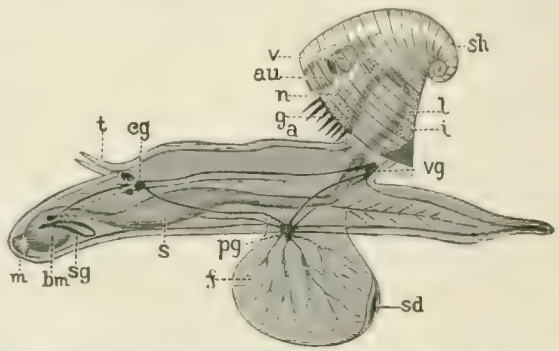
Heteroc'era: See Lepidoptera.

Heterocer'cal [liter., having a second tail; Gr. ἕτερος, other, second + κέρκος, tail]: a name applied to the tails of those species of fish which have the vertebral column extended into the upper lobe, which is the larger of the two, a condition found in all sharks. In the large majority of osseous fishes the posterior end of the vertebral column is bent upward, but the bones on its under side (hypural bones) which support the rays of the tail are correspondingly lengthened, so that the lower and upper portions of the tail appear symmetrical. This pattern is termed *homocercal*. Finally, the vertebral column may be quite straight, and the rays of the tail equally disposed about its end, so that the upper and lower portions of the tail are alike. This condition, which is well shown by the burbot (*Lota lota*), is called *diphycercal*.

F. A. Lucas.

Heterodon'tidæ [Mod. Lat., liter., belonging to the tribe with peculiar teeth; Gr. ἕτερος, other, different + ὀδούς, ὀδόντος, tooth + patronymic ending -ίδαι, descended from]: a family of sharks, including the Port Jackson shark (*Heterodontus philippi*) and several other living species interesting to naturalists as the surviving relics of a once extensive group. The head is squarish, with a declivous forehead; the mouth near the anterior extremity; the two dorsal fins are each armed in front with a spine. Important anatomical peculiarities also differentiate it as a peculiar group or sub-order. One species (*Gyropleurodus francisci*) occurs on the Californian coast.

Heterop'oda [Mod. Lat., from Gr. ἕτερος, other, different + ποῦς, ποδός, foot]: a group of gasteropod molluscs (see Gasteropoda), formerly regarded as a distinct order, but now



Carinaria, a heteropod mollusc: *a*, vent; *au*, auricle; *bm*, buccal mass; *cg*, cerebral ganglion; *f*, foot; *g*, gills; *i*, intestine; *l*, liver; *m*, mouth; *n*, nephridium; *pg*, pedal ganglion; *s*, stomach; *sg*, salivary gland; *sh*, shell; *t*, tentacles; *v*, ventricle; *vg*, visceral ganglion.

known to belong to the tænioglossate group, the body being modified for a pelagic life. They have the foot compressed to a vertical keel, a shell may be present or absent, the gills are in front of the heart, and the sexes are separate. Usually body and shell are transparent. The principal genera are *Atlanta*, with a spiral shell; *Carinaria*, with a hood-like shell; and *Pterotrachea*, without a shell. J. S. Kingsley.

Heteroptera: See Hemiptera and Entomology.

Heteropyg'ia [Mod. Lat., having a peculiar rump; Gr. ἕτερος, other, different + πυγή, rump, or anus]: a name formerly applied to the cave blindfishes and their relatives, the family of *Amblyopsidæ*, in allusion to the peculiar position of the vent, which is in front of the ventral fins. There are five species known, two of them confined to the caves, and three to the swamps or springs of the lowlands of the southern part of the U. S. One of these is especially abundant in the Dismal Swamp and the Okefinokee Swamp. There is not much doubt that the blind forms are descended from the eyed swamp types, and probably all are relics of an ancient fauna which preceded the ordinary river-fishes of the present day. The blind forms constitute the genera *Amblyopsis* and *Typhlichthys*, those with eyes the genus *Chologaster*. See Amblyopsis. See also Putnam, F. W., in *American Naturalist* (Jan., 1872). David S. Jordan.

Heteroso'mata [Mod. Lat., liter., (animals) with unsymmetrical bodies; Gr. ἕτερος, other, different + σῶμα, σώματος, body]: an order of true fishes, peculiar among the vertebrates in the asymmetry of the body, to which the name alludes. The animal is very much compressed, with dorsal and abdominal edges trenchant, and generally it rests on the sandy or muddy bottoms of the water, flat on one side, and hence the inferior is white, while the side which is kept uppermost is dark; the ventral fins are jugular or thoracic; the dorsal and anal fins very elongated; the scapular arch is destitute of a mesocoracoid bone. They are most nearly related to the codfishes and allied tribes. In the early embryonic stage these fishes are symmetrical, but they very soon assume that dissimilarity of the sides which is characteristic of the mature condition. Their development has been studied by Malm, Steenstrup, Thompson, Traquair, Schrödte, etc. Steenstrup (1864) contended that the combination of the eyes on one side was effected by a transfer of the upper one from the blind side through the tissues below the arch formed by the frontal bone of its own side to the opposite

one. But a more consecutive study of the development and anatomy of the various forms seems to establish the fact that this transfer is rather effected by a rotation of the eye and contiguous parts from the one side to the other. There is some reason to believe that both methods occur in different species. The rotation of the eye has been explained on the principle of its tendency, while the fish is yet young and symmetrical, but prone to lie on one side, to turn toward the light; this tendency, confirmed and established by slow degrees, finally culminated in the habit now universal. The least specialized type is *Atheresthes stomias*, a kind of halibut. The order embraces two families (*Pleuronectidæ* and *Soleidæ*) and numerous species. THEODORE GILL.

Het-her: See ATHOR.

Hetman: See ATTAMAN.

Hetzel, ät'sel', PIERRE JULES: editor and man of letters; b. at Chartres, France, Jan. 15, 1814; began as the partner of Paulin, the publisher of the works of the greatest modern French writers. In 1848 Hetzel exercised a great influence in favor of the republican movement, and occupied several offices in the capacity of an under-secretary in two ministries, and finally as general secretary of the executive power. He was banished in 1857, but returned in 1859, and during the empire he busied himself exclusively with publishing the books of Victor Hugo, George Sand, etc., and he wrote also, under the pseudonym of *P. J. Stahl*, some highly moral books, like *The Familiar Moral*, *A Student's Travels*, *New and Sole Adventures of Tom Thumb*, *The Esprit of Women and Women of Esprit*. D. Mar. 17, 1886.

Heuglin, hoi'glēēn, THEODOR, Baron von: explorer; b. at Hirschlanden, Würtemberg, Mar. 20, 1824; traveled in the East 1850–52; became Austrian consul at Khartum, and explored Abyssinia and the White Nile valley in 1852–54; traveled along the Gulf of Aden and the shores of the Red Sea 1856–58; from 1860 to 1865 was again engaged in African explorations; made a journey in the region of Spitzbergen and Nova Zembla 1870–71. Author of *Reisen in Nordostafrika* (1857); *Ornithologie Nordostafrikas* (1860); *Systemat. Uebersicht der Säugethiere Nordafrikas* (1867); *Reise nach Abessinien*, etc. (1868); *Reise in das Gebiet des weissen Nil* (1869), etc. D. at Stuttgart, Nov. 5, 1876.

Hewes, JOSEPH: a signer of the Declaration of Independence; b. of Quaker stock at Kingston, N. J., in 1730; was educated at Princeton, and went into business, first in Philadelphia and then at Edenton, N. C.; was a member of the General Congress from North Carolina 1774–77, and again in 1779. In Congress he took a prominent part in the performance of public business. D. at Philadelphia, Nov. 10, 1779.

Hewit, AUGUSTINE FRANCIS, D. D.: a Roman Catholic (Paulist) priest; a son of Nathaniel Hewit, D. D.; b. at Fairfield, Conn., Nov. 27, 1820; baptized as Nathaniel Augustus; graduated at Amherst in 1839; studied theology at East Windsor, Conn., and became an Episcopalian minister. In 1846, while residing in North Carolina, he became a Roman Catholic; was ordained in 1847; joined the Redemptorists in 1850; was associated later with the founders of the Congregation of St. Paul (Paulists), in whose seminary at New York he taught philosophy, theology, and Holy Scripture from 1865 to 1889. He is now superior of the Paulists, and resides in New York. Author of *Problems of the Age* (New York, 1868); *Light and Darkness* (1871); *King's Highway* (1874; 2d ed. 1879); of several translations, and a frequent contributor to such Roman Catholic periodicals as *The Catholic World*, *American Quarterly Review*, and *The American Ecclesiastical Review*.

Revised by J. J. KEANE.

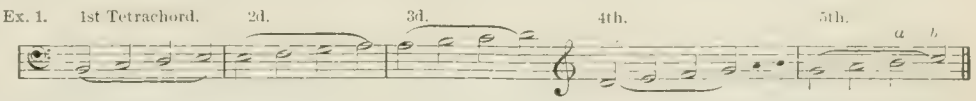
Hewit, NATHANIEL, D. D.: clergyman; b. at New London, Conn., Aug. 28, 1788; graduated at Yale in 1808; taught for some years, and in 1811 was licensed to preach; studied theology at Andover; was pastor of a Presbyterian church at Plattsburg, N. Y., 1815–17, and of the Congregational church at Fairfield, Conn., 1818–27; engaged in the temperance reform 1827–30 (he was called the "Luther of the early temperance reform"); was pastor of Congregational and Presbyterian churches at Bridgeport, Conn., 1830–62. He was one of the founders of the East Windsor (now Hartford) Theological Seminary. D. in Bridgeport, Conn., Feb. 3, 1867.

Hewitt, JOHN NAPOLEON BRINTON: linguist and ethnologist; son of David B. Hewitt, M. D.; b. on the Tuskarora reserve, Niagara co., N. Y., Dec. 16, 1859; of mixed blood, having Scotch-English on the paternal side, and Tuskarora-French-English blood on the maternal side. In early youth he acquired a fair knowledge of the Tuskarora language from some of his schoolmates. He was educated at the Wilson, N. Y., union school and the Lockport, N. Y., union school, and for several years thereafter devoted himself to farming and journalistic work. In 1879 he was engaged by Mrs. Erminnie Adele Smith to aid her in the linguistic and other work in which she was engaged on the Tuskarora reserve in field-work for the Bureau of Ethnology. Mr. Hewitt's work consisted in the collection of vocabularies and mythologic materials in the vernacular of the various Iroquoian tribes and in the translation of this matter, and this work was the means of familiarizing him with the grammatical elements of these different dialects. Since the death of Mrs. Smith he has continued this and other linguistic work. He is now (1894) compiling a dictionary and grammar of the Tuskarora language, and collecting material for a work on the ethnology of the Iroquoian people.

J. W. POWELL.

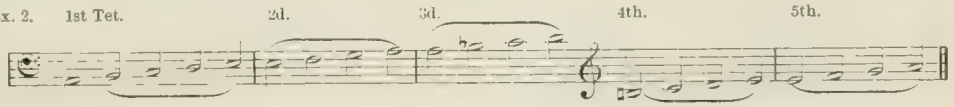
Hex'achord [from Gr. ἕξ, six + χορδή, gut, string, cord, chord]: in music, a series of six notes in direct succession, forming a portion of a scale. The extension of the musical scale and its division into hexachords are attributed to Guido, a monk of the eleventh century. Under the system of the ancient Greeks, which continued for ages to influence all music, both ecclesiastical and secular, the scale was divided into *tetrachords*, or portions of four notes each. As the Greek scale comprised only about fifteen notes, or two octaves, these tetrachords could not apparently exceed four and a fraction in number; but the Greeks, by an ingenious use of some extraneous elements, obtained no fewer than five. According to modern reckoning—taking B in the bass, as the Greeks did, and following their mode of division—the four tetrachords would not fill the double octave, and a fifth tetrachord added would reach beyond it, as at *a*, *b* in Ex. 1:

Ex. 1. 1st Tetrachord. 2d. 3d. 4th. 5th. *a* *b*

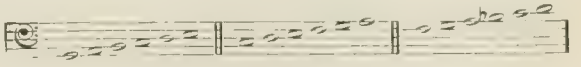


But under the Greek system the five tetrachords were obtained—1, by adding an initial note A, which note was called the *Proslambanomenos*; 2, by using B♭ in the third tetrachord, and then beginning the fourth tetrachord by a descent to B♯, thus:

Ex. 2. 1st Tet. 2d. 3d. 4th. 5th.



About the year 1024 Guido Aretinus proposed the following arrangement, an evident approach toward the modern scale. The hexachords will be seen to be groups of *six* sounds with a diatonic semitone between the third and



fourth notes of each series. The four remaining hexachords are simply repetitions of these three in higher octaves.

The system of hexachords is of no practical use in modern music, being superseded by the simple and natural division of the scale on the normal type of the series of notes forming the octave.

Revised by DUDLEY BUCK.

Hexacoral'lia [Mod. Lat., from Gr. ἕξ, six + κοράλλιον, coral]: an order of Cœlenterates belonging to the class Scyphozoa and the sub-class Anthozoa. In it are included the common sea-anemones and coral polyps in which the parts are arranged in six, or multiples of six. Thus the tentacles are in sixes, while the digestive cavity is divided in the same way in most forms. In their development they pass through a stage where eight is the prevailing number, a fact which leads to the placing of these forms above those forms

(Octocorallia, *q. v.*) in which the number eight is never exceeded. The order *Hexacorallia* is divided into three suborders: (1) Antipatharia, or horn corals, in which the colony forms a horny axis and the mouth is surrounded with either six or twenty-four tentacles, and the septa are similarly arranged, except in *Antipathes*, where but two septa are developed. (2) Madreporaria, the true coral polyps, which play the most important part in the formation of coral reefs. In these the tentacles and septa are very numerous, but always in multiples of six. The polyps are usually in connected groups or colonies (rarely single), and from the outer skin (ectoderm) of the base and sides of the body is secreted the deposit of lime which we know as Coral (*q. v.*). In this can be easily seen the sixfold arrangement of the calcareous septa, which alternate with the fleshy septa of the polyp itself. (3) Actiharia, which differ chiefly from the madreporaria in the absence of all calcareous skeleton. The polyps are usually solitary, and are commonly known as sea-anemones. (See Bunodes, Gemmacea, and Actinidæ.) All the hexacorallia (which are also often called hexactinaria or zoantharia) are marine. J. S. Kingsley.

Hexactinaria: See Hexacorallia.

Hexagonal System: See Crystallography.

Hexam'eter [readapted to Lat. from M. Eng. *exametron*, from Lat. *hexa metrum* = Gr. ἑξάμετρον, neut. of ἑξάμετρος, having six measures; ἕξ, six + μέτρον, measure]: properly *dactylic hexameter*, called also *heroic hexameter*, or *verse*; is the meter used by the Greeks from the earliest times and by the Romans, beginning with Ennius, in epic poetry, such as Homer's *Iliad* and *Odyssey*, and Vergil's *Æneid*. It consists of six feet, as its name suggests. Each of the first four is either a dactyl or a spondee; the fifth is regularly a dactyl, but sometimes a spondee (in which case the verse is called "spondaic"); the sixth always a spondee or trochee. As the last syllable of a verse is "*anceps*," i. e. may be either long or short, it makes no difference in practice whether the last foot of this verse be regarded with some as a spondee (— —), or with others as a trochee (— ⏑), i. e. a catalectic dactyl (— ⏑ ⏑).

The verse consists of two *cola*, or members, and hence always has a verse-cæsura. This cæsura does not fall in the middle (*diæresis*), but falls regularly in the third foot, either (*a*) after the first long ("male" cæsura) or (*b*) between the two short ("female" cæsura), but not rarely (*c*) after the first long of the fourth foot. Sometimes, especially in pastoral poetry, a diæresis (*d*) between the fourth and fifth feet serves as main ("bucolic") cæsura. Accordingly, the general scheme, exhibiting all the main cæsuras simultaneously, is

— ⏑⏑ —⏑⏑ —⏑⏑ —⏑⏑ — ‖⏑⏑‖ — ⏑.

Verses without a cæsura are very rare and inelegant, as are also verses composed entirely of spondees.

The following examples illustrate the special forms the verse may assume:

(*a*) O fōrmōsĕ pŭĕr, ‖ nĭmĭūm nē crēdĕ cŏlōrī.
(*b*) Nīl nōstrī mīsĕrērĕ? ‖ mōrī mē dēnīquĕ cōgēs.
(*c*) Mīrāntūr dōn(a) Ænēæ, ‖ mīrāntūr Īŭlŭm.
(*d*) Insānīrĕ lĭbĕt | quŏnĭām tĭbī, ‖ pōcŭlă pōnăm.
(*Spondaic.*) Pōst vēntō crēscēntĕ ‖ măgīs măgīs ĭnerrĕbēscūnt.

The hexameter, combined with the Pentameter (*q. v.*), formed the Elegiac Distich (*q. v.*).

The hexameter arose from the welding of two shorter series, and traces of the origin are discernible in the Homeric poems, e. g. in

ἀλλ' ἀκέουσα κάθησο, | ἐμῷ δ' ἐπιπείθεο μύθῳ (*Il.*, i., 565), and
νῦν δ' ἄγε νῆα μέλαιναν | Ἐρύσσομεν εἰς ἅλα δῖαν (*Il.*, i., 141).

It is also to be noted that in Homer the cæsura after the short syllable in the third foot, as in the first line of the *Odyssey*,

Ἄνδρα μοι ἔννεπε, Μοῦσα, | πολύτροπον ὃς μάλα πολλά.

is somewhat more common than the break after the long syllable in the same foot, which is the favorite cæsura in Latin, as in the first verse of the *Æneid*:

Arma virumque cano | Troiæ qui primus ab oris.

Not too long to make unity impossible nor so short as to fatigue by repetition, the hexameter is admirably adapted to continuous composition, and the variety of longs and shorts, of breaks and pauses, by allowing the most diverse effects under the same rhythmical movement, has made of the hexameter in classical literature a wonderful vehicle for the conveyance of poetical thought from the majestic roll of the epic to the familiar amble of didactic and satiric verse. The general movement is common to the Indo-Germanic race, and the attempt to naturalize the hexameter in modern language is perhaps due to something deeper than imitation and affectation, but it must be borne in mind that ordinary English hexameters—certainly such as we find in Longfellow's *Evangeline*—are simple stress-verses in which quantity is neglected, often to the utter effacement of the stress itself. See Meter and Rhythm.

Hex'apla [= Gr. (τὰ) ἑξαπλᾶ, neut. plur. of ἑξαπλοῦς, sixfold; ἕξ, six + -πλόος, -fold]: a celebrated edition of the Old Testament presenting the original Hebrew, the Hebrew in Greek letters, the Septuagint, and the Greek versions of Aquila, Symmachus, and Theodotion. Besides these, there were columns containing parts of three other Greek versions, whose authors are not known. Origen was the author of this great work, which he originally prepared as a tetrapla, giving four columns only. The *Hexapla* had also marginal notes, and marks indicating variations, retrenchments, and additions in the texts. The *Hexapla* is not extant except in fragments, of which the most complete edition of the Septuagint fragments is that of the Benedictine Montfaucon (2 vols. folio, Paris, 1714), and F. Field (2 vols., London, 1867–74). Revised by S. M. Jackson.

Hexap'oda [Mod. Lat., from Gr. ἕξ, six + πούς, ποδός, foot]: the name of the group commonly called insects from the fact that they have six appendages adapted for walking. See Entomology. J. S. K.

Hex'ateuch [from Gr. ἕξ, six + τεῦχος, tool, implement, book]: the first six books of the Bible, viz., Genesis, Exodus, Leviticus, Numbers, Deuteronomy, and Joshua—recently so called. The first five of these have long been called the Pentateuch. This name, introduced by early Christian writers, was appropriate, since these five formed a distinct division of the Jewish Scriptures called the Torah or Law, and were believed to have been written by a single author, Moses. Now, however, it is claimed as a well-established result of biblical study that these books were not written by Moses, but that they are a compilation from four principal documents by later writers, and that the book of Joshua belongs with them, the six books forming a literary unit properly entitled the Hexateuch.

The Higher Criticism.—This result has been reached by that form of historical and literary investigation commonly called the higher criticism, whose special object is to ascertain the age and authorship of writings. The principles of this criticism are such as these: A writing can not be earlier than its historical allusions. Marked differences in language, style, and thought, especially when they concur in the treatment of the same subject, imply different writers. Silence concerning a writing under circumstances where it would naturally be mentioned implies its non-existence.

The Beginnings of the Criticism.—Whenever, after the Babylonian captivity, the Jewish canon of Sacred Scriptures was formed, the Pentateuch was received as the work of Moses. This opinion passed into the Christian Church. Early, however, it was noticed that these books contained passages inconsistent with Mosaic authorship. This seems to have been gently expressed by Jerome (d. 420), who said, "Whether you choose to say that Moses was the author of the Pentateuch or that Ezra was the restorer, I have no objections." During the Middle Ages attention was also called to this fact by Jewish scholars, directly by Isaac ben Suleiman (d. 940 A. D.), and obscurely by Ibn Ezra (d. 1167 A. D.). But neither the early centuries nor the Middle Ages were at all favorable to investigations of this nature. Not until the seventeenth century were these passages systematically pressed to their conclusion (although in the previous century Carlstadt (d. 1541), a Protestant scholar, had openly denied the Mosaic authorship of the Pentateuch on the ground of its diction, and Andreas Masius (d. 1573), a Roman Catholic, regarded the apparently post-Mosaic passages insertions by Ezra). Then three writers—Hobbes (d. 1679), the English philosopher, Peyrere (d. 1676), a French Roman Catholic priest, and Spinoza (d. 1677), the distinguished scholar of Jewish race—all about the same time and independently of each other, made these passages a reason for the rejection of the Mosaic authorship.

Passages Inconsistent with Mosaic Authorship.—The leading ones which they presented were these—Gen. xii. 6: "The Canaanite was then in the land." This implies that

the writer wrote after Joshua's conquest, when the Canaanite was no longer in the land. Gen. xiv. 14: "And he pursued as far as Dan." Dan, however, did not receive its name until long after Moses's death. Gen. xxxvi. 31: "Before there reigned any king over the children of Israel." This implies an author after the establishment of the Jewish monarchy. Ex. xvi. 35: "Did eat the manna forty years . . . until they came unto the borders of the land of Canaan." This was after Moses's death (see Josh. v. 12). Deut. i. 1: "Beyond Jordan" must have been written by one west of the Jordan. Deut. ii. 12: "As Israel did unto the land of his possession," i. e. Canaan W. of the Jordan. The references to Og's bedstead (Deut. iii. 11), and to the name Havvoth-jair," with the expression "unto this day" (Deut. iii. 14), and to "the book of the wars of Jehovah" (Num. xxi. 14), could scarcely have been made by Moses. Deut. xxxiv. 10, "And there hath not arisen a prophet since in Israel like unto Moses," and Num. xii. 3, "Now the man Moses was very meek," imply a later or another writer than Moses.

The Pentateuch not Written by a Single Author.—The next phase of the question of the authorship of the Pentateuch arose from the observation (provoked, especially at first, by Richard Simon (d. 1712), an eminent French scholar, sometimes named the father of biblical introduction) of the repetitions, diversity of style, and lack of order in the Pentateuch, which precluded its composition by a single author. The real beginning, however, of scientific investigations in this direction was made by Jean Astruc (d. 1776), a French physician, who, led by the fact that in certain sections of Genesis the name of God is Elohim and in other sections Jehovah, distinguished two principal documents in the book, called the Elohistic and Jehovistic, and their writers the Elohist and the Jehovist. This discovery was confirmed and brought particularly to the attention of German scholars, who have been the most fruitful investigators of this subject, by their countryman Eichhorn (d. 1827). The proof of these documents is seen in the repetitions of Genesis: the double accounts of the creation, Gen. i.–ii. 4^a and ii. 4^b–25; of the cause and announcement of the flood, vi. 9–13 and vi. 5–8; of the summons to enter the ark, vi. 18–21 and vii. 1–3; of entering, vii. 13–16 and vii. 7–9; of the promise not to bring a second flood, ix. 8–17 and viii. 20–22; of the promise of seed to Abraham and the establishment of a covenant, xvii. 1–14 and xv. 1–20; of the promise and name of Isaac, xvii. 15–19 and xviii. 1–15; of the destruction of Sodom, xix. 29 and xix. 1–25; of the expulsion of Hagar, xxi. 8–21 and xvi. 4–13; of the name of Beersheba, xxi. 22–32 and xxvi. 25–33; of Jacob's going to his uncle Laban, xxviii. 1–5 and xxvii. 1–45; of the name Bethel, xxxv. 13–15 and xxviii. 16–19; of Issachar, xxx. 16–18; of Zebulun, xxx. 20; of Joseph, xxx. 23 f.; of Israel, xxxv. 9–10 and xxxii. 22–28. (In this list, where two distinct passages are given, that of the Elohist is placed first.) These double narratives differing in the use of the divine name have also concurrent differences in language, style, and thought, and thus plainly point to two or more writers. Astruc and Eichhorn found two, the Elohist and the Jehovist, with some minor insertions from other sources. They both believed these writers to have been pre-Mosaic, and that Moses had used their productions. Thus the real Mosaic authorship of the Pentateuch was not denied by them. Eichhorn also noticed a lack of orderly arrangement in the contents of the three following books of the Pentateuch.

The Fragmentary Hypothesis of the Pentateuch and the Repetitions in the last Four Books.—The lack of unity in the Pentateuch was next presented by Geddes (d. 1802), Vater (d. 1826), and others in the form of the "fragmentary hypothesis." Its advocates held the Pentateuch to be composed of pre-Mosaic, Mosaic, and post-Mosaic fragments by various authors, which were gradually brought together and finally received their present form near the time of Solomon or as late as the captivity. While this view of many fragments was an extreme one, to its authors belongs the merit of having called attention more particularly to the evidences of a diversity of authorship in the books subsequent to Genesis. Among these are the two accounts of the announcement of the name Jehovah, Ex. vi. 2–7 and iii. 1–15; of Moses and the signs given him, vi. 14–vii. 9 and ii., 1 f., iv. 1–9; of the unleavened bread at the Exodus, xii. 9 and xii. 39; of the name of Moses's father-in-law, of the naming of his son, and of his wife's position in respect to Egypt, xviii. 1–6, and ii. 18–22, iv. 20; of the position of the tabernacle, within the camp, Num. ii. 17, without the camp, Num. xi. 23–27, xii. 4; of the ark, in the midst of the host, Num. x. 11–28, before the host, vs. 33–36.

These books contain also three sets of laws—Ex. xx.–xxiii., Leviticus, with related parts of Exodus and Numbers, and Deut. xii.–xxvi., which not only repeat many enactments but some of them in a decidedly different form. For example: In Ex. xxi. 2–7 the maidservant is not to be released like the manservant, but in Deut. xv. 17^b she is to be treated like the manservant. In Ex. xxii. 31 a torn animal is forbidden to be eaten, but is to be given to the dogs; in Deut. xiv. 21 that dead of itself is forbidden to be eaten, but may be given to the stranger to eat or sold to the foreigner; in Lev. xvii. 15 there is no prohibition, but every one eating of either of these, whether homeborn or stranger, shall simply purify himself and be unclean until the evening. In Deut. xviii. 3 the portion of the priest is "the shoulder, the two cheeks, and the maw"; in Lev. vii. 34 it is "the right thigh or shoulder" and "the wave breast." In Deut. xii. 6, 17 ff., xiv. 22–29 the tithes are eaten by the offerer; in Lev. xxvii. 30–33, Num. xviii. 21–29 they are given to the Levites, who in turn give tithes to the priests. (Further differences are mentioned below.) It was also noticed (by Geddes) that the Book of Joshua is a continuation of the Pentateuch, and thus belonged with the other five books. Subsequent investigations have fully confirmed this view. The casual reader even can not but notice that in language and style the first chapter is thoroughly one with Deuteronomy.

The Supplementary Hypothesis.—The fragmentary hypothesis was soon shown by Ewald (d. 1875) and others to be untenable, contradicting the too plain unity of the Pentateuch, and there was a return to the two writers of Genesis, the Elohist and the Jehovist, or Jahvist, whose work was shown to extend also through the other books of the Hexateuch, except in the case of Deuteronomy, which was naturally assigned to another writer, whose hand was seen in the Book of Joshua. This view was called the "supplementary hypothesis," because the Hexateuch was supposed to have been formed by writers supplementing or adding to one fundamental original writing. This was presented in various forms by many scholars, among whom may be mentioned de Wette (d. 1849), Bleek (d. 1859), Stähelin (d. 1875), Knobel (d. 1863), but generally the agreement was that the oldest document was the Elohistic, usually believed to have been written by a priest of the eleventh or tenth century B. C., containing, however, genuine Mosaic legislation, and then that this work was supplemented by the Jehovistic writer one or two centuries later, whose work was also supplemented in turn by the Deuteronomist (the author of Deuteronomy) living in the seventh century, who also, with the use of earlier Elohistic and Jehovistic material, wrote the Book of Joshua, and possibly was the compiler of the Hexateuch.

The Documentary Hypothesis.—It was soon clearly pointed out, however, especially by Hupfeld (d. 1866), that the Elohistic document was not a unit (this had previously been asserted by Ilgen (d. 1834) and slightly indicated by others), but that in its narrative portions must be recognized the hand of another writer (the younger Elohist) much resembling the Jehovist, and that these two writers had written independently of each other, and that their writings had been combined before their union with the underlying Elohistic or priestly document. This conclusion has been generally accepted, and thus we have the "documentary hypothesis" of the Hexateuch, i. e. the Hexateuch is a compilation from four leading documents: the underlying Elohistic or priestly document, sometimes called the "Priests' Code," and indicated by P; the Jehovistic, J; the other (younger) Elohistic, E; their combination, J E: and the Deuteronomic, D; and the formula of the Hexateuch is (P J E D) R. The letter R represents the final compiler, or editor, *Redacteur* as German writers call him. These letters are used interchangeably for the writers or their writings.

The Leading Characteristics of the Documents.—P: The principal document P is the framework of the Hexateuch, the part exhibiting its unity, and was composed upon a distinct plan. "Not only is the narrative constructed with a careful and uniform regard for chronology, but the history advances along a well-defined line marked by a gradually diminishing length of human life, by the revelation of God under three distinct names—Elohim, El Shaddai, and Jehovah, by the blessing of Adam with its characteristic conditions, and by the subsequent covenants with Noah, Abraham, and Israel, each with its special 'sign'—the rainbow,

the rite of circumcision, and the Sabbath." Wherever possible a concrete picture is given with definite figures and proportions. To P belong the precise measurements of the ark, of the tabernacle, the precise arrangement of the tribes on their march, their census, their exact gifts for the tabernacle, and the definite spoil taken from the Midianites. Its literary style is strongly marked, being rigid, stereotyped, verbose, and repetitious, reminding one constantly of a legal document. The Levitical legislation of the Hexateuch belongs to it.

J, E, and D.—The two writings J and E have much in common. To them belong most of the stories of the Hexateuch. Their style is free, flowing, and picturesque. Both are also prophetic in character. So much are they alike that at times they are with difficulty distinguished. The fact of their separate existence is seen in the repetitions of Genesis mentioned above. The work of the Deuteronomist appears plainly in the books of Deuteronomy and Joshua, and requires no further description than to observe its hortatory style. Save possibly in the case of a few verses, it is confined to these two books.

The Limits of the Documents.—In respect to the limits of these documents those accepting them are in some minor details not agreed, although they are in respect to their general outlines. Some parts of the Hexateuch are with difficulty assigned to any of the four writers. There is a tendency among some scholars to refine this criticism excessively, and to point out beside P, J, E, D, and R, P^1 P^2, J^1 J^2, E^1 E^2, D^1 D^2, R^1 R^2, etc. Such results, however, must be received with caution, for while a compiled or frequently re-edited literary product of great antiquity like the Hexateuch must necessarily contain the work of many writers, it is a very difficult and delicate process to point them all out.*

* The following analysis of the Hexateuch is taken from Driver's *Old Testament Introduction*, and is fairly representative:

P = Genesis i., 1—ii., 4^a. v., 1–28. 30–32. vi., 9–22. vii., 6. 7–9 (in parts). 11. 13–16^a. 18–21. 24. viii., 1–2^a. 3^b–5. 13^a. 14–19. ix., 1–17. 28–29. x., 1–7. 20. 22–23. 31–32. xi., 10–27. 31–32. xii., 4^b–5. xiii., 6. 11^b–12^a. xvi., 1^a. 3. 15–16. xvii., xix., 29. xxi., 1^b. 2^b–5. xxiii., xxv., 7–11^a. 12–17. 19–20. 26^b. xxvi., 34–35. xxvii., 46—xxviii., 9. xxix., 24. 29. xxxi., 18^b. xxxiii., 18^a. xxxiv., 1–2^a. 4. 6. 8–10. 13–18. 20–24. 25 (partly). 27–29. xxxv., 9–13. 15. 22^b–29. xxxvi.,* xxxvii., 1–2^a. xli., 46. xlvi., 6–27. xlvii., 5–6^a (LXX). 7–11. 27^b–28. xlviii., 3–6. 7 ? xlix., 1^a. 28^b–33. l., 12–13.

Exodus i., 1–7. 13–14. 23^b–25. vi., 2—vii., 13. 19–20^a. 21^b–22. viii., 5–7. 15^b–19. ix., 8–12. xii., 1–20. 28. 37^a. 40–51. xiii., 1–2. 20. xiv., 1–4. 8–9. 15–18. 21^a. 21c–23. 26–27^a. 28^a. 29 (xv., 19).† xvi., 1–3. 6–24. 31–36. xvii., 1^a. xix., 1–2^a. xxiv., 15–18^a. xxv., 1—xxxi., 18^a. xxxiv., 29–35. xxxv.—xl.

Leviticus i.—xxvii.

Numbers i., 1—x., 28. xiii., 1–17^a. 21. 25–26^a (to *Paran*). 32^a. xiv., 1–2.* 5–7. 10. 26–38.* xv., xvi., 1^a. 2^b–7^a. (7^b–11). (16–17). 18–24. 27^a. 32^b. 35. (36–40). 41–50). xvii.—xix., xx., 1^a (to *month*). 2. 3^b. 6. 12–13. 22–29. xxi., 4^a (to *Hor*). 10–11. xxii., 1. xxv., 6–18. xxvi.—xxxi., xxxii., 18–19. 28–32.‡ xxxiii.—xxxvi.

Deuteronomy xxxii., 48–52. xxxiv. 1^a. 8–9.

Joshua iv., 13. 19. v., 10–12. vii., 1. ix., 15^b. 17–21. xiii., 15–32. xiv., 1–5. xv., 1–13. 28–44. 48–62. xvi., 4–8. xvii., 1^a. (1^b–2), 3–4. 7. 9^a. 9^c–10^a. xviii., 1. 11–28. xix., 1–8. 10–46. 48. 51. xx., 1–3 (except "*and* unawares"). 6^a (to *judgment*). 7–9 [cf. LXX]. xxi., 1–42 (xxii., 9–34).

J = Genesis ii., 4^b–iii., 24. iv., 1–26. v., 29. vi., 1–4. 5–8. vii., 1–5. 7–10 (in the main). 12. 16^b–17. 22–23. viii., 2^b–3^a. 6–12. 13^b. 20–22. ix., 18–27. x., 8–19. 21. 24–30. xi., 1–9. 28–30. xii., 1–4^a. 6–20. xiii., 1–5. 7–11^a (to East). 12^b (from *and moved*)—18. xvi., 1^b–2. 4–14. xviii., 1–xix., 28. 30–38. xxi., 1^a. 2^a. 33. xxii., 15–18. 20–24. xxiv., xxv., 1–6. 11^b. 18. 21–26^a. 27–34. xxvi., 1–14. (15). 16–17. (18). 19–33. xxvii., 1–45. xxviii., 10. 13–16. 19. xxix., 2–14. 31–35. xxx., 3^b–5. 7. 9–16. 20^b (*now . . . sons*). 24–xxxi., 1. 3. 46. 48–50. xxxii., 3–18^a. 22. 24–32. xxxiii., 1–17. xxxiv., 2^b–3. 5. 7. 11–12. 19. 25 (partly). 26. 30–31. xxxv., 14. 21–22^a. xxxvii., 12–21. 25–27. 28^b (to silver). 31–35. xxxviii., xxxix., xlii., 38–44. 34. xlvi., 28–xlvii., 4. 6^b. 12–26. 27^a (to Goshen). 29–31. xlix., 1^b–28^a. l., 1–11. 14.

Exodus iii., 7–8. 16–20. iv., 1–16. 19–20^a. iv., 22–vi., 1. vii., 14–18. 23. 25. viii., 1—4. 8–15^a. viii., 20–ix., 7. 13–21. 23^b–34. x., 1–7. 13^b–19. 28–29. xi., 4–8. xii., 29 f. xiii., 21 f. xiv., 5–7. 10^a (to *afraid*). 11–14. 19^b–20. 21^b (to *dry land*). 24–25. 27^b. 30–31. xvi., 4–5. 25–30. xvii., 1^b–2. xix., 20–25. xx., 22–xxiii., 33. xxiv., 3–8.

E = Genesis xx., 1—17. (18). xxi., 6–32^a. (32^b). (34). xxii., 1–14. 19. 28. 11–12. 17–18. 20–22. xxix., 1. 15–23. 25–28. 30. xxx., 1–3^a (to *knees*). 6. 8. 17–20^a. 20^c–23. xxxi., 2. 4–18^a. 19–45. 47. 51—xxxii., 2. 13^b–21. 23. xxxiii., 18^b–20. xxxv., 1–8. 16–20. xxxvii., 2^b–11. 22–24. 28^a (to *pit*). 28^c–30. 36. xl. xli., 1—45. 47–57. xlii., 1–37. xlv., 1–xlvi., 5. l., 15–26.

Exodus i., 8–12. 15–22. ii., 1–23^a (to *died*). iii., 1–6. 9–15. 21–22. iv., 17–18. 20^b–21. vii., 17 (partly). 20^b–21^a (to *river*). 24. ix., 22–23^a. 24^a. 35. x., 8–13^a. 14^a. 20–27. xi., 1–3. 9–10. xii., 31–36. 37^b–39. xiii., 17–19. xiv., 10^b. 19^a. xv., 1–18. 20–21. xvii., 3–6. 8–16. xviii. xix., 2^b. 3–19. xx., 1–21. xxiv., (1–2). (9–11). 12–14. 18^b. xxxi., 18^b. xxxii., 1–8. 15–29. 30–xxxiii., 6 (in the main). 7–11. Joshua xxiv., 1–11^a. 11^c. 12. 14–30. 32–33.

J E (passages which are from this source and yet can not be with confidence separated into component parts or assigned to either J or E) = Genesis (xiv.). xv. xlviii., 1–2. 8–22. Exodus xii., 21–27. xiii., 3–16. xv., 22–27. xxxii., 9–14. xxxiii., 12–xxxiv., 28. Numbers x., 29–36. xi. xii. xiii., 17^b–20. 22–24. 26^b–31. 32^b–33. xiv., 3–4. 8–9. 11–25. 39–45. xvi., 1^b–2^a. 12–15. 25–26. 27^b–34. xx., 1^b. 3^a. 4–5. 7–11. 14–21 xxi., 1–3. 4^b–9. 12–35. xxii., 2–c. 24. xxv., 1–5. xxxii., 1–17 (in the main). 20–27 (in the main). 34–42. Deuteronomy xxvii, 5–7^a. xxxi., 14–22. xxxii., 1—43. 44. xxxiv., 10. Joshua ii., 1–9. 12–24. iii., 1. 5. 10–iv., 11^a. 15–18. 20. v., 2–3. 8–9. v., 13–vi., 27. vii., 2–26. viii., 1–29. ix., 3–9^a. 11–15^a. 16. 22–23. 26–27^a (to *day*). x., 1–7. 9–11. 12^b–14^a. 15–24. 26–27. xi., 1–9. xiii., 13. xv., 14–19. 45–47. 63. xvi., 1–3. 9–10. xvii., 5. (6). 8. 9^b. 10^b–18. xviii., 2–6. 8–10. xix., 9. 47. 49–50.

D = Deuteronomy i.–xxvi. xxvii., 1–4. 7^b–8. 9–10. 11–13. (14–26). xxviii. xxix.–xxx. xxxi., 1–13. 23–30. 45–47. (xxxiii.). xxxiv., 1^b–7 (in the main). 11–12. Joshua i. ii., 10–11. iii., 2–4. 6–9. iv., 11^b–12. 14. 21–24. v., 1. 4–7. viii., 30–35. ix., 1–2. 9^b–10. 24–25. 27^b. x., 8. 12^a. 14^b. 25. 28–43. xi., 10–23. xii. xiii., 1–12. 14. 33. xiv., 6–15. xviii., 7. xx. (4–5). (6^b). xxi., 43–45. xxii., 1–6. (7–8). xxiii. xxiv., 11^b (to *Jebusite*). 13. 31.

* In the main.

† The verses and chapters placed in parentheses appear due to the compilers, or their assignment is doubtful, or they are from other independent sources.

‡ With traces in xxxii., 1-17. 20-27.

The Dates of the Documents.—The history of the criticism of the Hexateuch has been traced thus far with only slight allusion to the dates given its various parts, and to the bearing of the history of Israel on this problem. That the Hexateuch has been proved to belong to a much later age than that of Moses we have already indicated. Especially fruitful in this proof were the investigations of de Wette and Ewald. Until recently P, as we have seen, was regarded as the oldest portion. Now, however, the majority of critics regard it as the latest. The reason for this change of view is obvious. The criticism which discovered the documents was primarily literary. They were discovered by literary features—differences in language, style, and thought. Their date, however, so unchanging was the Hebrew language, must be primarily determined by their relation to the history and literature of Israel. In the examination made from this point of view a corresponding development in the three legal codes of the Hexateuch and in the history and literature of Israel has been observed. (The researches of Graf (d. 1869), Kuenen (d. 1892), and Wellhausen are noteworthy in connection with this.) The legislation of J E (Ex. xx.–xxiii.) is the simplest, that of D next, and that of P the most elaborate and complex. Graded differences exist in many laws, especially those concerning the sanctuary and priests. J E allows sacrifice at different places (Ex. xx. 24); D insists, as though it were an innovation, upon one place (Deut. xii. 5 ff., 13 f., 26, *et al.*); while P treats the matter as though there always had been only one, or that only one were possible (Lev. xvii. 1–9). J E makes no provision for a priesthood, but apparently assumes that an Israelite of any tribe might perform that office. D assigns the duties of the priesthood to the Levites. P draws a sharp line of distinction between other Levites and the sons of Aaron, who alone could be priests. D represents the Levites as poor, the recipients of charity, P as well endowed with cities and pastures, and the recipients of a stated revenue, the tithes. Similar differences in respect to the regulations concerning tithes, offerings, and feasts also appear. An examination of the historical books—Judges, Samuel, and Kings—reveals a corresponding development in the history of Israel. In the early times sacrifices were not confined to one place. This was not attempted until the reigns of Hezekiah and Josiah. But during the exile and after nothing else was thought of. In the early times the functions of the priesthood were performed by others than Levites. (Samuel, according to the earliest account, was not a Levite, and David's sons were priests, 2 Sam. viii. 18.)

The literature of Israel gives a similar testimony. In the writings of the early prophets Amos, Hosea, and Isaiah, there is no clear acquaintance with any other history or legislation than that of J E, while Jeremiah and the books of Kings, probably both of the same date, show a manifest acquaintance with D, and Ezekiel and the post-exilic literature generally, especially Chronicles, show a marked acquaintance with P, being thoroughly of its spirit. Another line of evidence for the late date of P is seen in the ideal character of its historical portions, in which particular it strikingly resembles Chronicles. Instead of being the most trustworthy portion of the Hexateuch, P has on critical examination been proved to be the least reliable in its historical statements; inferentially, then, it is the latest of all the documents.

Hence the conclusion has been reached that the order of the documents is (J E) D, P. J and E are regarded not later than 750 B. C. Their tone is that of the prophets of this period. They may, however, be one or more centuries earlier, but their post-Mosaic passages show that they are later than the period of the conquest of Canaan. D is not later than 621, the eighteenth year of the reign of Josiah, for it was clearly the book of the law, or in the book discovered at that time (Josiah's reform was carried out step by step according to the prescriptions of D, 2 Kings xxiii.). It may, however, be as early as the reigns of Manasseh or Hezekiah,

but it follows J E, for its narrative and laws are clearly based upon J E. P is, then, a product of the exilic or post-exilic period. Some (Dillmann, Schrader, Nöldeke, and others), however, place P earlier than D, holding that while the exilic or post-exilic period exhibits the influence of this legislation in a marked manner, the time for its composition is earlier, yet after the centralization of worship at Jerusalem through Solomon's temple, whose priests must be recognized as the authors of P. Within P is recognized, in Lev. xvii.–xxvi., a distinct code of laws older than the remaining portions, called from their subject-matter the "laws of holiness," and designated by H.

The Contents of the Documents Earlier than their Dates.—These dates do not, however, necessarily represent the periods of the origin of all the laws and beliefs contained in the documents. These in many particulars may be much older, some extending back to the time of Moses. These dates rather express the periods of the closing of codes which were gradually formed and were for a long time open.

Opposition to Modern Views of the Hexateuch.—The views of the Hexateuch, whose rise and progress have been sketched, have been controverted from the first by Carpzov (d. 1767), Michaelis (d. 1791), Hävernick (d. 1845), Hengstenberg (d. 1869), Keil (d. 1888), and others, and both in the U. S. and in Great Britain a goodly number of biblical scholars hold to the traditional opinion of the unity and Mosaic authorship of the Pentateuch. They present in its behalf (*a*) the unbroken Jewish and Christian tradition; (*b*) the fact of the Samaritans having the Pentateuch, received, it is said, from the ten tribes who must have obtained it before the division of the kingdom, about 975 B. C.; (*c*) the acquaintance of the author of Genesis and Exodus with Egypt; (*d*) the local coloring of the desert in P and the historical coloring of the conquest in D (for example the command to exterminate the Canaanites); (*d*) the testimony of the historical and prophetical books to the history and laws of the Pentateuch; (*e*) the unity of the Pentateuch, pointing to one master mind as its composer; and (*f*) the accuracy of the Pentateuch as confirmed by modern researches in archæology and geography. And in reply to the evidence presented for the post-Mosaic authorship and documentary character of the Hexateuch it is argued: (*g*) the alleged post-Mosaic statements arise either from glosses or have been misunderstood; (*h*) the appearance of different documents is due either to documents used by Moses, different occasions and purposes of writing, or the use of amanuenses or scribes on his part; and (*i*) also in many cases their appearance is forced upon the narratives by the arbitrary process of selecting their criteria beforehand; (*j*) the differences in the codes are due to their different purposes, and to the experience of the forty years in the wilderness: the code of J E was the first rough draft of legislation given at Sinai for immediate use; P was a technical code designed especially for the priests; D was a people's code embodying changes suggested by the forty years' experience, and designed for use only after the permanent conquest and settlement of Canaan; (*k*) the neglect of D and P during Israel's early history arose not from their non-existence, but from the unsettled condition of affairs, which forbade their enforcement, and from the backsliding and failure of the people to live up to their requirements; (*l*) the correspondence between the literature of periods and certain parts of the Hexateuch arises merely from the attractiveness of those parts for the writers of those periods; (*m*) the apparent unhistorical character of portions of the Pentateuch is due to our ignorance, our ignoring the supernatural element in Israel's history, or to copyist's errors; (*n*) and finally the introduction of laws in the name of Moses and in the setting of the wilderness at a later age implies a fraud and deliberate deception inconsistent with the moral and spiritual tone of those laws and the character of the religious leaders in Israel.

Observations on the Argument for the Mosaic Authorship and Unity of the Pentateuch.—In regard to the points mentioned above it may be said: (*a*) Jewish and Christian traditions have often proved erroneous; (*b*) the Samaritans probably received their Pentateuch through the priest Manasseh (Josephus, *Ant.*, xi., 8) about 430 B. C.; (*c*) there was close intercourse with Egypt during many periods of Israel's history; (*d*) the local coloring of the desert in P and the historical of the conquest in D arise either from traditions and formulas coming down from those periods, or have been reproduced in good faith by later writers; (*d*) the testimony of the historical and prophetical books, as shown above, is not to the Pentateuch as a whole, and, properly considered, confirms the documentary theory; (*e*) the unity of the Pentateuch arises from the extent of P, and with this unity is a diversity proving two or more authors; (*f*) this accuracy has no bearing on *Mosaic* authorship or unity; (*g*) (*h*) (*i*) (*j*) (*k*) (*l*) (*m*), while apparently plausible, are inadequate explanations of the facts of the Hexateuch, of Israel's history and literature, and their relations to each other; (*n*) arises from a misunderstanding of the nature of ancient law: the promulgation of later laws, carrying forward or developing more ancient ones, in the name of an ancient law-giver, implies no fraud or deception, but is a necessary device, in early periods of civilization, to preserve the continuity of law; and likewise the beginnings of later institutions are in good faith assigned to early periods.

The problem of the authorship, composition, and date of the Hexateuch (Pentateuch) is thus seen to be very complex. These books present a great variety of phenomena, and that hypothesis is to be accepted which, taking all the facts into consideration, sets forth their most probable explanation. The conclusion is reached by different lines of evidence and by their cumulative force.

LITERATURE.—The literature on this subject is very voluminous. For a list of over 2,000 titles, see Bissell's *The Pentateuch, its Origin and Structure* (New York, 1885). The following are a few of the more important works, which will serve to introduce the reader to this subject: (*a*) Works favoring modern critical views: Introductions to the Old Testament by de Wette (trans. 1843); Davidson (1862–63); Bleek (trans. 1875); and Driver (1891). This last is especially to be commended. Colenso's *The Pentateuch and Book of Joshua Critically Examined* (1862, part i.; 6th ed. 1873), for treatment of historical questions. Ewald's *History of Israel* (trans. 1869), vol. i.; Wellhausen's *History of Israel* (trans. 1885), an epoch-making book in presenting the relation of the codes to the history and literature of Israel; Kuenen's *The Origin and Composition of the Hexateuch* (trans. 1886); Bacon's *Genesis of Genesis* (1892); and *The Triple Tradition of the Exodus* (1894). In these last two works Genesis and the story of the exodus are printed in different kinds of type to represent the documents. Briggs's *The Higher Criticism of the Hexateuch* (1893); a good explanation of the subject and history of the criticism. (*b*) Works defending the traditional view of the Pentateuch: Hengstenberg's *Genuineness of the Pentateuch* (trans. 1848); Hävernick's *Introduction to the Pentateuch* (trans. 1850); Green's *The Pentateuch Vindicated from the Aspersions of Bishop Colenso* (1863); Keil's *Introduction to the Old Testament* (trans. 1869); Green's *Moses and the Prophets* (1883), containing a reply to W. R. Smith's *The Old Testament in the Jewish Church*; Bissell's *The Pentateuch, its Origin and Structure* (1885), an examination of the codes to vindicate their Mosaic origin; Cave's *Inspiration of the Old Testament* (1888) contains a constructive theory of a Mosaic Pentateuch; Green's *Hebrew Feasts* (1883), directed especially against the argument of Wellhausen. (*c*) Works marking epochs in the historical criticism and the analysis of the Hexateuch: Spinoza's *Tractatus Theologico-Politicus* (Hamburg, 1670; republished in England, 1863); Astruc's *Conjectures sur les Mémoires Originaux, dont il paroit que Moyse s'est servi pour composer le Livre de la Genèse* (Brussels, 1753); Eichhorn's *Einleitung in d. Alte Testament* (1st ed. Leipzig, 1780); Vater's *Commentar über den Pentateuch* (Halle, 1802); de Wette's *Dissertatio critico-exegetica qua Deuteronomium a Prioribus Pentateuchi Libris Diversum alius cujusdam Recentioris Auctoris Opus est Demonstratur* (Jena, 1805); Ewald's *Die Composition d. Genesis kritisch untersucht* (Brunswick, 1823); Hupfeld's *Die Quellen der Genesis* (Berlin, 1853); Knobel, *Die Genesis erklärt* (Leipzig, 1852); *Exodus und Leviticus* (1857); *Numbers, Deuteronomy, und Joshua* (1861); Graf's *Die geschichtliche Bücher des Alten Testaments* (Leipzig, 1866); Colenso's *The Pentateuch and Book of Joshua Critically Examined* (part i., London, 1862); Nöldeke's *Untersuchungen zur Kritik d. Alten Testaments* (Kiel, 1869); Kuenen's *Die Godsdienst van Israel* (2 vols., Haarlem, 1869–70; English trans. 1874); Wellhausen's *Prolegomena zur Geschichte Israels* (Berlin, 1883; English trans. 1885). EDWARD L. CURTIS.

Heyne, hīne, CHRISTIAN GOTTLOB: classical scholar; b. in Chemnitz, Germany, Sept. 25, 1729. On the recommendation of Ruhnken, he was called in 1763 to succeed Gesner at Göttingen, where he remained for fifty years till his death in 1812, during which time he succeeded in raising the reputation of the university throughout Europe. Though

once occupying the position of a philological pope, owing to his activity as a reviewer (he wrote more than 1,000 reviews) and an author, his fame declined with the appearance of the *Prolegomena* of F. A. Wolf. Heyne possessed neither the critical acumen nor the constructive genius of his great pupil, but he was the first scholar to attempt a serious and scientific explanation of Greek mythology, and, while his writings are now quite forgotten, the stimulus which he gave to philological studies generally entitles him to an honorable place in the pantheon of classical scholars. His most notable works of the many that proceeded from his untiring pen were the chiefly exegetical editions of Vergil (1775; 4th ed., by Ph. Wagner, 1833), and Homer's *Iliad*, in 8 vols. (1802), with indexes by Gräfenhan, vol. ix. (1822), to which may be added his edition of Pindar (1798, in 5 vols.), and *Opusc. Academ.* (6 vols.). See Heeren, *Christian Gottlob Heyne* (Göttingen, 1813); Hand, *Allgem. Encycl. der Wissensch. u. Künste*, sect. ii., vol. vii., p. 369 ff.; Bursian, *Allgem. deutsch. Biographie*, vol. xii., 375 ff.; and Carlyle, *On the Life of Heyne*. ALFRED GUDEMAN.

Heyse, PAUL: poet and novelist; b. in Berlin, Germany, Mar. 15, 1830. The son of Karl Wilhelm Heyse, a university professor and distinguished philologist, he was familiar from early youth with the best scholars and writers of Berlin. He studied under Lachmann and Boeckh, then went to Bonn, working there on the Romance languages under Diez. In 1849 and again in 1852 he journeyed to Italy, on the latter occasion ostensibly to study manuscripts in the libraries. In truth, however, he got more imaginative than philological profit therefrom. In 1854 he went to Munich, being given a place with a salary at the court of art-loving King Max. There he has since lived, though he gave up his public place and salary in 1868. Heyse's scholarly training has chiefly shown itself in translation, of which he is one of the greatest living masters in Germany. (Cf. particularly his versions of Giuseppe Giusti, 1875, and Giacomo Leopardi, 1878.) Far more important, however, is his original work. As early as 1847 his anonymously published *Jungbrunnen, neue Märchen von einem fahrenden Schüler* showed the hand of the born writer. After his return from Italy he began tentatively, and at first not altogether successfully, to produce plays, of which the list is now long: *Francesca da Rimini* (1850); *Meleager* (1854); *Die Sabinerinnen* (1859); *Ludwig der Bayer* (1862); *Elisabeth Charlotte* (1864); *Maria Moromi* (1865); *Hadrian* (1865); *Hans Lange* (1866); *Kolberg* (1868); *Ehre um Ehre* (1875); *Graf Königsmark* (1876); *Elfriede* (1877); *Die Weiber von Schorndorf* (1881); *Alcibiades* (1883); *Don Juans Ende* (1883); *Das Recht des Stärkern* (1883); *Die Hochzeit auf dem Aventin* (1886); *Getrennte Welten* (1886). At the same time that he was writing these plays Heyse was producing much else both in verse and prose. And here his success has been, on the whole, far greater. As a playwright he is too delicate, too fanciful, too poetic. He has not the gift of bringing upon the stage flesh-and-blood men and women; and his dramas suit better the library than the theater. As a romancer, however, he succeeds admirably, finding abundant opportunity for his imagination, and yet giving the reader the feeling of life and of truth to nature. His earlier tales were in verse: *Die Brüder* and *Urica* (1852); *Die Braut von Cypern* (1856); and he has always affected this *genre*, of which perhaps the best representative among his works is the romantic narrative *Thekla* (1858). In 1863 he published his *Gesammelte Novellen in Versen*; in 1867, *Syritha*; in 1879, *Die Madonna im Oelwald*. He speedily tried his hand, however, at *Novellen* in prose; and from 1855, when the first collection of these appeared, down to 1886, no less than eighteen volumes of them were published. In all his tales Heyse shows great literary power. His style is often very beautiful, and he has the rare art of giving to every piece its own atmosphere, its own inner *raison d'être*. Often, to be sure, his themes are remote from the moral purposes of the actual world, but when this is not the case—for example, in *Marion* or *La Rabbiata*—his success is complete. The *Tendenz* element in Heyse, however, has been too strong to be kept out of sight. Essentially a modern pessimist, an intellectual follower of Strauss in religion, and of Schopenhauer in philosophy, he has striven to find a faith for himself in the service of beauty, and has not hesitated to show his scorn of the conventional beliefs of others. All this appears in his two longer romances, *Die Kinder der Welt* (1873) and *Im Paradiese* (3 vols., 1875). Both are written with rare ability, and have found multitudes of readers; but few imaginative productions of modern Germany have caused more bitter discussion. Besides all these works, we must mention three collections of poems: *Das Skizzenbuch* (1877); *Der Salamander, ein Tagebuch in Terzinen* (1879); and *Verse aus Italien* (1880). Heyse's *Gesammelte Werke* have been appearing in Berlin since 1871 (twenty-one volumes up to 1886). A. R. MARSH.

Heyward, hā'ward, THOMAS, Jr.: a signer of the Declaration of Independence; b. in St. Luke's parish, S. C., in 1746; the son of a wealthy planter, Col. Daniel Heyward. The son studied law in London, and was early and prominently connected with the Revolutionary movement in North Carolina. He was (1775–78) a delegate to Congress, and was afterward a judge in his native State, holding also a military command. He was (1780–81) a prisoner in the hands of the British at St. Augustine. He was a member of the constitutional convention of 1790. D. in St. Luke's parish, Mar. 6, 1809.

Heywood: town of England; in Lancashire, on the Roach; 9 miles N. of Manchester (see map of England, ref. 7-G); has large iron-foundries and extensive manufactures of cotton fabrics, woolens, machinery, and chemicals. Pop. (1891) 23,286.

Heywood, THOMAS: English dramatist and miscellaneous writer from the latter part of the sixteenth and the first part of the seventeenth century; the exact dates of his birth and death are not known. He was born in Lincolnshire and educated at Cambridge. At one time he was a member of the lord admiral's company of players. The first of his dramas, so far as known, dates from 1596; the last from 1655. Twenty-three dramas by him have come down to us (*A Woman Killed with Kindness* (1607); *Fortune by Land and Sea* (1655); *The English Traveler*, *The Fair Maid of the West* (1631), etc.); they were printed by the Shakspeare Society in 1874 (6 vols.) with notes and illustrations. Besides dramas, he wrote *Troia Britannica*, containing a universal chronicle from the creation of the world to the date of publication (1609); *An Apology for Actors* (1612); *England's Elizabeth: Her Life and Troubles from the Cradle to the Crown* (1631); *The Hierarchy of the Blessed Angels* (1635); *The Life of Merlin, surnamed Ambrosius* (1641), etc.

Hezeki'ah [Heb., strength of the Lord]: the thirteenth monarch of Judah; son and successor of Ahaz, a devout man, a severe enemy of idolatry, and the restorer of the ancient worship. He warred successfully against the Philistines, and refused to pay the tribute established by Tiglath-Pileser, King of Assyria. According to the biblical data, his twenty-nine years were B. C. 723 to 695 inclusive, the numerals given in the marginal Bibles being, for his reign, too large by three. The Assyrian records treat of this period very fully (see Schrader's *Cuneiform Inscriptions*, and other like works), and opinions differ as to the order of the history; but the following cast harmonizes all the known facts. In Isaiah xxxvi.–xxxvii., 2 Kings xviii.–xix., we have an account of Hezekiah's relations to Sennacherib from before Hezekiah's fourteenth year, 710 B. C., to the death of Sennacherib, 681 B. C., six years after that of Hezekiah. In Isaiah xxxviii.–xxxix., 2 Kings xx., is an account of the illness of Hezekiah, 710 B. C. The chronological place for this account would be just before Isaiah xxxvi. 2, 2 Kings xviii. 17, with which verses begin an account of events which the Assyrian records date in 701 B. C. and later.

Sargon captured Samaria and reimposed tribute 722 B. C. He captured and destroyed Samaria, after three years' siege, 718 B. C. He conquered Hezekiah's Philistine allies 711 B. C. The following year he marched to Babylon, but his son Sennacherib captured the cities of Judah, and imposed a fine of 300 talents of silver and 30 of gold, 2 Kings xviii., 13–16. Later, in 701 B. C., Sennacherib again invaded Judah, proposing to deport the inhabitants, 2 Kings xviii. 32. He was diverted from laying siege to Jerusalem by the approach of Tirhakah, 2 Kings xix. 9. He defeated Tirhakah, but was compelled by circumstances to return to Nineveh, and therefore compromised with Hezekiah, receiving from him a tribute which included 800 talents of silver and 30 of gold. At some subsequent time and place not mentioned, Jehovah's angel destroyed the 185,000. (The deliverance was not to be sudden, but was to occupy more than a year, 2 Kings xix. 29–30. "That night," therefore, verse 35, does not mean the night after the prophecy was uttered, but means that night, whenever it was, when Jehovah fulfilled his threat.) Except during these two periods of invasion, the reign of Hezekiah appears to have been, in the main, peaceful and prosperous. WILLIS J. BEECHER.

Hiawatha, hī-a-waa'tha: city; capital of Brown co., Kan. (for location, see map of Kansas, ref. 4–J); on the Mo. Pac. and the St. J. and Gr. Is. railways; 42 miles W. of St. Joseph. It is in an agricultural and stock-raising region, and has several grain elevators, steam flour-mill, four periodicals, an academy, and a public library. Pop. (1880) 1,375; (1890) 2,486; (1895) 3,062. EDITOR OF "WORLD."

Hibernation, or **Hybernation** [from Lat., deriv. of *hiberna're*, hibernate, pass the winter, deriv. of *hiber'nus*, belonging to winter, deriv. of *hi'ems*, winter]: a condition into which certain mammals (such, for example, as some of the bats, rodents, insectivores, bears, etc.) and many inferior animals, both vertebrate and invertebrate, pass in cold weather, the temperature of the blood being lowered nearly to that of the air, and many of the vital functions entering a state of abeyance. The power of the will over the muscles is quite suspended, and respiration is nearly abolished, while the muscular irritability in the case of the higher hibernating animals is remarkably increased. Meanwhile a very great loss of weight occurs from the slow destruction of the store of fat which the animal has laid up in the autumn. It is evident that animals feeding on insects and succulent vegetables could never survive a northern winter but for the state of hibernation which suspends the need of food. Accordingly, while northern bats and some bears hibernate, those of tropical regions do not.

Somewhat analogous to hibernation is the long slumber which many reptiles, mollusks, and other inferior organisms undergo during the dry season in very hot countries. The animal becomes more or less completely desiccated, and from the loss of moisture the functions of life are suspended. This suspension also serves to preserve animal life in very untoward conditions. Revised by F. A. LUCAS.

Hiber'nia, **Iber'nia**, **Iver'nia**, and **Ier'ne**: the names under which Ireland is mentioned by the ancient writers—by Aristotle, Diodorus Siculus, Strabo, Pomponius Mela, Pliny, and Ptolemy. See IRELAND.

Hibis'cus [Mod. Lat., from Lat. *hibis'cus* = Gr. *ἰβίσκος*, mallow]: a large genus of malvaceous trees, shrubs, and herbs, often with large and showy flowers. The herbaceous species are numerous in the U. S., and are known as rose-mallows. Among the cultivated species are the GUMBO (*q. v.*), the *H. cannabinus*, or Deccanee hemp of India, a useful fiber-plant, and *H. syriacus*, the ornamental, shrubby althæa of gardeners. Other species, mostly tropical, are cultivated for their fruit or seeds or the beauty of their flowers. One of the most interesting species is *Hibiscus tiliaceus*, a very large but not tall tree, growing in Florida, the East and West Indies, and the South Sea islands. Its wood is light, tough, and very useful; its bark yields material for matting and cordage, and the same bark is used as food in the Pacific islands. Revised by CHARLES E. BESSEY.

Hiccough, hik'kŭp, or **Hiccup** (in Lat. *singultus*): a clonic spasm of the diaphragm and of the glottis, accompanied by a sharp sound, produced by the rush of air into the larynx from without. It may attend an over-distension of the stomach with food, and sometimes accompanies intoxication. In young children it often is the forerunner of intestinal disturbances. When persistent, it is, in some diseases, such as low fevers, peritonitis, and gangrene, a rather grave symptom. Lumps of ice frequently swallowed or small doses of antispasmodic medicines will usually relieve obstinate hiccough. Revised by WILLIAM PEPPER.

Hickman: town; capital of Fulton co., Ky. (for location of county, see map of Kentucky, ref. 5–B); on the Mississippi river, and the Nash., Chat. and St. L. Railway; 36 miles S. of Cairo, 56 miles S. W. of Paducah. It contains a college, town library, steam flour-mills and sawmills, two stove-factories, carriage and wagon factory, box-factory, and weekly newspapers. Pop. (1880) 1,264; (1890) 1,652; (1893) estimated, 2,219. EDITOR OF "COURIER."

Hick'ok, LAURENS PERSEUS, D. D., LL. D.: theologian and philosopher; b. at Bethel, Conn., Dec. 29, 1798; graduated at Union College 1820; ordained and settled as pastor of the Congregational church at Kent, Conn., 1824; installed pastor at Litchfield, Conn., 1829; became Professor of Theology in the Western Reserve College 1836, and in the Auburn Theological Seminary 1844; was again transferred to Union College as vice-president and Professor of Mental and Moral Philosophy 1852, where for eight years he was associated with Dr. Nott in the government and discipline of the college, and where for the eight years succeeding he had sole charge, being officially inducted into the presidency only at Dr. Nott's death, 1866. Besides occasional sermons and addresses, he was a frequent contributor to such periodical publications as *The Christian Spectator*, *Bibliotheca Sacra*, *Biblical Repository*, *Presbyterian Quarterly*, etc., on various theological and philosophical themes. His more extended published works are *Rational Psychology* (Auburn, N. Y., 1848); *System of Moral Science* (Schenectady, 1853); *Empirical Psychology* (1854); *Creator and Creation* (Boston, 1872); *Humanity Immortal* (1872); and *Logic of Reason* (1875). His collected works were published at Boston in 1875. D. at Amherst, Mass., May 6, 1888.

Revised by S. M. JACKSON.

Hickory [shortened from earlier *pohickery*, the Amer. Ind. word]: the common name of trees of the genus *Hicoria*, or *Carya* (of the family *Juglandaceæ*) often erroneously called walnut-trees in New England. The hickory-trees are North American. Besides the PECAN (*q. v.*), there are four species known as shellbark or shagbark hickories, having excellent timber and nuts generally edible, the bark of the trees being very rough. The pignut or bitter hickories, on the contrary, have more generally a smooth bark, inedible nuts, and rather inferior wood. Hickory timber is excellent for handspikes, axhelves, spokes, barrel-hoops, and the like. It is prized as fuel, but will not stand the weather. The oil of the nuts is recommended for oiling clocks and delicate machinery. Most species of the hickory become noble trees, reaching a height of from 60 to 90 feet, with straight trunks and with symmetrical branches. When confined in the forest, they shoot up 50 or 60 feet without any branches; but with sufficient room they expand into lofty pyramids of bold, pinnated foliage. They have, indeed, all the qualities which are necessary to constitute a fine park-tree, and should find their way into every large plantation. Some of the species are worthy of cultivation on account of the delicious nuts they produce. The recent changes in the nomenclature of the hickories are as follows:

Hicoria pecan	formerly	*Carya olivæformis.*
H. ovata	"	*C. alba.*
H. mexicana	"	*C. mexicana.*
H. alba	"	*C. tomentosa.*
H. sulcata	"	*C. sulcata.*
H. microcarpa	"	*C. microcarpa.*
H. glabra	"	*C. porcina.*
H. minima	"	*C. amara.*
H. aquatica	"	*C. aquatica.*
H. myristicæformis.	"	*C. myristicæformis.*

Revised by CHARLES E. BESSEY.

Hickory: town (founded in 1859); Catawba co., N. C. (for location of county, see map of North Carolina, ref. 3–D); 2½ miles from the Catawba river, on the Richmond and Danville Railroad; 50 miles N. W. of Charlotte, 80 miles N. E. of Asheville. It contains the Claremont Female College, Lenoir College, St. Paul's Seminary, Meade school for boys, Baptist, Methodist, Lutheran, German Reformed, Presbyterian, and Protestant Episcopal churches, a national bank, three periodicals, electrical lights, and numerous manufactures. Corn, wheat, tobacco, and cotton are the principal productions of the surrounding country. Pop. (1880) 1,400; (1890) 2,023; (1893) estimated, 2,400.

EDITOR OF "PRESS AND CAROLINIAN."

Hicks, ELIAS: minister of the Society of Friends; b. at Hempstead, L. I., Mar. 19, 1748; at the age of seventeen years was placed as an apprentice to a carpenter, and became master of that trade; subsequently followed the business of building houses. In the more advanced period of his life he engaged in agriculture. When about twenty-seven years of age he began, to use his own words, "to have openings leading to the ministry," and was "deeply engaged for the right administration of discipline and order in the Church, and that all might be kept sweet and clean, consistent with the nature and purity of the holy profession which Friends made before the world." In 1781 and subsequently he visited the meetings and families of Friends extensively through the country, working at his trade in the intervals passed at home, whereby he obtained means to pay his own expenses, declining to have them borne by the society, which made provision for its traveling ministers in necessity. Such was the high esteem in which he was held by all classes of people in his neighborhood that he was frequently chosen as an umpire to settle differences. Very early in life he denounced slavery as a crime, and preached persistently against it. As early as 1811 he published a

valuable essay on the subject, and exerted constant personal influence to induce persons who held slaves to set them free. But this fell short of the measure of justice in his view, and he obtained for many of the emancipated wages for their time in addition. He was a bold and fearless preacher, both in deed and word. His religious visitations were not confined to members of his own society, but extended to distant sections of country where few such resided. His meetings were crowded by people of every sect and opinion. He was an impressive speaker, with direct and clear enunciation, of commanding presence, and profoundly serious deportment in his public appearance. He was the subject of much misrepresentation in his religious opinions by bigots and by many dissenters from the original doctrines of Friends. The name Hicksite was given as a reproach to that part of the old Society of Friends with which he continued in fellowship, but was never recognized by it or him. A journal of his religious travels was published (Philadelphia, 1828; 3d ed. 1832); *Observations on Slavery* (1811); and *Doctrinal Epistle* (1824). There have been published since his death (in Jericho, N. Y., 1830) a volume of his sermons and one volume of his letters. See FRIENDS, SOCIETY OF. Revised by F. B. GUMMERE.

Hicks, JOHN BRAXTON, M. D.: gynecologist; b. at Rye, Sussex, England, Feb. 23, 1823; educated privately; lecturer on obstetrics at Guy's Hospital, London, 1865; consulting obstetric physician, Guy's, in 1883; obstetric physician and lecturer 1888–92, now also consulting obstetric physician at St. Mary's Hospital, London. Author of a large number of professional essays published mainly in *Transactions of the Obstetrical Society*, London.

Hicks-Beach, Sir MICHAEL EDWARD: statesman; b. in London in 1837; educated at Eton and Oxford; elected member of Parliament for East Gloucestershire in July, 1864, and served the Conservative interest; was parliamentary secretary to the poor-law board in 1868, and later a member of the royal commission on friendly societies. When the Conservatives returned to power in Feb., 1874, he was appointed Chief Secretary for Ireland, and had a seat in the cabinet in 1877. He was Secretary of State for the Colonies from 1878 to 1880, and in Lord Salisbury's government he was appointed Chancellor of the Exchequer June, 1885. He was again made Chief Secretary for Ireland 1886, but resigned on account of failing sight in 1887. He was president of the Board of Trade from Feb., 1888, till the change of administration in Aug., 1892. In the latter year he was re-elected to Parliament for West Bristol.

Hicksites: See FRIENDS, SOCIETY OF.

Hicksville: village (founded in 1837); Defiance co., O. (for location of county, see map of Ohio, ref. 2–C); on the Baltimore and Ohio Railroad; 24 miles N. E. of Fort Wayne, Ind. It is surrounded by one of the finest agricultural regions in Northwest Ohio, is a center of wooden manufactures, with extensive handle-factories; and has water-works supplied by a subterranean stream, a bank, and two weekly newspapers. Pop. (1880) 1,212; (1890) 2,141.
EDITOR OF "INDEPENDENT."

Hidalgo, ĕē-daal'gō (named in honor of Hidalgo y Costilla, a popular Mexican patriot): one of the central states of Mexico; between lats. 19° 37′ and 21° 17′ N. and lons. 97° 58′ and 99° 53′ W.; bounded N. by San Luis Potosí, N. E. by Vera Cruz, S. E. by Puebla, S. by Tlaxcala and Mexico, and W. by Querétaro. Area, 8,917 miles. The northern part is mountainous, culminating in the Cérro Canjando, 9,380 feet high. The drainage is by the Panuco river and by the San Juan, which with its branch, the Pate, forms the western boundary. There are several small independent drainage basins, the largest being by the Metztitlan, which empties into a lagoon of the same name. The principal product is maize; others are wheat, barley, rice, cotton, sugar-cane, peas and beans, and sarsaparilla. The maguey-plant is extensively grown and large quantities of the national beverage, *pulque*, are produced. The state is most celebrated for its very rich mines of silver, iron, copper, coal, lead, sulphur, etc., the annual product from which is about $5,000,000. There are a number of cotton-factories in the state. Several railways pass through the southern part. Pop. (1890) 506,028. Capital, Pachuca.
MARK W. HARRINGTON.

Hidalgo de Cisneros y Latorre, ēē-daal gō-dā-thwĕ-nā'rōs-ee-lăă-tōr'rā, BALTAZAR: naval officer; b. at Carthagena, Spain, about 1755. He entered the navy in 1770, commanded vessels from 1780, and in 1792 had charge of a squadron on the coast of France. During the wars with France and Great Britain he took part in many actions, including the battles of Cape St. Vincent, Feb. 14, 1797, and Trafalgar, Oct. 21, 1805, where he was severely wounded and his ship, the Trinidad, was sunk. In 1809 the *junta* of Seville appointed him Viceroy of the Platine colonies. He took possession of the office at Buenos Ayres July 14, but his severity and high-handed measures tended to precipitate the revolution which was impending. On the fall of the *junta* of Seville it was decided that Cisnero's commission was no longer valid; a governmental board was formed, with Cisneros as one of the members; but the people compelled it to resign May 24, 1810, putting an end to Spanish power in that part of South America. Next year Cisneros was forced to leave the country. The Spanish Government exonerated him and made him *vocal* of the *junta*, and in 1813 captain-general of Cadiz. In 1818 he was made Minister of Marine and director-general of the Armada. While preparing to send a fleet to America he was deposed and imprisoned by the revolution of 1820. After his release he became councilor of state, and from Nov., 1823, was captain-general of Carthagena, where he died June 9, 1829.
HERBERT H. SMITH.

Hidalgo y Costilla, -kōs-teel'yăă, MIGUEL: Mexican priest and patriot; b. in the state of Guanajuato, May 8, 1753. He took orders in 1779, and after holding various other charges became curate of Dolores in his native province. In conjunction with Allende, Abasalo, and others, he planned a revolt against the Spaniards; this was finally proclaimed by Hidalgo in his church, on Sunday, Sept. 16, 1810. Thousands of country people flocked to his standard, and on the 28th he entered Guanajuato city with an undisciplined and almost unarmed mob of 50,000 men. Hidalgo had been named general, and he distributed many commissions. Marching toward Mexico he met and defeated Trujillo, who had been sent by the viceroy to stop him (Oct. 30, 1810). Instead of taking advantage of the victory he fell back toward Querétaro, and was defeated by Calleja at Aculco. He then retreated to Guadalajara, where he soon had a force of, it is said, 100,000 men, but all badly armed. With these he met Calleja's army of 5,000 regular soldiers at the bridge of Calderon Jan. 17, 1811. After a bloody struggle Hidalgo was disastrously defeated. Eight days after he resigned his command, and with other chiefs endeavored to make his way to the U. S., but he was captured Mar. 21, taken to Chihuahua, tried, condemned, and shot Aug. 1, 1811. Hidalgo is called the father of Mexican independence. He was actuated by the noblest motives, but lacked abilities for the difficult position in which he was placed. His record is stained by many cruelties which he permitted his followers to inflict on Spanish prisoners.
HERBERT H. SMITH.

Hides [O. Eng. *hȳd*: O. H. Germ. *hūt* > Mod. Germ. *haut* < Teuton. *hūdi-* < Indo-Eur. *kuti-* > Lat. *cutis*, skin, hide]: in commerce, the skins of large animals, such as domestic cattle, horses, and the buffaloes of the Old World. They appear in commerce either dried, salted, or in the undried and natural state. Hides are used chiefly in the manufacture of leather, and the fragments and waste go to the glue-maker. The hair is also saved for plasterers' use, and is used to some extent in upholstery. (See also LEATHER.) *Domestic* hides are those sold in the green state, and manufactured into leather in the country where produced. The hides of general commerce are the product of South America, South Africa, Australia, India, California, Russia, etc. The hides of sheep, goats, deer, etc., are known in commerce as "skins."

Hideyoshi, hĕē-dā-yō'shĕē, TOYOTOMI: general and statesman; b. in Owari, Japan, in 1536. Of low birth, he gradually worked his way up to power in the troublous times of the sixteenth century civil wars, and succeeded to the power of his patron NOBUNAGA (*q. v.*). In 1586, having become virtual ruler of Japan, he caused the expulsion of Christian missionaries. He resigned his functions in favor of his son in 1591, receiving then the title of *Taiko*, which appears in the name *Taiko-Sama*, by which he is still popularly known. D. in 1598. A *Life*, by W. Dening, appeared at Tokio in 1889. J. M. DIXON.

Hiel, EMANUEL: Flemish poet; b. at Dendermonde, May 31, 1834. His early life was difficult and straitened. At one time he was superintendent in a cotton-factory; later, bookseller and custom-house official. Finally he obtained a

post in the Ministry of the Interior, and was made soon after Professor of Declamation in the Conservatory of Music at Brussels, as well as librarian of the Industrial Museum there. In spite of the obstacles of his career, however, he has succeeded in obtaining a pre-eminent place among modern Belgian poets, and that by work in several fields. His collections of verse, which contain much of interest, are *Gedichten* (Ghent, 1863; new series, Arnheim, 1868); *Nieuwe liedekens* (Ghent, 1861); *Bloemeken, een liederkrans* (Utrecht, 1877). His dramatic poems *Jacoba van Beieren* (1879) and *Bloemardinne* (1877) have many beauties. He has obtained much repute from his little poems for the use of children (*Liederen voor groote en kleine kinderen*), many of which were set to music by van Gheluwe (*Liedersolfege*, 1875). In a second edition others were adapted to German and Flemish popular melodies. Most important of all Hiel's works, however, are his great poems written for musical accompaniment. Such are *Lucifer* and *De Schelde* (music by Benoist), *Vrijheidshymne* (music by Hol), the oratorio *Prometheus*, and the northern legend *Helga*. In 1880 Hiel wrote for the celebration of the fiftieth anniversary of Belgian independence two fine poems, *Belgenland* and *Eer Belgenland*, which are among the best achievements of Belgian poetry in the nineteenth century. An edition of Hiel's poetical works is *Volledige dichtwerken* (3 vols., Rousselaer, 1885). A. R. Marsh.

Hierap'olis, or **Bamby'ce** [= Gr. Ἱεράπολις, liter., holy-town; *ἱερός*, strong, holy, sacred + *πόλις*, city]: a once splendid but now utterly ruined city of Cyrrhestica, in Syria; five days' journey from Antioch; about 25 miles S. of Carchemish, on the road to Seleucia and Babylon. It stood on a rocky, barren plain, and derived its prosperity from the caravan trade. Its palmy days were under the Seleucidæ. Extensive ruins mark its site.

Revised by J. R. S. Sterrett.

Hierapolis: the birthplace of Epictetus; in Phrygia, Asia Minor, between the rivers Lycus and Meander; celebrated for its warm mineral springs. Among its ruins, which are a mile and a half in circumference, is one of the most complete and best-preserved Greek theaters. The place is mentioned by St. Paul in his Epistle to the Colossians (iv. 13). Its present name is *Pambook Kalessi* (the cotton castle), which is probably derived from the singular appearance which the deposit of the springs has given to the place. It is totally deserted. Hierapolis (the sacred city) must be carefully distinguished from Hieropolis (the city of the Hieron) in the plain of Sandukli and once the home of St. Abercius. Revised by J. R. S. Sterrett.

Hi'erarchy [from Gr. *ἱεραρχία*, deriv. of *ἱεράρχης*, hierarch; *ἱερός*, sacred + *ἀρχή*, rule, government], or **Hierocracy** [from Gr. * *ἱεροκρατία*, from *ἱερός* + *κράτος*, might, authority, power]: the power, dignity, or office of a *hierarches*, a steward or president of sacred rites, one supreme in holy things, a high priest, a hierarch; especially in ecclesiastical Greek, the episcopate or patriarchate. The word is unknown to the classic Greek and to the Septuagint and New Testament (but *ἱερεύς*, priest, is used of Jewish priests, and metaphorically of Christians, Rev. i. 6, v. 10, etc.). In the work of the sixth century, of a Neo-Platonic cast, attributed to Dionysius the Areopagite (*q. v.*), the angelic orders are the prototypes of the ecclesiastical hierarchy. He enumerates three orders of angels, with three hierarchies in each—seraphim, cherubim, thrones; dominations, powers, principalities; virtues, archangels, angels. (See Moreri, *Dict. Historique*; Dean Colet, *On the Hierarchies of Dionysius* (1869); and Schaff, *Church History*, vol. iv., 590 *sqq.*). Milton adopts in *Paradise Lost* every one of these titles, though he does not use them all in any one place or in the order given. The word *hierarchy* came to be applied to the orders of clergy in the Christian Church—the ecclesiastical hierarchy, or to the body of priests in the various systems, in which they are regarded as divinely instituted administrators of holy things.

Among the Hebrews the hierarchy was hereditary, and its headship was in the high priest. In the Christian Church the hierarchy is the government of the Church by the clergy. It took its historical shape as the congregations increased in number and came into closer conjunction. The government of the Church is conceded to have originally been, at least relatively, popular in part (democratic hierarchy), and to have changed more and more into a spiritual aristocracy (aristocratic hierarchy). The line of historical advance is generally supposed by Protestant writers to have been from a government of perfect co-ordination among the presbyter-bishops of a congregation to the congregational and parochial episcopate, then to the diocesan episcopate. From this arose the metropolitan system, in which a governmental superiority was exercised by the bishops of the chief cities of the provinces. Then came the system of patriarchates, under which the bishops of the great sees of Rome, Constantinople, Antioch, Alexandria, and Jerusalem were recognized as patriarchs of the metropolitans. Civil events destroyed the prominence claimed for the last three. The tendency to unification remained fixed at the patriarchate in the Eastern Church, but advanced in the Western Church till it culminated in the papacy. Among the earlier representatives of this tendency was Leo. I. (440–461). In the ninth century this papal hierarchy was greatly strengthened by the false Isidorian decretals. (See Decretals, False). They systematized and professed to give historical vouchers for the tendency of the era, which made the pope a spiritual monarch, regent and lord of Western Christendom. This great hierarchy, preserving the unity of its purpose and plan amid the confusions of the Middle Ages, supplementing by moral power the feebleness of civil rule, preserved order when society without such a bond might have been reduced to chaos. From the eleventh century to the thirteenth the papacy had a political supremacy which was not successfully challenged. This it owed especially to several popes of distinguished ability and force of character. Gregory VII. (1073–85) is more readily recalled by his earlier name, Hildebrand, which made Hildebrandism the synonym of that hierarchical system of which he was so great a master. Clear in vision, iron in will, cautious and bold, he did much to subordinate the civil authority to the ecclesiastical. He made the papacy a universal theocracy of all Christian states, with the pope as Christ's vicar, by whom kings reigned; people and princes were simply, in different degrees, the virtual subjects of the pope. Innocent III. (1198–1216), in many respects the greatest of the popes, whose history is the history of his era, finished the work of Hildebrand and brought the hierarchy to the summit of its glory and power. Political independence and unlimited spiritual authority were the objects of his struggle. He brought to it the greatest qualities of Hildebrand, with others of the highest order, and the mightiest powers of Christendom bowed before him. Boniface VIII. (1294–1303), not inferior in intellectual force to his predecessors, but destitute of their nobler qualities, urged to the extremest point their principles of domination over the temporal power. As in him the loftiest assertion of the hierarchical claims to power over the state came to a crisis, so with his reign began that great reactionary movement of the fourteenth century by which that power was narrowed in various ways. His great opponent was Philip (IV.) the Fair of France (1268–1314). The pope interfered as umpire in the war between France and England, and in favor of the latter. The pope sent a legate; the king threw him into prison; the pope pronounced the king a heretic; the king called the pope a fool; the pope issued a bull; the king burned it; a council excommunicated the king, and the agents of the king seized the pope on his throne and held him captive. The Roman people said of him, "He crept in like a fox, he lorded it like a lion, and died like a dog." But harsh judgment did not cease with his death. He has been "damned to everlasting fame" by Dante, who assigns him a place in hell, as a Simonist, between Nicholas III. and Clement V. The French king came forth victorious in this conflict. Clement V. (1305–77) was the mere tool of the French policy, and formally transferred the curia to Avignon, where it remained during the "Babylonian exile." The French party elected John XXII. (1316–44). In the contest between Louis of Bavaria and Frederick of Austria for the imperial crown, John took sides against Louis. Louis was chosen by the electors; appealed to a general council against the pope; was excommunicated (1324); was crowned at Rome (1327); procured the temporary deposition of John, and the nomination, though not the permanent establishment, of Nicholas V. as a counter-pope. The residence of the popes in France, the great schism (1378–1429) with one pope at Rome, another at Avignon, for a time three popes (1409), the great reformatory councils of Pisa (1409), of Constance (1414–18), of Basel (1431–43), and the character and conduct of John XXIII. and other popes, greatly weakened the papacy. Though it seemed to come forth triumphant from the struggle, it had received deep wounds. The Church was yearning for reformation. Many symptoms of reaction from the Hildebrand

type were manifest, and at length the great struggle of the sixteenth century began.

The influence of the Reformation on the hierarchical claims was very marked. The part of European Christendom which sympathized with that movement rejected all these claims. All the Reformers, and none more radically than Luther, declared in the most uncompromising manner against the whole hierarchical system. But even in the states which adhered to the Roman Catholic Church tendencies the papal power was more and more restricted and limited by concordats. The progress of events has made the civil and hierarchical powers more completely independent of each other. Civil constitutions, the regulation of police and finance, show the influence of the modifications of the polity of the Church. See POLITY, ECCLESIASTICAL. For the latest history of the hierarchy, see PIUS IX. and LEO XIII.

The *divisions* of hierarchical power made in the theology of the Roman Catholic Church may be stated thus: The authority which belongs to the Church is connected either with her agency as the distributer of divine grace and blessings, or with the preservation and control of the Church's life. In accordance with this, the power correspondent with the authority is divided either into three parts, *potestas ordinis*, *magisterii*, and *jurisdictionis* (so Walter, Hinschius, Schulte), or into two, the *potestas ordinis* (the power derived from ordination, and embracing the *potestas magisterii*, or teaching function) and the *potestas jurisdictionis*, or ruling authority. The second classification is that of St. Thomas Aquinas (Bouvier, iv., 97), and of the majority of theologians, and accords with the Catechism of the Council of Trent (ii., 7, 7). See Richter, *Lehrbuch d. K. u. L. Kirchenrecht bearb. v. Dove* (7th ed., 1874, § 91).

I. The *potestas ordinis* respects the spiritual goods, especially the sacraments, which those in holy orders are to distribute to believers. It rests in its fullness on the bishops, from whom, by ordination, it passes over to the priests in *quantitative restriction*. The sacrifice of the mass, which is the supreme point of this power, appertains to both bishops and priests, and in virtue specially of this fact the bishops and priests constitute one priestly order—*ordo*. In ancient times the deacons were aids to the bishops and priests, and at a later period for the same end there were appointed subdeacons, acolyths, exorcists, lectors, and vestiarii, all of whom receive the necessary gifts for their offices by ordination. Hence the organs of the Church in the sphere of *ordo*, the sphere of the power conferred by holy orders on bishops, priests, and ministers. Under this last name are grouped all the clergy but those of the first order, which embraces the bishops and priests. This is called the hierarchy of (holy) orders—*hierarchia ordinis*.

II. The *potestas jurisdictionis*, or governmental power, is divinely committed to the bishops and the pope. Between the diocesan bishop and the pope exist by human right the gradations of archbishops, primates, exarchs, or patriarchs. The priest, with no *potestas jurisdictionis*, exercises the *potestas ordinis* in his parish; the bishop with the *potestas jurisdictionis* rules the clergy of his diocese; the metropolitan has as his suffragans the bishops of his province; the primate ordinarily has under him several metropolitans or archbishops; the patriarch is the superior of the metropolitans; and the pope, patriarch of patriarchs, primate of primates, metropolitan of metropolitans, bishop of bishops, priest of priests, and servant of the servants of God, is earthly head of the whole Church on earth. This is the *hierarchia jurisdictionis*. See Decorde, *Diction. d. Culte Catholique* (1859), and Wetzer und Welte (2d ed. by Kaulen, 1888, vol. v., 2011).

The hierarchy of orders is of divine institution; the hierarchy of jurisdiction is of ecclesiastical institution. The former may exist without the latter, but the latter exists by virtue of the former. In the hierarchy of order respect is had to the sacramental "character" impressed in ordination; in the hierarchy of jurisdiction respect is had to degree. As regards the hierarchy of orders, the diocesan bishop and the primate are on the same level; the parish priest is the same as the vicar-general, and is the superior of the cardinals when they are deacons. It is in the hierarchy of jurisdiction the gradations exist which have been enumerated. There is also in some cases a simple honorary hierarchy. See Pascal, *Origine et Raison de la Liturgie Catholique*, article *Hiérarchie*.

The theory on which the papal hierarchy rests is that the one Catholic Church of Christ on earth is a divine monarchy, under one catholic head, the pope, who is the œcumenical pastor of all the churches. The prelates under him govern particular churches, participating in the solicitude, but not possessing the plenary power, which belongs to the pope alone. To the spiritual rule, supreme in the pope and subordinate in the prelates, the whole laity, from the humblest to the most exalted, owe obedience. In the great body of the older Roman Catholic divines who have been distinguished as defenders of the hierarchy, the names of those now most frequently quoted are Bellarmin and Petavius. (See INFALLIBILITY.) In the Roman Catholic *system* the hierarchy is usually treated of under *Ordo*, the sacrament of holy orders. Ordo is defined as (1) the ecclesiastical hierarchy, or estate of the ministers of the Church; and (2) the act by which they are constituted a part of that estate—ordination. (See Bailly, *Theol. dogm. et moral.* (Lyons, 1822), v., 340; Perrone, *Prælect. Theolog.* (Paris, 1852), ii., 439.) "It is an article of faith that there exists in the Church a plurality of orders, constituting the sacred hierarchy—to wit, the episcopate, the presbyterate, and the diaconate." (Bouvier, *Instit. Theolog.*) "If any man shall say that there is not in the Catholic Church a hierarchy instituted by divine ordination, which consists of bishops, presbyters, and ministers, let him be anathema." (Can. 6, Sess. 23, Council of Trent.) Under the "ministry" is embraced certainly the deacons. How many more, or whether any more, are included is left an open question. (Bouvier, iv., 96.) The theology of the fifth and sixth centuries, in which the priestly office was greatly exalted, is sometimes styled the hierarchical theology. Offenses against the hierarchical government are called sacrilege of the hierarchy. The *celestial* hierarchy of Cellot is the rule of the Trinity, of Christ, the Virgin, and the angels in heaven. Trevoux, *Dictionn. Universel*, 1740.

In Protestant theology the term hierarchy is sometimes used in a generic sense to designate the sacred and divine rule of the Church established by Christ. The body of Protestant divines hold that Christ instituted no hierarchy in the ecclesiastical sense, but condemned it; that he endowed his Church with no civil power; and that the functions of its teachers and officers are purely moral and spiritual. From these views many of the writers of the Church of England dissent, rejecting the papal supremacy and what is involved in it, but holding in substantials the rest of the hierarchical views of the Church of Rome. (See Blunt, *Dict. of Doctrin. and Histor. Theology*, articles *Hierarchy*, *Jurisdiction*.) The Lutheran Reformers (at Augsburg, 1530) rejected the whole theory of the hierarchy. Retaining the twofold divisions of the *potestas ordinis* and *potestas jurisdictionis*, they defined the former as covering only the ministry of the word and sacraments—the latter as involving no more than the cognizance of doctrine, the office of the keys, absolution, and excommunication; and that both powers are by divine right conferred on one and the same body of ministers, all of whom are equal. (*Augsb. Confess.*, Abus. vii.) In the official reply of the Roman Catholic divines (the *Confutatio Pontifica*) they assert over against this that "the bishops not only have the power of the ministry of the word of God, but also the power of regimen and coercitive correction." (Given in full in Franke, *Lib. Symbol.*, App. 68; Hase, do. *Prolegom.*, 84, and better in the original of the *Confutatio*, which has recently been discovered and published by Fricker, 1891, pp. 124, *sqq.*) On this the *Apology* of the Augsburg Confession (xiv., 13) says, "We are satisfied with the old division of power into the *potestas ordinis* and the *potestas jurisdictionis*." It defines both in substance as defined in the Confession. The Reformers at the same time expressed their desire to retain the canonical polity and the grades existing in the Church, even though they rested on human authority, provided the bishops would cease their cruelty to the evangelical churches.

The literature of the subject, direct and indirect, is very large. The dogmatic and polemic works of a general kind take it up. Those on the Church and the sacraments more particularly discuss it. The great names connected with special discussions of the monarchy, priesthood, power of order and jurisdiction, the papal power, and infallibility, are Sander (1571), Palatin (1794), Rocaberti, (11 vols. folio, 1695–99), Pineda (1588), Maimburg (1685), Ballerini (1776), Veith (1781), Fischer (1819), Pinel (1829), Rothensee (1836–38), Ellendorf (1841), Vestermayer (1867–70), Phillips (1888), on the Roman Catholic side. On the Protestant side may be mentioned the names of Chamier (1601), Brochmand (1628), Salmasius (1608), Calixtus (1650), Hase (1871), J. Köstlin (1880, art. *Kirche* in Herzog's *Encyc.*, vii., 695 *sqq.*).

To these are to be added the special historical works on the constitution of the Church, the hierarchy and the papacy, and works on church polity. See the articles on the different forms of church government, CONGREGATIONALISM, EPISCOPAL CHURCH, METHODISM, LUTHERANISM, ROMAN CATHOLIC CHURCH, etc.; articles on the ecclesiastical orders, BISHOP, ELDER, etc.; on ecclesiastical dignities, ARCHBISHOP, EXARCH, POPE, etc.; and on rites connected with the clerical office, INSTALLATION, INVESTITURE, etc.

Revised by PHILIP SCHAFF.

Hi'ero (in Gr. *Ἱέρων*): tyrannus of Syracuse, in Sicily; was victor at Olympia 488 B. C. (*Müller*); succeeded Gelon, his brother, in 478; conquered Naxos and Catana in Sicily; defeated the great fleet of the Etruscans 474, and in the same year won a victory at the Pythian games. He was a generous patron of art and letters. In 472 and 468 he won his second and third victories in the Olympic games. Pindar celebrated these victories in his odes. D. in 467 B. C.

Revised by J. R. S. STERRETT.

Hiero: King of Syracuse; was a natural son of one Hierocles; b. before 306 B. C.; served with distinction under Pyrrhus; became general of the Syracusans; sent a supply of corn to Rome 272; routed the Mamertines at the river Longanus, and was declared king in 270 B. C.; waged a disadvantageous war with Rome 264–263 B. C., after which he was a most faithful ally of that power. He was a popular ruler, and his reign as a whole was one of splendor and prosperity. There are many coins, inscriptions, and other existing remains of Hiero's time. D. 216 B. C.

Revised by J. R. S. STERRETT.

Hier'ocles: a grammarian who wrote a guide-book (*Συνέκδημος*, or *Traveling Companion*), containing an account of the 64 provinces of the Eastern Roman empire, and of the 935 towns situated in them. Its date is probably about the beginning of the sixth century A. D. Ed. by Wesseling in his *Vet. Rom. Itineraria* (Amsterdam, 1735), by Bekker at the end of his *Constantinus Porphyr.*, in the *Byzantine Historians* (Bonn, 1840), and by Burckhardt in the Teubner collection (1893). More familiar is the name of another HIEROCLES, the reputed author of a very late collection of poor jokes (*ἀστεῖα*), which used to be dished up in Greek readers. This Greek Joe Miller (*Φιλόγελως*) has been edited by Eberhard (Berlin, 1869). B. L. GILDERSLEEVE.

Hieroglyph'ics [from Gr. (*τὰ*) *ἱερογλυφικά*, neut. plur. of *ἱερογλυφικός*, hieroglyphic, pertaining to sacred writing or engraving: *ἱερός*, sacred + *γλύφειν*, grave, carve]: a word used by the Greeks to describe the Egyptian writing, and by moderns in reference to those graphic systems which employ more or less conventionalized representations of material objects as symbols of ideas or sounds. All writing was originally pictorial, and modern systems may be traced back to such a parentage. Pictures drawn by prehistoric man give the earliest traces, and those of uncivilized races in recent times are illustrations. But the records which have been preserved are not sufficient to allow us to formulate a doctrine of development without the aid of conjecture at some points. A pure picture-writing is necessarily independent of language, and it is only when a symbol begins to represent a sound that the fundamental distinction between an ideogram and a phonogram appears. It has been conjectured (Taylor, *The Alphabet*, i., 22) that the step from the one to the other grew out of the necessity of expressing proper names. In the earliest specimens of the Egyptian writing (possibly 5000 B. C.) are found determinatives (pure ideograms) and phonograms, verbal (phonetic ideograms), syllabic, and alphabetic signs. Specific and symbolic determinative signs were employed to denote the idea which was to be connected with a group of phonographic signs, composed of one or more of the three classes. They are evidently survivals from the original picture-writing. Closely connected with them and derived from them historically are the word-signs or phonetic ideograms whose values corresponded with the names of the objects originally depicted. A peculiar usage which marks one of the steps in the development from picture-writing to the phonetic delineation of a word is seen in the Assyrian and Egyptian practice of supplementary writing, by which the initial or final sound of the word intended was indicated by a character or letter prefixed or added to an ideogram. Such characters are called phonetic complements. Out of the ideograms there grew, by means of the application of acrophony, syllabic and alphabetic signs by the gradual restriction of their use to the representation of the phonetic value of the first syllable or of the initial sound of the word in question. The circumscribed possibilities of the hieroglyphic system caused some of the symbols to be used with more than one power, whence arose polyphones; and the similarity in the names of things and of abstract ideas, connected with the impossibility of finding adequate independent expression of all such, gave rise to homophones. The transition from the phonetic ideogram to the syllable, and thence to the alphabetic symbol, was one of the most momentous in the history of human intellectual development. With the Egyptian, however, this final step was one of convenience in the graphic system rather than one due to an insight into the primary elements of language. This last was a triumph of Semitic and Greek genius.

The peoples which have had a hieroglyphic system of writing known to us were the Aztecs and some tribes of Central America, the Chinese, the Assyrians and Babylonians, the Hittites, and the Egyptians. At the time of their discovery some of the peoples of Central America had passed beyond the hieroglyphic into the alphabetic stage, as the Maya remains indicate, but some of them were still in the ideogram stage of development. The Chinese system of picture-writing early became conventionalized, and lost its obviously hieroglyphic character, while subsequent use effected little advance in the system. The Chinese symbols were introduced in a modified form into Japan, where a purely syllabic writing was the final outcome. The Hittite writing is hieroglyphic, though it appears to contain phonetic elements along with ideograms. The original of the Babylonian wedge-writing or cuneiform was pictorial, the pictures being formed of right lines. The restrictions imposed by the limited possibilities of the only available writing material, clay tablets and the wooden stylus or stencil, caused a gradual abandonment of useless detail, and led to the adoption of forms which appear arbitrary. Like the Chinese, they expressed some abstract ideas by the union of two ordinary ideograms. Their system was ideographic and phonetic, containing word-signs and syllables to the number of about 500. The Proto-Medic cuneiform writing was almost wholly syllabic, with ninety-six signs, and the Persian form was almost solely alphabetic, with thirty-six letters. The Behistun inscription shows the three styles side by side. The Egyptian system of writing has retained most completely its picture forms, and in them is contained an extensive literature. Its range in time is immense, covering possibly more than 5,000 years, and reaching to the third century A. D. Through all this period the outward appearance of the hieroglyphic writing remained practically unchanged except for slight variations in the manner of execution. But at the earliest period it was no longer a pictorial writing pure and simple in anything except its symbols. That stage lay buried in a period then long past. Only traces of what the development had been were still visible.

Fig. 1 shows a section of an Egyptian text, reproduced in modern type. It contains about a line and a half of the celebrated decree of Canopus, dated from the ninth year of Ptolemy III., Euergetes I., B. C. 238.

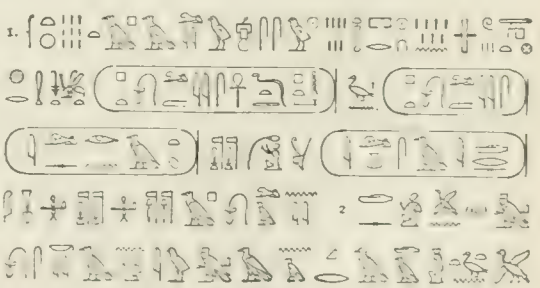


FIG. 1.

Egypt possessed three styles of writing—the hieroglyphic, the hieratic, and the demotic, the two latter being products of abbreviation. The idea of a sacred character attaching to the two former is exploded. The hieroglyphic was a lapidary script, in bas-relief or incised, traced in ink or painted, used for public monuments; but the very mistakes which occur in it show that the original copy from which the sculptors worked was in the shorter hieratic form. The demotic was a conventionalized form of the abbreviated hieratic.

Fig. 2 shows specimens of the three styles of Egyptian writing, in the order (reading downward) of hieroglyphic,

hieratic, and demotic. The words represented are (the god) Amon, "man" or mankind, "Pharaoh," and "day."

The total number of signs in the hieroglyphic writing can not be given exactly, but the movable types cast under

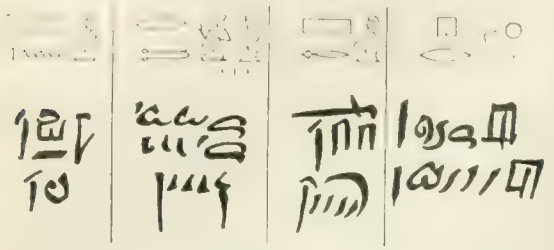


FIG. 2.

the auspices of the Royal Society of Berlin for the ready reproduction of Egyptian inscriptions are over 1,300 in number. The sign-lists in use in the handbooks, giving only the more common characters, contain about 600 alphabetic, syllabic, and word-signs, and about 150 determinatives. There are also twenty-four consonantal alphabetic values which had a separate representation. These consonantal symbols underwent slight change in the whole period, but for some of them there were alternative forms. The so-called "vowels" had consonantal power as in Semitic, and vowel power was a later acquisition. The following table, taken for the most part from *Das altägyptische Alphabet und seine Umschreibung* (*Zeitsch. der Deutschen Morgenländischen Gesellschaft*, xlvi., p. 727), by Prof. Georg Steindorff, of Leipzig, shows the Semitic consonants corresponding to the Egyptian letters, and the methods of transcriptions proposed by Lepsius and Erman, the former being the system in common use during the past decade or more, and the latter a more exact system adopted for use in scientific German works.

following square. In papyrus rolls the ordinary direction was from right to left, but occasionally the scribe varied his practice and wrote vertically. In all cases the writing was read from the side toward which the hieroglyphs faced.

For an account of the discovery of the key to the hieroglyphic writing of Egypt, see the article in this work on EGYPTOLOGY. See also the articles EGYPTIAN LANGUAGE AND LITERATURE and COPTIC LANGUAGE AND LITERATURE.

CHARLES R. GILLETT.

Hieron'ymites [from St. Jerome, or, in Latin form, *Hieronymus*]: properly the hermits of St. Jerome. The name of four hermit-bodies of Spaniards and Italians: (1) The body founded by Ferdinand Pecha out of those who were originally Franciscan Tertiaries of the Strict Observance. In 1373 the new order was accredited by Pope Gregory XI., and received an Augustinian rule. The monastery of Yuste, where Charles V. passed his last days after his abdication, and that in the Escorial erected by Philip II., belonged to this order, which was once very rich and extensive, but is now small and feeble. (2) A branch founded by the Spaniard Lupus in 1424, but the monasteries in Spain in 1595 were by Philip II. assimilated with those of (1); those in Italy maintained their independence. (3) Another small congregation, called Hieronymites, was founded at Pisa by one of the Gambacorti about 1390. It still exists. (4) The Hieronymites of Fiesole, founded 1360, dissolved by the pope in 1668.

Revised by S. M. JACKSON.

Hieron'ymus: Father of the Church. See JEROME.

Hieronymus of Cardia (in Thrace): Greek historian and general. He served with distinction under Eumenes, Antigonus, Demetrius, and Antigonus Gonatas, and wrote a history of the successors of Alexander extending to Pyrrhus, the invader of Italy. Fragments in Müller's *Fragmenta Historicorum Græcorum*, vol. ii., pp. 450–61. B. L. G.

Hier'ophant (in Gr. *ἱεροφάντης*): the mystagogue, prophet or priest of Demeter who had charge of the Eleusinian Mysteries, and initiated new members into those mysteries.

		Semitic.	Lepsius.	Erman.
1.		א	a	i
2.		ע	a	ȝ
3.		ה	ā	ɔ
4.		ו	u	w
5.		ב	b	b
6.		פ	p	p
7.		none	f	f
8.		מ	m	m
9.		נ	n	n
10.		ר	r	r
11.		ח ס	h	h
12.		כ	ḥ	ḥ
13.		ח	χ	ḫ
14.		none certain		ḥ
15.		ס†	s	s
16.		ש†	s	ś
17.		שׂ†	š	š
18.		ג†	ḳ	g
19.		כ	k	k
20.		ק	q	ḳ
21.		ת	t	t
22.		ט	ʘ	ṯ
23.		ט	ṭ	d
24.		צ ظ	ṭ	ḏ

* Somewhat uncertain. † Not satisfactorily proved.

FIG. 3.

Fig. 3 shows the Semitic equivalents of the hieroglyphic characters, with transcriptions into ordinary letters.

Some of the syllabic characters in the Egyptian are polyphones, as in the Assyrian syllabary. Determinatives were of two sorts—those which indicate concrete things or classes of things, and those used in connection with abstract ideas, specific or general. Occasionally the same sign was used for both purposes. A circle with a dot in the center represented the sun, and was also used to denote sections of time, year, day, hour, etc. A picture of the skin of an animal denoted a four-footed beast, a skin, leather, or an object made of leather. The "house"-sign was used also phonetically in spelling the name of Pharaoh.

The direction of the Egyptian writing was largely dependent upon convenience or artistic effect. It might run in either direction, horizontally, or vertically downward; all three directions are found in the same funereal stela. The successive groups of characters are found arranged in squares, each of which must be completely read before any in the

He must be a descendant of the hero Eumolpus, unmarried, and unblemished in character and in body. He preserved and expounded the unwritten law, and exhibited the sacred symbols to the initiates. Revised by J. R. S. STERRETT.

Hieropolis (in Gr. *Ἱεράπολις*): a city of Phrygia Parva, whose extensive ruins may still be seen at Kotch Hissar in the plain of Sandüklü, a three days' journey directly N. E. of Hierapolis in Phrygia Magna. See Ramsay, *Trois Villes Phrygiennes* in the *Bulletin de Correspondance Hellénique* (1882, p. 503 ff.), and his *Tale of St. Abercius* in the *Journal of Hellenic Studies* (1882, p. 339 ff.); Duchesne in *Revue des Questions Historiques* (July, 1883, p. 1 ff.); Lightfoot, *Ignatius and Polycarp* (vol. i., p. 477 ff.).

J. R. S. STERRETT.

Higbee: town; Randolph co., Mo. (for location of county, see map of Missouri, ref. 3–G); on the Chi. and Alton and the Mo., Kan. and Tex. railways; 10 miles S. W. of Moberly. It is in an agricultural, stock-raising, and coal-mining re-

gion, and has a weekly newspaper. Pop. (1880) 347; (1890) 1,093.

Higgins, ANTHONY, LL. D.: U. S. Senator; b. in Red Lion hundred, New Castle co., Del., Oct. 1, 1840; educated at Yale (A. B. 1861), Delaware College, and Harvard Law School; admitted to the bar in Delaware 1864; U. S. attorney for Delaware 1869–76; elected to the U. S. Senate as Republican, and took his seat Mar. 4, 1889. C. H. T.

Higginson, FRANCIS: clergyman; b. in England in 1588; graduated at St. John's College, Cambridge, and became a parish clergyman of Leicester, but was deprived for Nonconformity, and in 1629 became teacher of the congregation at Salem, Mass., where he died Aug. 6, 1630. He wrote *New England's Plantations* (1630). See his *Life* by T. W. Higginson (1891); also Palfrey's *History of New England*.

Higginson, THOMAS WENTWORTH, A. M.: philanthropist and author; b. in Cambridge, Mass., Dec. 22, 1823; graduated at Harvard College 1841; received the degree of A. M. 1869; studied divinity at Cambridge; was ordained at Newburyport, Mass. (First Religious Society), in 1847; was Free-soil candidate for Congress in 1859; went to Worcester, Mass., in 1852 as minister of the Free church; resigned in 1858 and left the ministry. Mr. Higginson had taken a leading part in the anti-slavery conflict that preceded the civil war; had visited Kansas in 1856; was acquainted with John Brown, and was active in sustaining the free-State men in the West. On Sept. 25, 1862, he was made captain in the Fifty-first Massachusetts Volunteers; on Nov. 10 accepted the colonelcy of the First South Carolina Volunteers, colored; was wounded Aug., 1863, and mustered out Oct., 1864. He has since lived in Newport, R. I., and Cambridge, Mass., devoting himself to literature and the work of social reform; is a vice-president of the Free Religious Association, a leader in the cause of woman suffrage, and an earnest friend of higher education. His efforts to introduce modern ideas and men into the management of Harvard College, and to have its facilities extended to women, have been assiduous. In 1880 and 1881 he was a member of the Massachusetts House of Representatives and also of the Governor's military staff, and from 1881 to 1883 he served on the State board of education. In 1889 he was appointed for five years as State military and naval historian. Mr. Higginson is the author of several volumes of collected essays: *Out-door Papers* (1863; illustrated ed. under title *In a Fair Country*, 1889); *Army Life in a Black Regiment* (1870; French transl. by Madame de Gasparin, 1884); and *Atlantic Essays* (1871); wrote a novel, *Malbone, an Oldport Romance* (1869); *Oldport Days* (1874); a history, *Young Folks' History of the United States* (1875; French transl. 1875; Germ. transl. 1876; Ital. transl. 1882); besides various pamphlets and magazine articles, memoirs of Lydia Maria Child and Margaret Fuller Ossoli in *Eminent Women of the Age* (1868), and a memoir of T. W. Harris, prefixed to his *Entomological Correspondence* (1869). He also edited (in connection with S. Longfellow) a book of poems, *Thalatta* (1853); a translation of Epictetus (1865; revised ed. 1891); *Harvard Memorial Biographies* (2 vols., 1866); and published *Child-pictures from Dickens* (1868); *Brief Biographies of European Statesmen* (1875); *A Larger History of the United States* (1885); *The Monarch of Dreams* (1886); *Hints on Writing and Speech-making* (1887); *Women and Men* (1888); *Travelers and Outlaws* (1889); *The Afternoon Landscape* (1890); *The New World and the New Book* (1891); *Concerning all of Us* (1892).

Higginsville: village; La Fayette co., Mo. (for location of county, see map of Missouri, ref. 3–E); on the Chi. and Alton and the Mo. Pac. railways; 12¼ miles S. E. of Lexington. It is an important shipping-point for wheat and corn, has valuable coal mines, is the seat of a Confederate home, and has a monthly and three weekly periodicals. Pop. (1880) 797; (1890) 2,342.

Higher Criticism: the scientific investigation of literary documents, to discover their origin, history, authenticity, and literary form. It is distinguished from *Lower Criticism*, which deals mainly with the text of the document, while the former judges it in its entirety. These terms are applied to the study of all ancient literature. The question whether this Greek word or that ought to stand in some line of the *Iliad* is a question of the lower criticism. The question whether the *Iliad* was written by Homer is a question of the higher criticism. Bentley's work on the *Epistles of Phalaris* is a fine illustration of the higher criticism. The term is most familiarly employed, however, in recent biblical studies. When thus applied it is an attempt to discover when the various books of the Bible originated; whether they were written by the authors to whom they are popularly assigned; of what materials they are composed; whether they are self-consistent, and to what extent they agree or disagree with one another; whether additions have been made to them from time to time; whether they are confirmed or discredited by the monuments and the history of the period in which they are supposed to have originated. For the most part, so far as the Bible is concerned, the higher criticism is engaged in the study of the Bible itself. Tradition says that the books of Samuel were written by Samuel. Higher criticism takes these books in hand and studies them to see whether they have anything to say about their author, and whether the facts recorded in them can be reconciled with this tradition. When two discrepant narratives of the same event occur, as frequently in the Kings and the Chronicles, higher criticism compares the two and seeks for a rational explanation of the discrepancy. It is sometimes supposed that the higher criticism is essentially destructive, but this is an error; it is simply the application of scientific methods to the study of ancient documents; and these methods are employed by those whose purpose it is to establish the authority of the Scriptures not less than by those who wish to undermine their authority. See HEXATEUCH. WASHINGTON GLADDEN.

High German: See TEUTONIC LANGUAGES.

Highland: city (founded in 1836); Madison co., Ill. (for location of county, see map of Illinois, ref. 8–D); on the Vandalia Line; 32 miles E. of St. Louis. It is in an agricultural region; contains 4 churches, Roman Catholic seminary and hospital, and 3 periodicals; and manufactures condensed milk, embroidery, machinery, flour, and beer. Pop. (1880) 1,969; (1890) 1,857; (1893) estimated with suburbs, 2,400. EDITOR OF "UNION."

Highland: town; Ulster co., N. Y. (for location of county, see map of New York, ref. 7–J); on the Hudson river and the W. Shore and the Phila., Read. and N. Eng. Railways; opposite Poughkeepsie, with which it is connected by railway and ferry; 72 miles N. of New York city. It contains Methodist Episcopal, Protestant Episcopal, and Presbyterian churches, union free school, 4 flour-mills, 2 felloe-factories, several fruit-package factories, and 2 weekly newspapers. It has daily steamboat connection with Newburg, Albany, and New York city. The principal business is fruit, especially grape-culture. Pop. (1890) 1,033; (1893) estimated, 1,075. EDITOR OF "POST."

Highlanders: properly the Gaels or Celtic inhabitants of the Highlands of Scotland. In the British army previous to 1881 the term designated the eight regiments of foot-soldiers who wore the old Highland costume, each with its own distinctive tartan. These were the 42d, 71st, 72d, 74th, 78th, 79th, 92d, and 93d regiments. The 91st (Argyleshire regiment) was sometimes reckoned with the Highlanders. In 1881 a territorial reorganization of regiments took place, the numerical designation of the foot-regiments was dropped, and the battalions were linked. The 42d and 73d regiments constitute the new Black Watch (Royal Highlanders); the 71st and 74th, the Highland Light Infantry; the 72d and 78th, the Seaforth Highlanders; the 75th and 92d, the Gordon Highlanders; the 91st and 93d, the Princess Louise's (Argyle and Sutherland Highlanders). The 79th remains a single battalion regiment, and is known as the Queen's Own Cameron Highlanders.

Highland Falls: village; Orange co., N. Y. (for location of county, see map of New York, ref. 7–J); on the Hudson river, and the West Shore Railroad, adjoining the grounds of the U. S. Military Academy at West Point; 11 miles S. of Newburg, its banking-place. It is the summer home of many New York business men, contains several hotels and many boarding-houses, commands a fine view of the river north and south, and is a delightful summer resort. Pop. (1880) 1,976; (1890) 2,237.
EDITOR OF "JOURNAL."

Highland Park: city; Lake co., Ill. (for location of county, see map of Illinois, ref. 1–G); on Lake Michigan, and the Chic. and N. W. Railway; 22 miles N. of Chicago. It is suburban in character and is the home of many Chicago business men; is the seat of Northwestern Military Academy, Deerfield Township High School, and Sylvan Dells

School for boys; and has two weekly newspapers. Pop. (1880) 1,154; (1890) 2,163; (1893) estimated, 2,400.

EDITOR OF "GAZETTE."

Highlands: city; Arapahoe co., Col. (for location of county, see map of Colorado, ref. 2–E); on the South Platte river, and the Union Pac. Railway; opposite Denver, of which it is a suburb. Pop. (1880) not separately returned; (1890) 5,161.

Highlands of the Hudson: the broken hills which stretch from S. W. to N. E. through Rockland, Orange, Putnam, and Dutchess counties, N. Y., being the northeast continuation of the Blue Ridge, extending farther northeast in the Taconic and Green Mountains of Western New England. The passage of the Hudson through the Highlands is marked by fine scenery, and it is remarkable as almost the only instance in the U. S. of a navigable river-passage through a great mountain range. The Highlands are mainly composed of azoic rocks, with rugged and steep sides and a somewhat scanty soil.

High Places: places frequently mentioned in the Old Testament as those where the people unlawfully went to worship strange gods. The custom of erecting shrines upon hilltops is a very ancient and widespread one, and seems to have arisen from the belief that the tops of hills were nearer the abode of Deity. The high-place worship is forbidden in the Pentateuch, in the interest of worship at a single sanctuary for the whole nation; but it was prevalent at all periods, and, in certain circumstances, even such men as Samuel, David, and Elijah practiced it. In later times reforms occurred, and the more devout kings of Judah actively destroyed the high places.

Revised by WILLIS J. BEECHER.

High Priest: in the hierarchy of the Hebrews, the principal religious dignitary of the nation. By the Mosaic law the office was held for life, and was hereditary in the line of Eleazar, son of Aaron, the first high priest. But in the New Testament times the office had ceased to be hereditary, and was held at the will of the civil ruler. One of the most brilliant periods of this pontificate was that of the Asmonæan princes (Maccabees), some of whom joined regal to priestly authority.

Hightstown: borough; Mercer co., N. J. (for location of county, see map of New Jersey, ref. 4–C); on the Penn. and the Penn. and Hights. railways; 14 miles E. by N. of Trenton. It is the seat of Peddie Institute (Baptist, chartered 1867), which in 1890 had 13 instructors, 192 students, grounds and buildings valued at $206,000, productive funds $70,000, and total receipts $48,500. It also has a noted seminary for young ladies. Pop. (1880) 1,355; (1890) 1,875.

Highway: a road or way over which the public at large have a free right of passage. The term, in popular usage, is commonly restricted to ways upon land, as carriage or foot-roads or turnpikes, but it is employed in law as a generic designation, including not only ways of this kind, but also watercourses which are, in a similar manner, open to public convenience, as, for instance, natural streams. Ferries are also sometimes included.

Mode of Creation.—Highways upon land are created either by express dedication of the owner, by prescription, or in pursuance of legislative authority. Dedication occurs when the owner of the property appropriates it to the public use as a common passageway, and there is a sufficient acceptance of the privilege on the part of the public, evidenced either by positive acknowledgment and assent or by constantly enjoying the advantage offered. A right is obtained by prescription by a continuous, undisturbed use of the land as a common way for a particular period of time established by law, usually twenty years (see PRESCRIPTION); but highways are usually established by the exercise of the right of EMINENT DOMAIN (*q. v.*), the methods by which new roads may be laid out as occasion may require being regulated by statute. The authority in the U. S. is usually delegated to towns or bodies of commissioners, who, in conjunction with a jury, determine upon the necessity of a road, its direction, and extent. The commissioners may also have power to direct its construction and make all necessary repairs. Highways by water, in the case of natural streams, exist independently of the granting of any privilege by dedication or of any legislative interposition—by force of the natural right which every citizen possesses of free passage along all watercourses not of artificial construction.

Rights of the Abutting Owner.—The establishment of a highway gives to the public merely an easement, and though this is so far restrictive upon the owner's management and control of his property that he can do nothing to deprive the public of their privilege of free passage or to incommode them, yet it must be enjoyed simply as a right to travel over the land, and an obligation rests also upon the public not to interfere with the owner's interests further than the appropriate use of the way demands. As a general rule the title of the owners of land adjoining and on opposite sides of a highway or a stream extends to the middle of the stream or highway; but he may of course grant his entire interest to the public, or the statute may provide that it shall vest in the public, in which case he loses all his rights in the land the title to which is conveyed. He has a right to the full benefit of the soil, provided he does not deprive the public of the right of way or impair their exercise of it. Thus he has the exclusive right to trees or grass growing along the line of a road, or to mines beneath the surface, and he may construct water-pipes or drains, excavate cellars, etc., below the surface, and he can maintain an action against any one who interferes with these rights. But the public right of easement, especially in villages and cities, sometimes includes particular privileges not directly incidental to the right of transit, but so important and essential for the common welfare of communities that they are deemed to be included within the interest which the public acquires by establishing the highway. For instance, the soil may be opened for the construction of sewers or gas or water pipes for the convenience of neighboring residents. But acts of this nature can only be done by virtue of public authority, and if any individual or combination of individuals attempt to lay gas or water pipes without obtaining special powers for that purpose, they commit an actionable offense for which the owner may seek redress. But nothing additional to such privileges as these is embraced within the easement which the public acquires in property taken for a highway; and if the legislature authorizes the use of the soil for other purposes, as for the construction of a steam railway, this is a new exercise of the right of eminent domain, for which further compensation must be made. Grants of property bounded upon a highway carry with them the same interest in the soil of the road as the grantor previously possessed, unless there be precise expressions in the deed of transfer, limiting the boundary to the edge of the way.

Rights and Obligations of the Public.—The public right of transit must be entirely unrestricted. If obstructions be placed in the way impeding free travel, they will constitute public nuisances, and will afford ground for an indictment or for a private action by any person especially discommoded. They may also be abated or removed by any one, so far as may be necessary to permit him to continue on his way. Moreover, in order that the privilege of passage may be enjoyed with as little inconvenience as possible, it is the duty of every traveler to observe proper care to avoid collisions and accident. To promote this desirable end, it has been made the rule in most European countries that vehicles in passing each other must keep to the left. In the U. S. the regulation is exactly the reverse—that they must keep to the right. The obligation of this requirement ceases when one of the vehicles is confined to a specific line of travel, as a horse-car, and in such a case the other carriage may turn to either side.

In Great Britain the repair of highways is generally a duty obligatory upon the inhabitants of the parishes, and they may be indicted if they suffer defects to continue after knowledge of their existence. In some cases, however, the duty of repair is incumbent on a township or a division of a parish, or, less frequently, upon individuals. In the U. S. it is held, with few exceptions, that there is no common-law liability in the case of *quasi* corporations such as townships and counties. In the New England States it is generally held that neither cities nor towns are liable at common law, but the duty is imposed by statute, and a right of action is given if any injury be sustained by a traveler in consequence of their neglect. In other States the obligation devolves, as a rule, upon municipal corporations proper, such as cities and villages, while towns, which are usually considered *quasi* corporations, are sometimes made liable, or the roads within their limits are placed under the charge of specially appointed commissioners, who may be subjected to an action if they fail to make repairs after they are provided with the means to obtain the requisite funds. If a

person brings an action for an injury sustained through a defect in the highway against the body bound to make repairs, he must show that they had knowledge of the existence of the alleged defect, or a reasonable opportunity and means of obtaining such knowledge. If the defect or obstruction be caused by a resident adjacent to the highway, and the city or town be compelled to respond in damages to a person injured in consequence, a suit for indemnification may be instituted by the city, etc., in its turn against the party primarily responsible by reason of his unauthorized act or culpable negligence. Revised by F. STURGES ALLEN.

Hil'ary: the names of four persons prominent in Church history: I. HILARY OF ARLES, SAINT, b. in S. Gaul about 401; was persuaded by Honoratus, afterward (426–429) bishop of his native place, to enter the monastery of Lerins; in 429, on the death of Honoratus, was chosen his successor in the see of Arles, and died there May 5, 449. Zealous in discipline and strong of will, he had a bitter controversy with Pope Leo the Great, which, however, was amicably settled at last. He was learned, eloquent, and charitable to the poor. His sermons, it is said, were sometimes very long (four hours), so that his hearers were driven into the novelty of sitting. His *Life of Honoratus* is in the *Acta Sanctorum*, Jan. 16. His *Metrum in Genesin*, dedicated to Pope Leo, is an account of the Creation, including also the Deluge and the preservation of Noah, in 197 hexameters.—II. HILARY OF POITIERS, SAINT, "the Athanasius of the West"; of distinguished but heathen parentage; was born at Poitiers in Central Gaul, near the beginning of the fourth century; became a Christian about 350 after prolonged and careful investigation; was chosen Bishop of Poitiers about 353; in 356 was banished to Phrygia because he would not sanction the condemnation of Athanasius; in 359 the emperor sanctioned his return to Poitiers, but he did not reach there till 362; soon after went to Italy, but returned in 364 and died there Jan. 13, 368. He was one of the ablest men of his century—clear-headed, incisive, resolute, learned, and eloquent. The leading characteristic of his career was the sharp and steady war he waged against Arianism. The earliest edition of his works was by Erasmus (Basel, 1523); the best is the Benedictine, by Coustant (Paris, 1693; republished, with additions, by Maffei, Verona, 1730, and in Migne, *Pat. Lat.*, ix. and x.). English translation of his works on the Trinity and the Synods in vol. ix. of the *Nicene and Post-Nicene Fathers* (New York, 1894). (See J. H. Reinkens's *Hilarius von Poitiers*, Schaffhausen, 1864.)—III. HILARY THE POPE, was born (date unknown) in Sardinia; while deacon at Rome, under Pope Leo the Great, was sent as legate to the "Robber Council" at Ephesus (449 A. D.); succeeded Leo in the papal chair in 461, being consecrated Nov. 19, two days after the death of Leo; and died at Rome Feb. 28, 468. He was zealous for the faith and strict in discipline. A synod which met in Rome Nov. 19, 465, passed five canons, inspired by him, indorsing the canons of Nice, and forbidding, among other things, the ordination of men twice married or marrying widows, and forbidding bishops to nominate their successors. (See *Acta Sanctorum*, Feb. 21.)—IV. HILARY THE DEACON. A Roman deacon of this name was sent by Pope Liberius (352–366 A. D.) to a council (attended by 300 bishops) which met at Milan in 355. He appears afterward to have joined the schism of Lucifer (who died 371), Bishop of Cagliari (Lat. *Calaris*) in Sardinia. He has generally been identified with the unknown author (AMBROSIASTER) of the commentary on the Pauline Epistles, wrongly ascribed to Ambrose of Milan, who also wrote the *Quæstiones Veteris et Novi Testamenti*, wrongly ascribed to Augustine. But this identification is now questioned. The commentary on St. Paul's Epistles contains passages which have important bearings on questions of church polity. Revised by S. M. JACKSON.

Hilda, SAINT: abbess of the monastery of Whitby in England; b. about 614; was consecrated as a nun in 647 or 648, and two years later became the abbess of Heortea, or Hartlepool, where she was intrusted by King Oswy with the care of his daughter. Obtaining grants of money from the king, she founded in 658 the monastery at Whitby, to which her reputation for piety soon drew a large number of monks and nuns. Among the inmates were Hedda, Wilfrid, and the Anglo-Saxon poet Cædmon. She directed its affairs with ability, and succeeded in making it the strongest establishment of the kind in England. D. in 680. The church at Hartlepool preserves Saint Hilda's effigy on its ancient seal. See Bede, *Ecclesiastical History of our Island and Nation.*

Hildebrand: See GREGORY VII.

Hildebrand, HANS OLOF HILDEBRAND, Ph. D.: archæologist; b. in Stockholm, Sweden, Apr. 5, 1842; studied at Upsala, where he graduated in 1866. Since 1879 he has been Swedish state antiquarian and secretary of the Swedish Academy of Literature. He has been a fertile writer on topics of Swedish history and prehistoric archæology. Besides numerous articles in periodicals and journals, particularly in *Vitterhets-akademiens Månadsblad* (The Monthly News of the Literary Academy) and *Antiquarisk Tidsskrift för Sverige* (Antiquarian Journal for Sweden), both of which papers he has edited—the former since 1872, the latter since 1883—he has published a great many works of historical interest: *Svenska Folket under Hednatiden* (The Swedish People during Pagan Times, 1866; 2d ed. 1883); *Lifvet på Island under Sagotiden* (Life in Iceland during the Saga Time, 1867; 2d ed. 1883); *De förhistoriska folken i Europa* (The Prehistoric Nations of Europe, 1873–80); *Den kyrkliga konsten under Sveriges Medeltid* (Ecclesiastical Art in Mediæval Sweden, 1875); *Fynden i Troas och Homeros Troja* (1878); *Sveriges Medeltid* (Mediæval Sweden, i.–ii., 1879–84); a collection of essays treating subjects of ancient civilization under the common title *Från äldre tider* (From Ancient Times, 1882). In the English language he has published *The Industrial Arts of Scandinavians in the Pagan Time* (1882). Together with his father, the famous archæologist, Bror Emil Hildebrand, he published, in the years 1873–78, several volumes of plates containing designs from the historical museum of the Swedish state (*Teckningar ur Svenska statens historiska museum*). P. GROTH.

Hildebrandsson, HUGO HILDEBRAND, Ph. D.: meteorologist; b. at Stockholm, Sweden, Aug. 19, 1838. He was educated in the gymnasium at Stockholm and in the university at Upsala. From 1865 to 1869 he was assistant at the Physical Institute at Upsala; 1866–72 tutor in Physics; 1872–78, chief of the meteorological division of the astronomical observatory; since 1878 has been director of the new meteorological observatory of the university; since 1885 "censor" or member of the commission of examinations of the gymnasia of Sweden. He is a member of many scientific societies, and an honorary member of the meteorological societies of London and Vienna. He is a prolific writer both of official publications and of papers on private studies. Among his most important publications may be mentioned: *Atlas des mouvements supérieurs de l'Atmosphère* (published by the Swedish Government in 1877); *Sur la classification des nuages, avec photographies de M. Ekholm* (Upsala, 1879; 2d ed. 1881); *Observations météorologiques faites par l'Expédition de la Vega*, Stockholm, 1882); *Cloud Atlas* (Hamburg, 1890, with Drs. Köppen and Neumayer); *Les orages dans la péninsule scandinave* (Acta Upsal, 1888, with Dr. H. Mohn). MARK W. HARRINGTON.

Hildesheim, hil'des-hīm: town of Germany; in the province of Hanover; on the Innerste; 25 miles by rail S. E. of Hanover (see map of German Empire, ref. 4–E). It contains a fine old cathedral, built in 1015, with famous bronze gates and glass-paintings; the Church of St. Godehard, built in 1133; and the Church of St. Michael, built in 1022. It is a Roman Catholic bishop's see. The chief manufactures are those of sugar, machinery, stoves, castings, and tobacco. Hildesheim became a member of the Hanseatic League in 1241, and remained a free town until 1803, when it was acquired by Prussia. Pop. (1890) 33,481.

Hildreth, RICHARD: historian; the son of Rev. Hosea Hildreth (1782–1835); b. at Deerfield, Mass., June 22, 1807. He graduated at Harvard in 1826; was admitted to the bar at Boston 1830; in 1832 became one of the editors of *The Boston Atlas*; resided 1834–35 in Florida, where he wrote *Archy Moore* (1837), an anti-slavery tale, republished in 1852 as *The White Slave*; published *History of Banks* (1837); a *Life of W. H. Harrison* (1839), whom he vigorously supported for the presidency; a translation of Dumont's version of Bentham's *Theory of Legislation* (1840, 2 vols.); and *Despotism in America* (1854), an anti-slavery work. He resided 1840–43 in Demerara, British Guiana, where he edited two free-labor journals. He published a *Theory of Morals* (1844) and a *Theory of Politics* (1853). His great work is a *History of the United States* (6 vols., 1849–56). The author's point of view is strongly Federalist. The first series of 3 vols. is devoted to the period from the colonization of the country to the adoption of the Constitution (1492–1789); the second series, also of 3 vols., extends from 1789 to the end of President Monroe's administration

(1821). The work is one of great vigor and general accuracy, but it is without attractiveness of style. He also produced *Japan as it Was and Is* (1855) and *Atrocious Judges* (1856, prepared from Lord Campbell's *Lives*. He was for several years on the editorial staff of *The New York Tribune*, and became U. S. consul at Trieste in 1861. D. at Florence, Italy, July 11, 1865. Revised by C. K. Adams.

Hilgard, Eugene Waldemar, Ph. D., LL. D.: chemist; b. in Zweibrücken, Germany, Jan. 5, 1833; emigrated with his father to Belleville, Ill., 1835–36; in 1849 returned to Europe, and studied at the Academy of Mines, Freiberg, Germany; also at the Universities of Zurich and Heidelberg, graduating at Heidelberg in 1853. In 1855 he returned to the U. S., and became assistant State geologist of Mississippi; in 1857 was in charge of the laboratory at the Smithsonian Institution, Washington, D. C.; in 1858 was appointed State geologist of Mississippi. Since 1871 he has held that office in connection with the chairs of Agriculture and of Chemistry in the State University at Oxford, Miss. In 1873 he took the chair of Geology and Natural History in the University of Michigan, and in 1874 was elected Professor of Agriculture in the University of California, a position he still occupies, in connection with that of director of the State agricultural experiment stations. He is the author of a report on the geology and agriculture of Mississippi, and of papers on chemical and geological subjects, particularly on the geology of the Cretaceous, Tertiary, and later formations of the Southwestern States, and on the chemistry and physics of soils; published in *The American Journal of Science* the *Smithsonian Contributions to Science*, and reports of the U. S. Department of Agriculture. Since 1877 he has published a series of reports of the agricultural department of the University of California, in which special stress is laid upon the investigation of soils; also the report on cotton culture for the U. S. census of 1880 (vols. v. and vi.), including descriptions of the physical features of the cotton-growing States. In 1892 he prepared for the U. S. Weather Bureau a discussion of the relations of soils and climate. This was published by the bureau, and was so favorably received abroad as to be translated into several European languages. The Liebig medal was awarded him by the Bavarian Government.

Hilgard, Julius Erasmus: scientist; b. in Zweibrücken, Germany, Jan. 7, 1825; he went in 1835 to Belleville, Ill., with his father, from whom he received a classical education; studied civil engineering in Philadelphia; in 1845 entered the Coast Survey service, which was the principal sphere of his labors, and to the success of which he largely contributed. His writings on geodetic methods, tides, and terrestrial magnetism are published in the Coast Survey reports and in various scientific journals. (See Coast and Geodetic Survey.) In 1862 he was appointed assistant in charge of the Coast Survey office, and of the construction of standard weights and measures, a position which he held until 1881; in 1863 he was named a member of the National Academy of Sciences; in 1872 took an active part in the international metric commission which met at Paris, and was chosen a member of its permanent committee. He at the same time conducted a determination by telegraph of the differences of longitude between the observatories of Washington, Greenwich, and Paris. In 1874 he was president of the American Association for the Advancement of Science. From 1881 to 1885 he was superintendent of the U. S. Coast and Geodetic Survey. D. in Washington, D. C., May 8, 1891.

Hilgard, Theodore Charles, M. D.: b. in Zweibrücken, Germany, Feb. 28, 1828; emigrated to the U. S. in 1835, and afterward completed his education at the German universities; settled as a physician in St. Louis, and devoted much time to the microscopic study of fungi and other lower forms of life. His papers on these and kindred subjects are published in the *Transactions* of the St. Louis Academy of Science and *Proceedings* of the American Association for the Advancement of Science. D. in New York city, Mar. 5, 1875. Revised by Charles E. Bessey.

Hilgard, Theodor Erasmus: lawyer; b. in Nassau, Germany, July 7, 1790; educated at Heidelberg and Paris; counselor at law at Trèves during the empire, and after the restoration of the Rhenish provinces to Germany judge of the court of appeals at Zweibrücken. While holding this position he published a series of reports on the working of the French system of jurisprudence and the Code Napoléon, which remained operative in those German provinces, contributing largely to the preservation and extension of that system. He was during five years member of the provisional assembly, maintaining the right of local self-government, but, dispirited by the reaction toward absolutism under the influence of Austria, he emigrated in 1835 to the U. S. with a family of nine children, whose education he personally directed at his new home in Illinois. He afterward returned to Germany, and settled in Heidelberg, where he died Feb. 14, 1873. He was author of publications on important social questions, such as pauperism, the death-penalty, woman's rights, and the war-power. He also published metrical translations into the German language of Ovid, Homer, and Moore, an original poem entitled *The Hundred Days*, and many minor poems.

Hill: village; Hamilton co., Tenn. (for location of county, see map of Tennessee, ref. 7–H); on the Tennessee river, and the Nash., Chat. and St. L. Railway; a suburb of Chattanooga. It is in an agricultural and stock-raising region, and has milling interests. Pop. (1880) not separately returned; (1890) 1,763.

Hill, Ambrose Powell: soldier; b. in Culpeper co., Va., 1825; graduated at the U. S. Military Academy July 1, 1847, and served in various positions in the U. S. army till Mar., 1861, when he resigned his commission to follow the fortunes of his native State. On the secession of Virginia he was appointed colonel Thirteenth Virginia Volunteers, and dispatched to Harper's Ferry, rejoining the army at and engaged in the first battle of Bull Run. Promoted to be brigadier-general, he was distinguished at the battle of Williamsburg, and advanced to be major-general. In the succeeding operations on the Peninsula he gained a brilliant reputation as a division commander. In Aug., 1862, his division rendered important aid in the defeat of Gen. Banks at Cedar Mountain (Aug., 1862), and in the succeeding battles of Bull Run and Chantilly. In the following month he received the surrender of Harper's Ferry, and hurrying forward arrived with his command at Antietam at the critical moment when he was most needed. At Fredericksburg his division formed the right of Jackson's command, which encountered the vigorous assault of Union troops under Meade, and which was finally repulsed; at Chancellorsville, still with Jackson, he participated in the famous flank movement which broke the Federal lines, and on the death of Jackson assumed command of the corps, being wounded soon thereafter. For gallantry on this occasion he was promoted to be lieutenant-general and placed in command of one of the three corps composing the Army of Northern Virginia. In the campaign of 1864–65 he commanded with great ability at all the conflicts from the Wilderness to the final assault of the Confederate lines before Petersburg, Apr. 2, 1865, where he displayed the greatest bravery, meeting his death by a rifle-shot while engaged in reconnoitering at the moment it was decided that Richmond could no longer be held.

Hill, Benjamin Harvey: politician; b. in Jasper co., Ga. Sept. 14, 1823; graduated at the State University with high honor in 1844; studied law, and entered the profession at La Grange, Ga., in Aug., 1845; in 1851 was elected a member of the Legislature from Troup county as a Union man; and for the next ten years was active both in State and national politics. He was a member of the secession convention of Jan., 1861, and was an earnest advocate of the Union until the convention passed a resolution declaring that the State ought to secede, after which he became one of the prominent supporters of secession. He was elected to the provisional Confederate Congress that met at Montgomery, Ala., on Feb. 4, 1861, and in the fall of the same year to the Confederate Senate, in which body he served until the end of the war. He was arrested at his home, La Grange, Ga., in May, 1865, and confined in Fort La Fayette, New York, until July following, when he was released on parole. After the war he opposed the reconstruction policy of Congress, against which he wrote his *Notes on the Situation* (1867–68). His *Address to the People of Georgia*, issued in 1870, brought upon him severe censure from many quarters previously friendly to him. He supported the "Greeley movement" with zeal and eloquence. He was defeated in the Senatorial contest of Jan., 1873, but pending the canvass made an able speech vindicating his course, and urging the Democracy of Georgia to stand by the policy adopted at Baltimore in 1872. He was elected U. S. Senator for Georgia for 1877–83. D. Aug. 16, 1882. A statue of him was unveiled at Atlanta, Ga., May 1, 1886.

Hill, Daniel Harvey: soldier; b. at Hill's Iron-works, York District, S. C., July 12, 1821; graduated at the U. S. Military Academy, and was appointed brevet second lieutenant of artillery July 1, 1842; transferred to the infantry in 1847, with rank of first lieutenant; served in the Mexican war with distinction, and was presented by his native State with a sword of honor. In Feb., 1849, he resigned his commission, and accepted the chair of Mathematics in Washington College, Va., which he filled until 1854; that of Mathematics and Engineering in Davidson College, North Carolina, 1854–59, when he assumed superintendency of the North Carolina Military Institute at Charlotte. On the outbreak of the war he entered the Confederate army as colonel. Speedily promoted to be major-general, he commanded a division during the Seven Days' fight on the Virginia Peninsula, remaining in command of the James on the departure of the main army of Gen. Lee for Northern Virginia, but rejoining it in season to participate in the battles of South Mountain and Antietam, where he led his division, as subsequently at Fredericksburg. He was in Sept., 1863, at the battle of Chickamauga, Ga., and in 1864 at Bermuda Hundred, Va.; his division was among the command of Gen. Johnston, who surrendered at Durham Station. At the close of the war he returned to Charlotte, N. C., and published *The Land We Love*, a monthly magazine. In 1877 he became president of the University of Arkansas, and in 1887 president of the Military and Agricultural College at Milledgeville, Ga. Among his works published prior to 1861 are *Elements of Algebra*; *Consideration of the Sermon on the Mount* (Philadelphia, 1858); and *The Crucifixion of Christ* (1860). D. at Charlotte, N. C., Sept. 25, 1889.

Hill, David Bennett: politician; b. at Havana, Schuyler (then Chemung) co., N. Y., Aug. 29, 1844; removed to Elmira, N. Y., in 1862, and in 1864 was admitted to the bar; member of New York Assembly in 1869 and 1871; presided at the meetings of the Democratic State conventions of 1877 and 1881; was elected alderman in 1881, and in 1882, mayor of Elmira; was elected in 1882 Lieutenant-Governor of New York on the ticket which had Grover Cleveland at the head, and acted as Governor from Jan. 6, 1885, through the balance of Mr. Cleveland's term of office, the latter having been elected President of the U. S. Mr. Hill was elected Governor of New York, Nov. 3, 1885, and was re-elected Nov. 6, 1888. In 1891 he succeeded William M. Evarts as U. S. Senator.

Hill, David Jayne, A. B., A. M., LL. D.: educator and author; b. at Plainfield, N. J., June 10, 1850; educated at Lewisburg (now Bucknell) University; Professor of Rhetoric Bucknell University 1877–79; president Bucknell University 1879–1888; president University of Rochester since 1888. He has published *The Science of Rhetoric* (New York, 1877); *Elements of Rhetoric and Composition* (New York, 1879); *Life of Washington Irving* (New York, 1879); *Life of William Cullen Bryant* (New York, 1880); *Principles and Fallacies of Socialism* (New York, 1885); *The Elements of Psychology* (New York, 1887); *The Social Influence of Christianity* (Boston, 1887); *Genetic Philosophy* (1893). He has edited Jevon's *Logic* (New York, 1884), and printed *Lecture Notes* for his students on political economy, anthropology, and ethics. He has written numerous articles for reviews, as *The Forum*, *Popular Science Monthly*, *American Journal of Psychology*, and others.

W. H. Whitsitt.

Hill, George William: mathematical astronomer; b. at Nyack, N. J., Mar. 3, 1838; graduated at Rutgers College in 1859. While in college he wrote for *The Mathematical Monthly* an essay which gained him the first prize in a general competition of mathematical students in the U. S. He was soon after appointed assistant in the office of *The Nautical Almanac*, with which he retained his connection until 1892. Mr. Hill's energies have been devoted almost entirely to the mathematical theories of the celestial motions. In 1887, the gold medal of the Royal Astronomical Society was awarded him for his mathematical labors, and in 1892 the University of Cambridge, England, conferred on him the honorary degree of LL. D. In 1890 his monumental work on the theory of Jupiter and Saturn was published. In 1892 he resigned his position, in order to pursue his researches free from the restrictions of official discipline.

S. Newcomb.

Hill, John Henry, D. D., LL. D.: educator; b. in New York city, Sept. 11, 1791; graduated at Columbia College; was ordained a deacon in the Protestant Episcopal Church in 1830, and in the same year went as a missionary to Greece. He and his wife opened at Athens a school for girls, and later a school for boys, which in 1833 were housed in a building erected by Dr. Hill, near the Agora. The departments of "the American School," as it was called, included a high school for the training of teachers. After severe discouragements and personal trials on the part of its founders, the school began to prosper, and received pupils from families connected with the Government at Athens and from wealthy Greek families in Turkey. In 1845 Dr. Hill was appointed chaplain of the British legation in Greece, and retained the position for thirty years, continuing, however, his work of instruction. He died at Athens, July 1, 1882, and, by special direction of the Government, was buried with the honors of a taxiarch, while the Demos of Athens erected a monument over his grave. The Hill Memorial, as the institution was called after his death, was carried on by Mrs. Hill for some years, and is still (1894) in operation. The education and elevation of woman in Greece are chiefly due to the labors of Dr. Hill and his wife.

Revised by W. S. Perry.

Hill, Rowland: an eccentric divine, son of Sir Rowland Hill, first baronet; b. at Hawkestone Park, England, Aug. 13, 1744; was educated at Eton and at St. John's, Cambridge, B. A. 1769; became a Calvinistic Methodist; took orders in the Church of England, though six bishops refused his ordination on account of his Methodistic opinions; became an itinerant, and in 1773 curate of Kingston, Somerset; minister of the Surrey chapel, Blackfriars Road, London, 1783–1833; and was remarkable for wit, eloquence, and success as a preacher. D. in London, Apr. 11, 1833. His best-known publication was his *Village Dialogues* (London, 1810). See his *Life* by E. Sidney (1833) and by James Sherman (1857).

Revised by S. M. Jackson.

Hill, Rowland, Viscount: nephew of the great preacher; b. at Prees Hall, Shropshire, England, Aug. 11, 1772; entered the army in 1790; served with the greatest distinction in most of the battles against Napoleon in which the British participated from Toulon to Waterloo; was raised to the peerage in 1814; took the chief command in 1828, and became a viscount in 1842. D. near Shrewsbury, Dec. 10, 1842. Hill was called the "right arm of Wellington," and was the most popular general in the British army.

Hill, Sir Rowland, K. C. B.: reformer of the postal system; b. at Kidderminster, Dec. 3, 1795; early showed an unusual aptitude for mathematics and taught that branch at his father's school at Hilltop, Birmingham (subsequently removed to Hazelwood), where he practiced the system of education known as the Hazelwood method, which he afterward expounded in a pamphlet entitled *Plans for the Government and Education of Boys in Large Numbers* (1822). He was a successful educator, remarkable for the high moral standard which his personal influence maintained in the school. His health failing, he gave up his educational work in 1833, but soon after became secretary of an association for the carrying out of Gibbon Wakefield's scheme for colonizing South Australia. In 1835 he began to consider the reform of the postal service, and two years later published a pamphlet recommending that the postage should not exceed the rate of a penny for half an ounce on letters within the United Kingdom, and suggesting the use of postage stamps. By a diligent study of statistics, he had reached the conclusion that the distance of the point at which a letter was delivered was an unfair basis on which to reckon the charge, and that a small uniform rate would suffice for expenses on account of the great increase of correspondence. His proposals were widely and earnestly discussed, and the House of Commons appointed a committee to investigate the subject. The penny rate was established in 1840, and Hill received an appointment in the Treasury, but on the downfall of the Liberals in 1841 he was compelled to retire. To show the public appreciation of his services a subscription was started, and he was presented with over £13,000. On the return of the Liberals to office in 1846, he was appointed secretary to the Postmaster-General, and in 1854 became chief secretary. His reforms were successfully carried out, but in 1864 he was compelled by poor health to resign. He was gazetted K. C. B. in 1860. D. Aug. 27, 1879.

F. M. Colby.

Hill, Thomas, D. D., LL. D.: Unitarian minister and mathematician; b. at New Brunswick, N. J., Jan. 7, 1818. He graduated at Harvard College 1843, and at the Cambridge Di-

vinity School 1845; was settled in Waltham, Mass., 1845; was made president of Antioch College 1859; of Harvard College 1862; resigned in 1868 on account of ill-health; retired to Waltham; accompanied Agassiz on the expedition to South America; accepted on his return (1873) a call to the Unitarian church at Portland, Me. He invented an occultator and several other mathematical machines. As a preacher he was fond of proving mathematically the truths of natural religion and the authority of revelation. He published *Christmas, and Poems on Slavery* (Cambridge, 1843); an elementary treatise on arithmetic (1845); *Geometry and Faith* (New York, 1849; Boston, 1874–82); a treatise on curves (1850); *First Lessons in Geometry* (Boston, 1855); *Liberal Education* (1855); *The True Order of Studies* (New York, 1876); *Jesus the Interpreter of Nature, and other Sermons* (1859); *The Natural Sources of Theology* (1875); *Practical Arithmetic* (1881); a volume of verse, *In the Woods and Elsewhere* (Boston, 1888), and other works. D. at Waltham, Mass., Nov. 21, 1891.

Revised by J. W. CHADWICK.

Hil'la, or **Hella**: town of Asiatic Turkey; in the province of Bagdad; about 60 miles S. of the city of Bagdad (see map of Turkey, ref. 8–J); on the Euphrates, which here is 450 feet broad and crossed by a floating bridge. It has manufactories of cottons and woolens, and large bazaars. It is built near the ruins of Babylon. Pop. about 10,000.

Hillebrand, KARL: critic; b. at Giessen, Germany, Sept. 17, 1829; studied law at Heidelberg; was imprisoned for participation in the insurrection of 1849; escaped to France, where he continued his studies; graduated at the University of France and at the Sorbonne; taught German for a few months in the military school at St.-Cyr; and in 1863 became Professor of Foreign Literatures at Douai. At the outbreak of the Franco-German war he resigned his professorship, went to Rome as correspondent for the London *Times*, and afterward settled in Florence. He was an accomplished linguist and published valuable works in English, German, French, and Italian. Among them are *Dino Compagni* (Paris, 1862); the prize essay *De la bonne comédie* (1863); *La Prusse contemporaine* (1867); *Études italiennes* (1868); *De la réforme de l'enseignement supérieur* (1868); *Zeiten, Völker, und Menschen* (7 vols., 1875–85); two volumes of *Geschichte Frankreichs von der thronbesteigung Ludwig Phillips bis zum Fall Napoleons III.* (1877, 1879); *Lectures on German Thought during the Last Two Hundred Years* (delivered at the Royal Institution, London, 1880). See Homberger, *Karl Hillebrand* (1884). D. in Florence, Oct. 19, 1884.

Hil'lel [Heb.; singing, praising], THE GREAT OF THE ELDER (*Hazaken* or *Hassaken*): doctor of the Jewish law; b. at Babylon about 75 B. C., or, as others say, 110 B. C.; became one of the most illustrious of Jewish rabbis, eminent alike for wisdom, holiness, and learning; went about 50 B. C. to Jerusalem and worked with his hands for his living, at the same period attending the lectures of the principal officers of the Sanhedrin, of which, about 30 B. C., he became president, retaining that exalted position till his death, 10 A. D. He became the founder of the school of Hillel, which numbered thousands of adherents, while Shammai, vice-president of the Sanhedrin, was at the head of the rival school of Shammai. The two schools disputed mainly about questions of the law and discipline in sacred things, Hillel's, which was the more liberal, finally becoming the dominant one. (See Delitzsch's *Jesus und Hillel*, 3d ed., Erlangen, 1879.)—HILLEL, the Prince, a descendant of the foregoing, became president of the Sanhedrin and head of the school of Tiberias, as some say in 258 A. D., dying in 320; or, as others say, was chosen president 330 A. D., and died before 400. He is distinguished as the great reformer of the Jewish calendar.

Revised by S. M. JACKSON.

Hiller, FERDINAND: composer; of Jewish parentage; b. at Frankfort-on-the-Main, Germany, Oct. 24, 1811; not only an eminent musician himself, but also the teacher of many eminent pupils. He studied under the best masters of his day, and in 1827 accompanied Hummel on a professional tour. He was in Paris from 1828 to 1835, then returned to Frankfort and subsequently to Cologne, which remained his home for the rest of his life, except when he was professionally engaged elsewhere. He conducted the Leipzig Gewandhaus concerts 1843–44; the lower Rhine music festivals at Cologne from 1850, and occupied various positions as conductor in different German cities. D. at Cologne, May 10, 1885. His first opera, *Romilda*, was produced at Milan in 1839. Five other operas were composed by him, two oratorios, *Saul* and *The Destruction of Jerusalem*, three symphonies, several cantatas, including, *Nala and Damayanti*, for the Birmingham festival of 1871; many motets, psalms, and smaller vocal and instrumental works; also several literary works, including *Aus dem Tonleben unserer Zeit* (2 vols., 1867), a third volume in 1871, and a fourth in 1876, besides many miscellaneous musical articles in German and English periodicals. D. E. HERVEY.

Hillern, WILHELMINE, von: novelist; daughter of Christian Birch and Charlotte Birch-Pfeiffer; b. in Munich, Mar. 11, 1836; studied dramatic art and won success at the Hoftheater at Coburg in 1853; married Kammerherr von Hillern in 1857; and for many years has devoted herself to authorship. She has written the plays *Guten Abend* (1873); *Ein Autographensammler* (1874); *Die Augen der Liebe* (1878); and the novels and stories *Doppelleben* (1865; 2d ed. 1880); *Ein Arzt der Seele* (1869; 4th ed. 1885); *Die Geyer-Wally* (1873; 5th ed. 1884; dramatized 1880); *Höher als die Kirche* (1876); *Sie kommt doch* (1879); *Die Friedhofsblume* (1883).

Hillhouse, JAMES ABRAHAM: poet; son of James Hillhouse (1754–1832), chief justice of the U. S. Supreme Court: b. at New Haven, Conn., Sept. 26, 1789; graduated at Yale, in 1808; became a merchant in New York, and in 1822 married and retired from business. His principal poems were *The Judgment* (1812); *Percy's Masque* (1820); and *Hadad* (1825). His collected works in two volumes appeared in 1839. D. at New Haven, Jan. 4, 1841.

Hilliard, HENRY WASHINGTON: lawyer; b. in Cumberland co., N. C., Aug. 4, 1808; graduated at South Carolina College, Columbia, in 1826. Soon afterward he went to Athens, Ga., where in 1829 he was admitted to the bar; in 1831 was elected to a professorship in the Alabama University at Tuscaloosa, and filled the position with distinction for three years; then, resigning, he resumed the practice of law at Montgomery in that State, and in the meanwhile was a lay preacher in the Methodist Church. He was a member of the State Legislature in 1838, and presidential elector on the Whig ticket in 1840. In 1842 he was appointed minister to Belgium by President Tyler, and afterward was a member of Congress from Alabama from 1845 to 1851, when he declined being again a candidate. In 1856 he was a candidate on the Fillmore electoral ticket of Alabama, and also on the Bell-Everett ticket in 1860. He strongly opposed secession in 1861, but after the convention of Alabama passed the ordinance of secession he espoused the cause of his State. He accepted from President Davis the appointment of commissioner to Tennessee, and held the rank of brigadier-general in the provisional army of the Confederate States. After the war he returned to Georgia, and resumed the practice of law. He was U. S. minister to Brazil 1877–78. A volume of his speeches was published in 1855, and in 1865 *De Vane, a Story of Plebeians and Patricians* (2d ed. Nashville, 1886). D. Dec. 17, 1892.

Hills, GEORGE, D. D.: first Bishop of British Columbia; b. at Eyethorn, Kent, England, in 1816; a son of Rear-Admiral Hills; graduated B. A. at Durham University 1835; received several Church preferments, and in 1859 was consecrated Lord Bishop of British Columbia, having his see-house at New Westminster. In 1892 he resigned his see and returned to England. D. at Parham, Suffolk, Dec. 10, 1895.

Hillsboro: city; capital of Montgomery co., Ill. (for location of county, see map of Illinois, ref. 8–E); on the Cl., Chi., Cin. and St. L. Railway; 11 miles E. of Litchfield, 67 miles N. E. of St. Louis. It is in an agricultural region, and has manufactures of flour, furniture, and woolen goods, and a public high school and two weekly newspapers. Pop. of township, city not separately reported (1880), 2,858; (1890) 2,691.

Hillsboro: village; capital of Highland co., O. (for location of county, see map of Ohio, ref. 7–D); on the Balt. and O. S. W. and the Cin., Ports. and Va. railways; 60 miles E. of Cincinnati. It has a soldiers' monument, a college (M. E.), with 10 instructors and 102 students, high school, planing, flour, and woolen mills, foundries, bent-wood and furniture factories, and three periodicals. Pop. (1880) 3,234; (1890) 3,620.

EDITOR OF "GAZETTE."

Hillsboro: city; capital of Hill co., Tex. (for location of county, see map of Texas, ref. 3–H); on the Mo., Kan. and Tex. and the St. L. S. W. railways; 33 miles N. of Waco, 55 miles S. of Fort Worth. It is in a cotton, corn, small-

grain, and stock raising region, and contains a $100,000 court-house, several churches, a private academy, cottonseed-oil mill, ice-factory, gin-feeder factory, cotton compress, artesian wells, and three weekly newspapers. Pop. (1890) 2,541; (1893) estimated, 4,500. EDITOR OF "MIRROR."

Hillsborough: a village of New Brunswick; 100 miles E. N. E. of St. John; founded in 1763 by a Henry Steeves (see map of Quebec, etc., ref. 5–I); exports to the U. S. mineral oil from the Albert mines near by. Of the 3,000 inhabitants of the parish, 700 have the name of Steeves.
M. W. H.

Hillsborough River: in Volusia co., Fla.; a salt-water lagoon continuous with Halifax river, and extending 30 miles S. of Mosquito inlet. It abounds in fish and oysters, and is separated from the sea by a strip of land from half a mile to 5 miles wide. It is shallow, though navigable for small boats, but its navigation is obstructed by mangroves, coral, sand, etc. Its west bank is a range of oyster-shells. From its head to Indian river a short and shallow canal has been dug. This channel was once called Mosquito South Lagoon, and (with Halifax river) it is still known as Mosquito river. It averages a mile in width.—Another Hillsborough river flows into Tampa Bay, and a third into the Atlantic, directly at Hillsborough inlet.

Hillsdale: city; capital of Hillsdale co., Mich. (for location of county, see map of Michigan, ref. 8–J); on the Lake S. and Mich. S. Railway; 66 miles W. of Toledo, 177 miles E. of Chicago. It is the seat of Hillsdale College, and has 3 steam flour-mills, screen, door, table, chair, and other factories, machine-shops, water-works, gas and electric light plants, and 5 periodicals. Pop. (1880) 3,441; (1890) 3,915; (1894) 4,121. EDITOR OF "STANDARD."

Hillsdale College: an institution founded as Michigan Central College at Spring Arbor, Mich., in consequence of a vote (1844) of the Michigan yearly meeting of the Free-will Baptist denomination. The college was chartered in 1845 by the Legislature, rechartered and removed to Hillsdale, Mich., in 1855. A portion of the principal college building was burned in 1874, but new buildings were erected. Both sexes are educated here. The college has musical, art, theological, academic, and commercial departments, 25 professors and instructors, 521 students, a library of 8,500 volumes, $150,000 invested in grounds and buildings, and $160,000 in productive funds.

Hilo, hee'lō: an important town of Hawaii, and the second town in size in the Sandwich islands. It has a spacious and commodious harbor, and is the center of a rich agricultural district.

Hiltl, GEORG: actor and novelist; b. in Berlin, July 16, 1826; studied for the stage, and after a two years' engagement in Hanover went to the Hoftheater in Berlin in 1845, and nine years later became its manager. His literary productions consist of a great number of translations and adaptations, and a long list of rather shallow historical novels which have been widely read. Among them are *Gefahrvolle Wege* (1865); *Unter der roten Eminenz* (1869); *Der alte Derflinger und seine Dragoner* (1871); *Das Roggenhauskomplott* (1873); *Die Damen von Nanzig* (1874); *Auf immer verschwunden* (1878). He wrote also the popular histories *Der böhmische Krieg und der Mainfeldzug* (4th ed. 1875); *Der französische Krieg von 1870–71* (3d ed. 1876); *Preussische Königsgeschichten* (1875). D. in Berlin, Nov. 15, 1878.

Hilton Head: a township in Beaufort co., S. C.; on Hilton Head island; has on the N. the Port Royal entrance, which constitutes a noble harbor. On the outbreak of the civil war in the U. S. Hilton Head was fortified by the Confederates, but was taken by the U. S. naval forces Nov. 7, 1861.

Himalaya, hĭ-maa'la-ya [= Sanskr. Himālaya, abode of snow; *himá-*, snow, frost: Gr. χιών: Lat. *hiems* + *alaya*, abode; anc. *Emodus* or *Imaus*]: the great chain of mountains which form the southern rampart of the Tibetan table-land, separating it from the low-lying plains of Northern India. The name is usually limited to that part of the southern mountains of the Tibetan plateau which lies S. of the upper waters of the Indus and the Brahmaputra or Sánpu; but to the northward are two other ranges, which some geographers call Himalayas also, in which case the Himalayas proper are called the southern range. The latter are the highest and best known, and what follows relates to them. The eastern end is where the Brahmaputra breaks through to pass from the northern to the southern slope, but the same mountain axis is now known to extend into China, and that portion of it is in that country sometimes called the "Alps of Sze-chuen." The western end is usually taken at the place where the Indus breaks out of the mountains, but here also the axis can be traced several degrees farther. As thus defined, extending from the Indus to the Brahmaputra, it is a magnificent mountain-chain, striking a curve 1,400 miles long, containing the highest known mountains and the greatest number of high mountains in the world, and presenting the remarkable peculiarity of being drained on the N. by the same streams that drain more than half of the southern slope.

Beginning at the W., the range, from the Indus to where it is crossed by its tributary, the Sutlej, covering Kashmir and the Punjaub, is relatively low and diffused, apparently not reaching 20,000 feet in altitude. From here through the Northwestern Provinces and Nepaul to Sikkim mountains abound which are over 20,000 feet in height. About 70 are already known, and there is no reason to think that all have been found and measured. Of those known 16 are above 25,000 feet and 4 above 27,500. The latter are Gaorinsakar or Everest, on the northern boundary of Nepaul, 29,005 feet, the highest known mountain; Kinchinjinga, in the northwest angle of Sikkim, with two peaks respectively 28,156 and 27,815 feet; and Sihour, between Gaorisankar and Kinchinjinga, 27,799 feet. It may be interesting to add the next highest known mountains. These are Dapsang, in the Karakorum range, N. of Kashmir, 28,283 feet, and in South America, Aconcagua, 22,423 feet. E. of Sikkim in Bhutan and to the N. of Assam the mountains are relatively low. The high peaks are thus confined to about half of the chain—seventy lofty peaks in about 700 miles—and it is a noteworthy fact that they are confined to that part of the chain whose southern slopes are drained by the Ganges.

The great mass of the Himalayan rocks are metamorphic, sometimes granitoid, sometimes schistose or slaty. Sandstone is found only in the small chain which separates the mountains proper from the southern plains, and these sandstones are fossiliferous. Igneous rocks are not entirely lacking, but there are no volcanoes, whether active or extinct. Slight shocks of earthquake are not uncommon, but very severe ones are unknown. The mountains rise from the plains by a series of interesting formations, often well marked but not always present. First comes a depression below the level of the plains. It is wet, marshy, and productive of fever. Then comes a gradual slope of detritus, dry but malarial, covered with forests especially characterized by the presence of the sal-tree; next a low range called the "Outer Hills," an anterior chain of sandstone rich in fossils, varying in height from 300 to 3,000 feet. Between these hills and the base of the mountains is a series of small valleys, with a rich productive soil and luxuriant forest vegetation, full of malaria a and favorite haunt of the larger wild beasts. Behind these rise the mountains proper, somber and monotonous, peaks without plateaus at the top, and separated by narrow winding gorges instead of broad and fertile valleys.

The snows extend in winter on the southern slope to a height of about 6,000 feet, but the line of perpetual snow is 10,000 or 12,000 feet high. It has been found to be about 3,000 feet higher on the northern than on the southern slope—a fact due to the greater aridity on the northern side. Glaciers occur as on other mountains, and it has been found that they have latterly decreased like those in the Alps. The forest growth on the slopes is abundant, varying with the altitude. At elevations of 14,000 or 15,000 feet a sort of barley is the only grain which can be cultivated. Wheat succeeds only up to about 12,500 feet, as also common barley, a millet, and peas. From about 10,000 feet down two crops a year are obtained. Bisons, musk oxen, and mountain sheep and goats are found wild in the highest region, while the tame animals are yaks and domestic sheep and goats. All parts of the chain abound in minerals, especially iron and copper. Lead, zinc, sulphur, and plumbago exist in smaller quantities. Mineral springs are common; limestone formations are absent. Salt is rare, though common farther north, and only traces of coal are found, and these are at the base of the mountains. A little gold is found in some torrent beds in the western Himalayas. The natives have mined copper largely, and lead to a less degree, while the British have mined some iron.

REFERENCES.—J. D. Hooker, *Himalayan Journals* (2 vols., 1855); Schlagintweit Brothers, *Scientific Mission to India*

and High Asia (5 vols. and atlas, 1861–72); H. von Schlagintweit, *Reisen in Indien und Hochasien* (4 vols., 1869–80); Saunders, *A Sketch of the Mountains and River Basins of India* (1870), and *The Himalayan System* in *Geographical Magazine* (1877); Markham, *Mission of T. Bogle*, etc. (1876), and *The Himalayan System* in *Geographical Magazine* (1877); article, *Himalaya*, in Saint-Vincent's *Géographie Universelle* (1884) and the *Encyclopædia Britannica*. MARK W. HARRINGTON.

Hi'mera: an ancient city of Sicily; situated on the northern coast; was founded in the seventh century before Christ by a colony from Zancle, and was destroyed in 408 B. C. by the Carthaginians under Hannibal.
Revised by G. L. HENDRICKSON.

Hime'rius: a Greek sophist of the fourth century after Christ (probably from 315 to 386); b. at Prusa in Bithynia; studied at Athens; traveled, and settled finally at Athens as a teacher of rhetoric. For some time he lived in Antioch at the court of the Emperor Julian, who fully appreciated him. Among his disciples was Gregory Nazianzen. He was, like Libanius, a pagan, but he speaks with moderation, and sometimes even with kindness, of the Christians. Of his orations, twenty-four have come down to us complete, and have been edited by Wernsdorf (Göttingen, 1790). There are fragments of eleven others, and extracts by Photius of thirty-six. His style is florid, figurative, affected. Apart from the allusions to his times, the chief value of Himerius lies in his poetic reminiscences and his reproduction in prose of lost poems of the best period.
Revised by B. L. GILDERSLEEVE.

Himil'co: a name of common occurrence in the history of Carthage. Pliny mentions one Himilco, a Carthaginian, who made a voyage of discovery along the western coast of Europe at the same time that Hanno explored the western coast of Africa. Both in the first and third Punic wars there were noted Carthaginian generals of this name, but the most famous was that Himilco, the son of Hanno, who in 406 B. C. commanded the Carthaginian expedition against Sicily, together with Hannibal, the son of Gisco. The expedition was very successful, and the whole western part of the island was conquered. In 397, however, Dionysius, tyrant of Syracuse, renewed the war. Himilco again commanded the Carthaginian force, and was successful in the beginning, but while he besieged the city of Syracuse a pestilence broke out in his camp. In this emergency Dionysius attacked and defeated him, and Himilco now made an infamous capitulation, paying 300 talents in order to be permitted to depart unmolested with all his native Carthaginians, while he left his allies and the mercenary troops to the mercy of Dionysius. Having returned to Carthage, the popular odium which he incurred pressed so heavily on him that he committed suicide. Revised by G. L. HENDRICKSON.

Himyarit'ic Language: See ARABIAN LANGUAGE.

Hīnayāna [Sansk.; *hīna*, imperfect, inferior + *yāna*, a vehicle or conveyance]: "the little or inferior vehicle or conveyance"; a slighting or contemptuous term applied to primitive Buddhism by those Buddhists, chiefly of the Northern school, who favored the expanded form of doctrine known as the MAHĀYĀNA (*q. v.*). The term implies that the monastic system founded by Buddha was adapted only for the few, while the speculative mysticism and the ampler and more varied means of salvation of the "great vehicle" or development provide salvation for all. The distinction is illustrated by what Buddha is reported to have said on one occasion: "A notable man's house took fire. He brought goat-carts to rescue his sons. He afterward gave them lofty broad wagons drawn by white bullocks." The first represents the methods of Hīnayāna, the latter of Mahāyāna. See Edkins, *Chinese Buddhism*, p. 63 (London, 1880). R. L.

Hincks, EDWARD, D. D.: archæologist; b. at Cork, Ireland, Aug. 19, 1792; studied under his father, Hebrew professor at Belfast; graduated with honors in 1812 at Trinity College, Dublin, and received a fellowship; took Anglican orders, and became rector of Ardtrea, and in 1826 rector of Killyleagh, Ireland, where he died Dec. 3, 1866. Though living in a remote country parish, and possessed of but small means, he became one of the first and ablest restorers of the lost knowledge of the meaning of the Assyrian inscriptions. He discovered the key to the Assyrian vowel system, and his papers *On Assyrian Verbs* (1855–56) contain the first successful attempts at an Assyrian grammar. Among his writings are valued papers on Egyptian MSS., and some polemical works.

Hincks, Sir FRANCIS, K. C. M. G., C. B.: Canadian merchant and politician; b. at Cork, Ireland, in 1805, a son of the Rev. Dr. Hincks, a learned Presbyterian divine of Belfast, and brother of Rev. Edward Hincks (1792–1866), the Assyrian archæologist. Sir Francis became a merchant, and in 1832 settled at Toronto, Canada, where he became a prominent editor and politician; Finance Minister of Upper Canada 1842–43 and 1848–54; Prime Minister in 1851; governor of the Windward islands 1853–62; of British Guiana 1862–69; Finance Minister of Canada 1869–73. He was knighted in 1869. D. Aug. 18, 1885.

Hincmar: Archbishop of Reims; b. in the province of Reims, 806. He was educated in the Benedictine monastery of St.-Denis, near Paris; became a monk there 829, but the next year was banished to New Corbie, in Saxony, for his alleged participation in a conspiracy against Louis the Pious, but was restored in 831 and lived at Louis's court. On May 3, 845, he was consecrated Archbishop of Reims and Metropolitan. He made a very vigorous prelate, and carried on some memorable and successful controversies, the most famous of which was with the monk Gottschalk upon the subject of predestination, which the monk advocated in its baldest form. He also played a prominent part as a statesman. In fact he was the foremost man of his very troublous times. In 882 the dreaded Normans made their appearance in the neighborhood of Reims, and he fled to Épernay, and there died Dec. 21, 882. Of far-reaching consequences was his use of the false Isidorian decretals, those bold forgeries of documents pretending to date from early Christian times. He was the first to employ them, when contending for the Gallican liberties against the pope, and did so probably in good faith, not knowing that they really were contemporary documents. See his works in Migne, *Pat. Lat.*, cxxv.–xxvi., and his biography by H. Schrörs (Freiberg im Breisgau, 1884).
SAMUEL MACAULEY JACKSON.

Hind, JOHN RUSSELL: astronomer; b. at Nottingham, England, May 12, 1823; began his astronomical studies on his arrival in London in 1840 as assistant to a civil engineer; discovered a number of the asteroids between 1847 and 1854, and was superintendent of *The Nautical Almanac* from 1857 to 1891. D. at Twickenham, Dec. 23, 1895. S. N.

Hin'dersin, GUSTAV EDUARD, von: soldier; b. at Wernigerode, Prussian Saxony, July 18, 1804; entered the artillery as a volunteer in 1820; distinguished himself by his quick apprehension, indefatigable application, and eminent business capacity, and was attached to the staff as first lieutenant in 1841. In 1846 he became major, and was appointed director of the topographical department. In the campaign of 1849 against the insurgents of Baden he had the misfortune to be taken prisoner while reconnoitering from a belfry, but was liberated after the capitulation of Rastadt. In 1854 he received the command of the Second Brigade of Artillery, in 1858 that of the Third, and in 1864 the position of inspector-general. Shortly before the assault on the Düppel intrenchments in Schleswig, during the war against Denmark, he was called to the headquarters of Prince Frederick Charles and appointed leader of the artillery attack; after the victory he was ennobled and received the title of a general of infantry. In the war against France (1870–71) he followed the royal headquarters as commander of the artillery, and took an active part in the siege of Paris. D. June 25, 1872. He did much for the improvement of the Prussian artillery, and introduced the breech-loading gun.

Hindley, hīnd'li: town of Lancashire, England; 2 miles E. S. E. of Wigan (see map of England, ref. 7–F); has extensive cotton manufactures and large coal mines in its vicinity. Pop. (1891) 18,973.

Hindoo-Koosh: See HINDU-KUSH.

Hindostan: See INDIA.

Hinds, SAMUEL, D. D.: clergyman and author; b. in Barbados 1793; graduated in 1815 at Queen's College, Oxford; became principal of Codrington College, Barbados; vice-principal of St. Alban's Hall, Oxford, 1827–31; domestic chaplain to Archbishop Whately 1831–33; was vicar of Yardley, Hertfordshire, 1834–43; prebendary and rector of Castlenock, Dublin, 1843–48; chaplain to the Lord-Lieutenant of Ireland 1846–48; dean of Carlisle 1848; Bishop of Norwich 1849–57, when he resigned. D. at Notting Hill, London, Feb. 7, 1872. Author of a *History of Christianity* (London, 2 vols., 1828; 3d ed. 1850); a treatise on logic, *Sonnets and Sacred Poems* (1834); *The Three Temples of the*

One True God Contrasted (Oxford, 1830; 3d ed. 1857); *Inspiration and Authority of Scripture* (1831); *Scripture and the Authorized Version* (London, 1845; 2d ed. 1853), etc. His *History of Christianity*, originally published in the *Encyclopædia Metropolitana*, has gone through many editions.

Hinduism: the religious system prevalent among the Hindus, who form the bulk of the people of India. It is a comparatively modern development, through BRAHMANISM and BUDDHISM (*qq. v.*), influenced by non-Aryan notions, of the primitive nature-worship of the earliest Aryan settlers, as exhibited in the collection of hymns called the *Vedas* (the oldest literary monuments of the country), and hence called *Vedism*. (See VEDA.) These hymns have a strong mythic character about them. They are addressed to the elements and powers of nature personified—to fire, to the wind, to the firmament, the moon, and other objects. Those addressed to the dawn are peculiarly interesting from their mythical significance. No one of the divinities has any recognized superiority over the others, but the differences in the numbers of the hymns addressed to the individual deities show that they were held in various degrees of dread and reverence. There are glimpses in some of the hymns of a high and spiritual conception of the Deity, or direct mystical allusions to one superior Being, from whom all the rest emanate; and texts are found which speak more or less explicitly of "One Supreme Spirit, the Lord of the universe, whose work is the universe." But the general character of the hymns does not rise above earthly objects. Protection from the elements, from sickness, and from enemies, aspirations for the favors of nature, for increase of children and of cattle, are their main topics. Various rites and ceremonies are provided for and enforced, and very frequent reference is made to the fermented juice of the *soma* plant (*Asclepias acida*), a beverage in high favor among mortals, and therefore presented as an acceptable offering to the superior powers.

The difference between the religion of the Vedas and modern Hinduism is very wide—so wide indeed that the two religions have little or nothing in common beyond the Vedic texts and formulas still in use. "The great feature of difference," says H. H. Wilson, "is the total absence of the divinities, both *nomina* and *numina*, who have for ages engaged, and, to a great degree, engrossed, the adoration of the Hindus. We have no indications of a Triad, the creative, preserving, and destroying power; Brahmá does not appear as a deity, and Vishnu, although named, has nothing in common with the Vishnu of the Puránas; no allusion occurs to his *avatárs* or incarnations. As a divinity Siva is not named; nor is his type, the *lingam*, ever adverted to. Durgá and her triumphs, and Kálí, 'whom the blood of man delights a thousand years,' have no place whatever in the hymns of the Vedas." The doctrine of transmigration seems to be entirely unnoticed in the Vedic hymns; and the rite of *sati*, the burning of widows with the corpses of their husbands, although known to Greek writers 300 years before Christ, and said to be a Vedic institution, proves upon examination to have no better authority than a misquoted verse. Some portion of the ceremonial of the Vedas still survives in the domestic observances of the Bráhmans and in their obsequial offerings. It is incumbent on every householder to make offerings of cakes and other viands to his own ancestors, and to the collective *Pitris* or Patres of the human race. Every Bráhman also, on approaching maturity and being invested with the sacred thread, is taught the celebrated verse called the *Gáyatri*: "Let us meditate on the adorable light of the Sun (or Divine Ruler): may it guide our intellects!" This may be the only verse of the Veda he may ever learn, but this he must repeat in all his devotions.

Second only to the Veda in importance is the Code of Manu, which is also a pre-Christian production. This shows a considerable advance in the development of the Hindu system. A future state of reward and punishment is clearly recognized, and the doctrine of transmigration is distinctly enunciated. No one of the three great gods of modern times was known to the Veda, but Manu recognizes Brahmá, the Creator. But Brahmá is not the One Supreme Being, the Soul of the universe, but merely the creative energy; and after the world which he has produced has endured for long ages, the Divine energy is withdrawn and Brahmá himself returns to the Supreme essence from which he emanated. (See BRAHMANISM.) The most remarkable feature in Manu, however, is the full development of the caste system. Not only are the four great castes recognized, but the "mixed castes" also have come into being through the intercourse of couples belonging to different castes. Most stringent rules are laid down for the separation and guidance of all the castes, the chief and leading object throughout being the elevation of the Bráhman and the degradation of the others. See CASTE.

It is in the PURÁNAS (*q. v.*), however, that Hinduism receives its full development. Brahmá the Creator, Vishnu the Preserver, and Siva the Destroyer (or rather Regenerator) are acknowledged as the three great divinities constituting the Triad. The first of the Puránas is the *Brahmá-purána*; the others are devoted, some to the exaltation of Vishnu in one or other of his many forms, and some to the honor of Siva and his emblem, the *lingam*. It is doubtful if Brahmá was ever an object of worship, for even the Brahmá-purána does no more than indicate a local worship of him at one place near Ajmír. Vishnu the Preserver was then, as now, the most popular deity, under one or other of his ten *avatárs* or descents, or, as the word is sometimes translated, "incarnations." See AVATAR and VISHNU.

Siva, the Destroyer and Regenerator, has also a vast number of votaries, but fewer than Vishnu. His appearance and attributes are of a very gloomy character. He is represented as sitting absorbed in thought—naked, smeared with funereal ashes, with matted hair, and a necklace of human skulls and bones. He has three eyes, and the fire from them consumes those who interrupt his devotions. See SIVA.

Saraswatí, the wife of Brahmá, is the goddess of learning and the arts, and the inventress of the Sanskrit language. She receives more honor than her lord. Lakshmí, the wife of Vishnu, is the goddess of prosperity and fortune. Both of these deities receive adoration on particular occasions, and the latter is very frequently invoked, but they are not the objects of any regular worship. It is far different with the consort of Siva, who is known under a great variety of names—Deví, Dúrgá, Kálí, Párvatí, Bhaváni, etc.—and is the recipient of a fierce fanatical adoration. This goddess is represented in a variety of ways, all more or less terrible and disgusting. In the mildest form she is a handsome woman riding on a tiger in a fierce and menacing attitude. In another and more common one she is Kálí, "the black," with a black skin, a hideous and terrible countenance, dripping with blood, wreathed with snakes, and adorned with human skulls. The worship of this deity is very widely spread, especially in Bengal, and it is from her that Calcutta obtained its name. The worship of Deví owes its diffusion, perhaps its rise, to a class of writings called *Tantras*. These are works of a comparatively late date, but their origin is very obscure and their authors are unknown. They are ascribed to Siva, and are generally in the form of dialogues between him and his consort. "They are very numerous, and some are of considerable volume. They have been but little examined by European scholars, but sufficient has been ascertained to warrant the accusation that they are authorities for all that is most abominable in the present state of the Hindu religion. The great feature of the religion taught by the *Tantras* is the worship of Saktí—divine power personified as a female, and individualized, not only in the goddesses of mythology, but in every woman; to whom, therefore, in her own person, religious worship may be, and is occasionally, addressed. The chief objects of adoration are, however, the manifold forms of the bride of Siva. Even in its least exceptional division the Saktí worship comprehends the performance of magical ceremonies, and rites intended to obtain superhuman powers and a command over the spirits of heaven, earth, and hell. The popular division is, however, called by the Hindus the *left-hand* faith. It is to this that the bloody sacrifices offered to Kálí must be imputed, and that all the barbarities and indecencies perpetrated at the annual worship of Dúrgá and the swinging festival are to be ascribed. There are other atrocities which do not meet the public eye." (*H. H. Wilson.*)

The religion of the Hindus is thus principally directed to the worship of three leading divinities, Vishnu, Siva, and Deví—each of whom has many names and forms. Each form or manifestation has some peculiar attribute, some special kind of worship, but the general features are maintained throughout. The worship of Vishnu is cheerful and sensuous; of Siva, somber and severe; of Deví, terrible and disgusting. But besides these great divinities there are many others of less dignity and power, who have their special attributes and spheres of action. They are not the ob-

jects of any regular worship, but they are invoked and adoration is offered to them when it is desired to propitiate them and secure a favorable exercise of their powers. There is Indra, the god of the firmament and heaven; Sûrya, the sun; Soma, the moon; Varuna, the waters; Pavana, the wind; Agni, fire; Kuvera, wealth; Kârtikeya, war; Kâma, love; Yama, the god of the infernal regions and judge of the dead; Ganesa or Ganapati, the god of wisdom and the remover of obstacles. He is represented as a short fat man with an elephant's head. His image is frequently found at the entrance of temples, and he is invoked at the beginning of important works and ceremonies. The total number of gods is said to be 330,000,000.

Two very remarkable features in the Hindu religion are the great powers and virtues ascribed to sacrifice and faith. Sacrifice and austere penance, perseveringly and rigidly performed, make even the gods subservient to the wishes of the devotee, and that quite irrespective of the object in view. The merit is in the performance, not in the spirit, of the observance, and the most impious and worthless are represented as gaining their ends by sacrifice and severe bodily torture. The virtue of faith was a leading principle in the *Bhagavad Gîtâ* ascribed to Krishna. Trust in the chosen deity, constant repetition of his name, the bearing of his sectarial marks—in short, the outward show of religion upheld by a fanatical faith—is of more avail than sacrifice and piety. Morality and innocence may be inculcated, but the saving principle is belief.

The worshipers of Vishnu and Siva are broken up into an infinite variety of sects and divisions, and they have also a great number of monastic and mendicant orders intent upon the maintenance of their respective phases of belief. Many instances are recorded of rival devotees coming in conflict at some of the great places of pilgrimage, and of hundreds and thousands being killed. There are among the Hindus men of superior intelligence who philosophically see through all these varieties of divinity the One Supreme Being, to whom alone worship is due. There have been others who, influenced by that feeling of mysticism so prevalent in the East, have treated all the forms of religion as mere symbols. Such were the founders of some of what may be called the dissenting sects, who deny the merit of religious ceremonies, and strive to seek above and beyond them the One Great Being. Such was the sect established by the weaver Kabir at the beginning of the fifteenth century; such also was that of the Sikhs, founded by Nának at the end of that same century. Many a pure thought and lofty idea is to be found in the verses of these and other such independent thinkers—for it is to be noted that all of them express their thoughts in verse—but there is a strong disposition in all such sects, as time wears on, unduly to exalt their *guru* or founder, and to adore him as a saint. See the articles Siva and Vaishnavas. See also *India* in Johnson's *Oriental Religions* (Boston, 1873); vol. iii. of Talboys Wheeler's *History of India from the Earliest Ages* (London, 1874); Robson's *Hinduism in its Relation to Christianity* (Edinburgh, 1874); Barth's *Religions of India* (London, 1881; New York, 1883); Monier-Williams, *Religious Thought and Life in India* (London, 1883; a third edition of this work appeared in 1887, with the title *Brahmanism and Hinduism*). See also a little work by the same author entitled *Hinduism*, prepared for the Society for the Promotion of Christian Knowledge (London and New York).

Revised by R. Lilley.

Hindu-Kush, or **Hindoo-Koosh**: a mountain range in Central Asia, extending from lon. 68° to lon. 75° E., and forming the boundary between Afghanistan and Turkestan. At its eastern extremity it is connected with the Karakorum Mountains, which it resembles in many of its features, though it is lower. The dividing-line between the Hindu-Kush and the Himalaya forms the Baroghil Pass, which leads from the high valley of Little Pamir down into the valley of Kashgar. At its western extremity it is separated from Koh-i-Baba by the Hajjigak Pass, which leads from Cabul to Turkestan. Its entire length is 365 miles. Its highest point is probably Tirich-Mir, about 23,000 feet high.

Revised by M. W. Harrington.

Hindu Philosophy: six schools of philosophy recognized by the Hindus. These are all founded ostensibly on the Vedas, and attempt to interpret the religious doctrine of those sacred books as regards the first principle of the universe and its relation (or non-relation) to the world. They claim to have one final object, the attainment of *mukti*, or deliverance, the emancipation of the soul from future birth and existence, and its absorption into the Supreme Soul of the universe.

The names of the six schools, or *darsanas*, are *Nyáya*, *Vaiseshika*, *Sánkhya*, *Yoga*, *Pûrva-Mîmânsâ*, and *Uttara-Mîmansâ* or *Vedânta*. But with European ideas as to what constitutes a system of philosophy, this classification is misleading and the cause of much confusion in the mind of the uninitiated. The Sánkhya system includes all that there is of philosophy in the six systems, the Nyáya system being merely an organon of logic and the Vaiseshika an atomic theory, or rather a system of physical categories used to explain the world of nature; but, unlike the atomic school of Leucippus, it does not regard atoms as ultimates, but as possessing a spurious individuality like the waves of the sea. The Yoga systems are professedly practical applications of the doctrines of the Sánkhya; the two Mímánsás are an attempt to interpret, by a commentary, the doctrine of the Vedas, using the insight of Kapila as the explanatory principle. That insight regards all beings in time and space as emanations from a One being entirely without attributes or variety of any kind. The orthodox Brahmins name this One Brahm, or Vishnu, Krishna, or by some other name, and consider themselves to be theistic; while the followers of Kapila describe their first principle negatively, and are called atheists. But it is a difference in names only, inasmuch as a pure being devoid of all attributes, properties, qualities, and actions, is an empty absolute accurately described by the word *nothing*. For the Hindu Absolute is not in fact a causal being nor a creator, although sometimes the Hindu lets his imagination go so far as to admit descriptive words that imply such causality. The one consistent view to explain both atheistical and theistical schools of philosophy in India is that all limited, particular being, including consciousness itself, is an illusion, owing to ignorance or error, which produces sense-knowledge of outside objects. True knowledge, enlightened by the Sánkhya, is aware that all seeming objects are illusionary. In fact Buddhism itself borrows the Sánkhya doctrine, and explains the world by twelve Nidânas or successive stages of ignorance of the true nature of illusions: first, ignorance that things are not real leads us to act in order to change something that does not please us; the second Nidâna is action. Again, action upon our environment leads us to knowledge of the limits between the *me* and the *not-me*; this is the third Nidâna, or consciousness, etc. In the eleventh chapter of the *Bhagavad Gîtâ* Krishna reveals to Arjuna the illusion in ordinary knowledge, and shows that the "universal form" destroys within it all particular beings, all individuality; whether in gods or in men, all limitation, all distinction, is unreal, and all supposed knowledge of things is ignorance. The *Sánkhya Kárikâ* (distich 64, Colebrooke's translation) says, "Through the study of (the twenty-five) principles the conclusive, incontrovertible, one, only knowledge is attained, that neither I am, nor is aught mine, nor do I exist." The *Bhagavad Gîtâ* is the best exposition of this one philosophy which underlies all Hindu thought. It represents that branch of the Sánkhya system called the Karma Yoga, and enjoins action to some extent (provided that the one who acts keeps himself in a state of complete indifference as to the results of his action), while the Yoga of Patanjali tends to complete non-resistance and quietism. The Yoga systems are applications of the Sánkhya doctrine to the purpose of religious emancipation from ignorance and the evils of mundane existence. The first authority is Colebrooke, *Miscellaneous Essays*, reprinted from the *Transactions of the Royal Asiatic Society*, and his translation of the *Sánkhya Kárikâ* (1837). Among the numerous writings accessible are *Hindu Philosophy*, by John Davies (1881); *The Vedântasâra*, translated by Maj. S. A. Jacob (1881); *The Religions of India*, by A. Barth, translated by Rev. J. Wood; *The Bhagavad Gîtâ*, translated by J. Cockburn Thomson (1855). (See R. W. Emerson's *Brahma* for a masterly summary of the doctrines of the *Bhagavad Gîtâ*.) *The Bhagavad Gîtâ*, translated by Mohini M. Cheterji (Boston, 1887); other and better known translations of this work by John Davies (London), Charles Wilkins, and by Kâshinâth Trimbak Telang in Max Müller's *Sacred Books of the East*. See articles on Sánkhya, Yoga, Vaisheshika, Mímánsá, and Vedánta.

W. T. Harris.

Hindus: See Caste and India.

Hingham, hing'am: town (settled 1633 and incorporated 1635); Plymouth co., Mass. (for location of county, see map

of Massachusetts, ref. 4–J); on Massachusetts Bay and the Old Colony Railroad: 14 miles S. E. of Boston, with which it has railway and steamboat connection. It contains 8 churches, a meeting-house built in 1681, excellent schools, 3 public halls, public library, Derby Academy, Melville Garden, Downer Landing, and weekly newspaper, and manufactures wooden-ware, wooden toys, cordage, awnings, boot-heels, furniture, worsted upholstery, and leatherette. In the cemetery are a monument to the first settlers and a statue of Gov. John A. Andrew. The township contains the villages of Hingham Center and South Hingham. The town is a noted summer resort. Pop. (1870) 4,485; (1890) 4,564; (1895) 4,819. EDITOR OF "JOURNAL."

Hin'ny, or **Jen'net** [*hinny* is from Lat. *hinnus*, mule: *jennet* is from Fr. *genet*: Span. *jinete*, pony, horseman: Ital. *ginnetto*, pony, probably < Gr. γυμνήτης, light-armed soldier. Origin in Arab. *zenāta*, name of a Barbary tribe of horsemen, has also been suggested]: a hybrid between the horse and the she-ass, a very different animal from the mule, which is bred between the ass and the mare. The hinny neighs like a horse, the mule brays like the ass. The mule's ears, tail, and general aspect are asinine. The hinny more nearly resembles the horse; is of slighter build, and of strength inferior to that of the mule. It is bred to some extent in Spain and Barbary. It was once called *jumart*, and was absurdly believed to be the fruit of a cross between the bull and the mare.

Hinrichs, hĕĕn'richs, GUSTAVE: composer and conductor; b. in Ludwigslust, Mecklenburg, Germany, in 1850; educated there and at Hamburg; when nineteen years old emigrated to the U. S. and settled in San Francisco; conducted operas and concerts there; in 1885 became assistant conductor of the American Opera Company under Theodore Thomas; when that company was reorganized in 1887 he became its only conductor. He has composed several operas, one of which, *Ontiora*, was successfully produced in Philadelphia, July 28, 1890. D. E. HERVEY.

Hinsdale: village; Du Page co., Ill. (for location of county, see map of Illinois, ref. 2–G); on the Chi., Burl. and Q. Railroad; 18 miles W. S. W. of Chicago. It has a high school and two weekly newspapers. Pop. (1880) 819; (1890) 1,584.

Hinsdale: town; Cheshire co., N. H. (for location of county, see map of New Hampshire, ref. 10–D); on the Ashuelot river and the Connect. River Railroad; 19 miles S. W. of Keene. It is noted for its manufactures, which include woolen goods, paper, machinery, mowing-machines, soap, hardware, etc. It has a weekly and two monthly periodicals. Pop. (1880) 1,868; (1890) 2,258.

Hinsdale, BURKE AARON, Ph. D.: educator; b. at Wadsworth, Medina co., O., Mar. 31, 1837; was educated at the Elective Institute, now Hiram College, where he was a pupil of James A. Garfield; entered the ministry of the Christian Church (called also Disciple, Campbellite, etc.) in 1861; was pastor in Solon, O., 1864–66; in Cleveland 1866–68; assistant editor of *The Christian Standard* 1866–69; Professor of History and English Literature in Hiram College 1869–70; became its president and Professor of Philosophy, History, and Biblical Literature 1870; Professor of the Science and Art of Teaching in the University of Michigan 1886; author of *Genuineness and Authenticity of the Gospel* (Cincinnati, 1870); *The Jewish Christian Church* (1878); *Republican Text-book* (New York, 1880); *Garfield and Education* (Boston, 1881); *Schools and Studies* (1884); *The Old Northwest* (1888); and edited *The Life and Works of James A. Garfield* (1882–85), and has contributed much to periodical literature.

Hinton: town; capital of Summers co., W. Va. (for location of county, see map of West Virginia, ref. 10–G); at the confluence of the Greenbrier and New rivers; on the Ches. and Ohio Railway; 100 miles S. E. of Charleston, the State capital. It contains the machine-shops and round-house of the Ches. and Ohio Railway, large steam sawmills, and a valuable brownstone quarry, and is in a coal and timber producing region. Pop. (1880) 879; (1890) 2,570; (1893) estimated, 5,000. EDITOR OF "INDEPENDENT HERALD."

Hiodon'tidæ [from Y, i. e. the U-shaped or hyoid bone, and ὀδούς, tooth]: a family of isospondylous teleocephalous fishes, having a herring-like form; cycloid scales; head scaleless; the margin of the upper jaw formed by the supramaxillaries on the side, and with those bones articulated to the extremities of the intermaxillaries; and the dorsal fin behind the anus; the stomach is not cæcal, and has only one pyloric appendage; the air-bladder is simple; the ovaries discharge their eggs first into the abdominal cavity. This group has been constituted especially for the reception of the "moon-eye herring" (*Hiodon tergisus*) of the lakes and Western rivers, to which it is peculiar. It is most nearly related to the Clupeids (herrings, shad, etc.).

Hiogo, hyō'gō: an important town and seaport of Central Japan; on the western shore of the Bay of Osaka, three hours by rail from the ancient capital, Kioto (see map of Japan, ref. 6–C). Hiogo is beautifully situated along a sandy beach at the base of a lofty coast range of hills; it possesses docks, a wharf for ocean steamers, extensive railway fitting-shops, etc. It forms one community with Kobe, which is the settlement of the foreign residents adjacent on the N. With Osaka, distant one hour by rail, Hiogo forms one commercial district, the most important in Japan. It has the reputation of being the most attractive of the foreign settlements in Japan. Since 1880 Hiogo has attracted to itself most of the trade of Nagasaki, once the more important foreign port, and its imports now exceed in value those of Yokohama. These consist mostly of cottons, raw and manufactured, woolens, metals, sugar, chemicals, and kerosene oil. The exports are rice, tea, dried fish, copper, matches, matting, porcelain, umbrellas, camphor, fans, lacquer-ware, Yokohama remaining the silk emporium. There is direct communication by all the more important steamship lines with Europe and America; also direct communication with Australia. There are ship-building yards, two foreign banks, and a large paper-mill. The total tonnage for 1892 of ships of foreign build entering the port amounted to 1,273,300 tons, of which 70 per cent. were British. Exports (1892), $22,345,663; imports, $36,220,175. Hiogo was in 1336 the scene of a famous battle, in which the heroic Kusunoki Masashige fell fighting in support of the rightful emperor. Pop. of Hiogo (1892) 80,545; of the prefecture, 1,554,697; foreign residents (not Asiatic), 623. J. M. DIXON.

Hip [M. Eng. *hepe* < O. Eng., *hēope*, hip, bramble: M. H. Germ. *hiefe*, bramble]: the fruit of the rosebush. Hips are used in pharmacy as a material for making "confection of hips" (*confectio rosæ caninæ*), the *Rosa canina*, or dog-rose, and *R. pomifera* of Europe, furnishing the most of the fruit. The seeds are taken out, and the hips beaten in a mortar with white sugar—2 lb. of sugar to 1 of hips. This makes a pleasant sourish confection. The more fleshy and juicy sorts of hips are in some places preserved or dried, and in winter are boiled in pottage, after taking out the seeds and bristly substance within them. In the northwestern part of the U. S. and in Canada rose-hips are a common food for some wild animals. Revised by L. H. BAILEY.

Hip-joint, Diseases of the: See COXALGIA.

Hippar'chus [Gr. Ἵππαρχος, liter., commander of cavalry: ἵππος, horse + ἀρχή, rule]: 1. The reputed founder of the science of astronomy; b. at Nicæa, in Bithynia; lived at Rhodes and Alexandria in the middle of the second century B. C. Of his life nothing is known, and of his writings only the least important, *A Commentary on Aratus*, has been left to us. But from the *Syntaxis* of Ptolemy we know that by his great discoveries, and more especially by his method, he actually laid the foundation of the science of astronomy. (See PTOLEMY.) 2. A comic poet of Athens, of whose works only titles and insignificant fragments are left. He was probably a contemporary of Menander. 3. A son of Pisistratus, slain by Harmodius and Aristogeiton. (See HARMODIUS.) In the dialogue entitled *Hipparchus*, and wrongly ascribed to Plato, the author gives an account of the literary activity of Hipparchus. He erected hermæ along the streets and country roads, and inscribed on them elegiac distichs of his own composition, in which he endeavored to inculcate principles of morality. 4. A Pythagorean, who lived about 380 B. C., and was a teacher of Epaminondas. Because he discussed openly the doctrines of Pythagoras, he was expelled from the Pythagorean fraternity, and a monument was erected to him as though he were dead. 5. A kinsman of Aristotle; b. in Stageira, and appointed by Aristotle one of his executors. 6. The title of the commander of cavalry. Revised by J. R. S. STERRETT.

Hippa'rion: See HORSE, FOSSIL.

Hippeau, ĕē'pō', CÉLESTIN: author; b. at Niort, Deux-Sèvres, France, May 11, 1803; made his studies in his native city, and filled different positions as a teacher and professor at Poitiers, Napoléon-Vendée, Strassburg, Paris, and Caen.

The most prominent of his writings are *Histoire de l'Abbaye de Saint-Étienne de Caen, 1066–1790* (1855); *Les Écrivains normands au dix-septième siècle* (1857); *Histoire du gouvernement de la Normandie* (9 vols., 1863–73); *Dictionnaire de la langue Française au douzième et treizième siècle* (1875); *Avènement des Bourbons au trône d'Espagne* (1875, 2 vols.); *L'Instruction publique aux États-Unis* (1869), *en Angleterre* (1872), *en Allemagne* (1873), *en Italie* (1874), *en Suède, Norvège, et Danemark* (1876). He received the decoration of the Legion of Honor Aug. 13, 1861. D. in Paris, May 31, 1883.—His wife, Eugénie Hippeau Delacour, published *Cours d'économie domestique* (1869) and a volume entitled *Mères et nourrices* (1875).

Hip'pias (in Gr. Ἱππίας): 1. Son of Pisistratus and brother of Hipparchus. After the death of Pisistratus he became the tyrant of Athens. His rule was in the main mild and beneficent, though some of his acts were tyrannical. He cut down the taxes imposed by his father by one-half. He collected at his court such poets as Anacreon and Simonides, and continued the work of Pisistratus on Homer. After the assassination of Hipparchus (see Harmodius), Hippias ruled with greater sternness because he feared a revolution. Through the tyrant of Lampsacus he entered upon negotiations with the King of Persia in anticipation of his expulsion. In the meantime the exiled Alcmæonidæ had built a temple in Delphi at their own expense, and by this bribe secured an oracle instructing the Spartans to restore them to Athens. Archimolius led the first expedition against Athens and failed, but in the second expedition King Cleomenes was more successful. He captured the children of Hippias, who had been sent away to a place of safety. For their sake Hippias was forced to lay down the tyranny and leave Athens (510 B. C.). He took up his residence at Sigeum, trying in various ways to bring about his restoration, and finally succeeded in persuading Darius to make war upon Athens. He himself acted as guide, and induced the Persians to land at Marathon. According to some he was slain in the battle of Marathon (490 B. C.), just twenty years after his expulsion from Athens, though there seems to be more authority for the statement that he died on the island of Lemnos shortly after the battle of Marathon. 2. A contemporary of Protagoras and Socrates; b. at Elis; lived mostly at Athens. Nothing is known of his life, and none of his writings have been preserved, but his character has been very vividly drawn by Plato in two dialogues. He seems to have been a man of great gifts and comprehensive knowledge, but arrogant, vain, and superficial.

J. R. S. Sterrett.

Hippocam'pus [Mod. Lat., from Gr. ἱππόκαμπος, a fabulous sea-monster, half horse and half fish; ἵππος, horse + κάμπος, a sea-monster]: a genus of fishes of the order *Lophobranchii*, family *Syngnathidæ*, distinguished by the prehensility of the tail and the want of a caudal fin, combined with a tubular snout, narrow gill-openings, a single soft dorsal, belonging partly to the abdominal and partly to the caudal portion, and the absence of ventral fins. The males carry the spawn in pouches under the tail till the fry is hatched. All the species are small. The most characteristic and familiar form is the little sea-horse, *Hippocampus hippocampus*, remarkable for the resemblance of its head and neck to those of a horse, and the winding downward and inward of its caudal portion, or tail. *H. hudsonius* is found along the Atlantic coast of the U. S.; other species occur southward. The cut shows *H. brevirostris*, a common European species.

The sea-horse.

Revised by D. S. Jordan.

Hippoc'rates [= Gr. Ἱπποκράτης, liter., strong with the horse; ἵππος, horse + κράτος, strength, might]: the father of medicine and the most distinguished of Greek physicians; b. in Cos in 460 B. C. (according to Soranus); the son of Heraclides, one of the Asclepiadæ, and Phænarete, a woman who belonged to the Heracleidæ. Hippocrates studied medicine with his father and with Herodicus of Selymbria; learned rhetoric of Gorgias the Leontine, Prodicus of Ceos, and Democritus of Abdera; practiced his profession chiefly at Cos, and rendered its medical school, already very famous, by far more illustrious than it had ever before been. He traveled much among the Grecian towns, and died at Larissa in Thessaly B. C. 357. (*Clinton.*) Little more than the above facts is known regarding his life, but ancient writers relate of him many fabulous tales. His sons, Thessalus and Draco, and Polybus, his son-in-law, perpetuated his fame, and probably wrote some of the works which bear his name. Those now extant are seventy-two in number (some of them very short), but by far the larger part are either spurious or incorrectly ascribed to Hippocrates. Part or all of the *Aphorisms*, parts of the *Epidemics*, parts of the *Prognostics*, the *Regimen in Acute Diseases*, the treatise on *Wounds of the Head*, and that *On Air, Water, and Places*, are considered genuine works of Hippocrates; and (according to Littré) the treatises *On Ancient Medicine*, on *Joints*, on *Fractures*, on *The Use of the Lever* (in reducing luxations), on *Law*, on *Ulcers*, on *Hæmorrhoids*, on *The Sacred Disease*, on *Fistulæ*, and the *De Medici Officina*, are possibly genuine. As a practitioner, it would be unfair to judge of Hippocrates's merits by any modern standard. His pathological notions were founded mainly on natural analogies and *a priori* reasoning; they consequently have no scientific value, but are memorable as the direct source of the humoral pathology so long dominant in the schools. He also taught the doctrines of *crases*, *coctions*, and *crises*, treated disease chiefly by attention to regimen, and earnestly advocated the expectant treatment in many acute diseases. He was a careful observer and excellent describer of symptoms, and (as his genuine writings show) was a man of the noblest mental and moral qualities. Among the most valued works upon the Hippocratic writings are the commentaries of Galen. The best editions of the entire works are by C. G. Kühn (3 vols., Leipzig, 1825–27), and by Littré, with French translation (Paris, 1839–61, 10 vols.).

Revised by J. R. S. Sterrett.

Hippocrat'ic Face: See Facies.

Hippocratic Oath: a solemn engagement entered into in ancient times by young men about beginning the practice of medicine, and especially by the Asclepiadæ. The formula itself has been ascribed to Hippocrates, and is certainly very ancient. It was as follows: "I swear by Apollo the physician, by Æsculapius, by Hygieia, Panacea, and all the gods and goddesses, that, according to my ability and judgment, I will keep this oath and stipulation: to reckon him who teaches me this art equally dear to me with my parents; to share my substance with him, and relieve his necessities if required; to look upon his offspring upon the same footing as my own brothers, and to teach them this art, if they shall wish to learn it, without fee or stipulation; and that by precept, lecture, and every other mode of instruction I will impart a knowledge of this art to my own sons, to those of my teachers, and to disciples bound by a stipulation and oath according to the law of medicine, but to no others. I will follow that system of regimen which, according to my best judgment, I consider best for my patients, and abstain from whatever is injurious. I will give no deadly medicine to any one if asked, nor suggest any such counsel. Furthermore, I will not give to a woman an instrument to procure abortion. With purity and holiness will I pass my life and practice my art. I will not cut a person who is suffering with stone, but will leave this to be done by those who are practitioners of such work. Into whatever houses I enter I will go for the advantage of the sick, and will abstain from every voluntary act of mischief and corruption, and, further, from the seduction of females or males, bond or free. Whatever in connection with my professional practice, or not in connection with it I may see or hear, I will not divulge, holding that all such things should be kept secret. While I continue to keep this oath inviolate, may it be granted me to enjoy life and the practice of my art, respected always by all men; but should I break through and violate this oath, may the reverse be my lot." This oath is not now administered to practitioners, though something equivalent to it was used in the Middle Ages, and especially in the school of Salerno; but every honorable and right-minded physician governs his private and professional life by its noble principles. It is the oldest and one of the best of the codes of medical ethics, there being but one simpler and better code, the Golden Rule of doing as one would be done by.

Revised by J. R. S. Sterrett.

Hippocre'ne [= Gr. Ἱπποκρήνη, liter., horse-fountain; ἵππος, horse + κρήνη, fountain]: a fountain upon the side of Mt. Helicon, in Bœotia, believed by the ancients to be a favorite haunt of the Muses and a source of poetic inspiration. It was fabled to have been produced by a stroke of the foot of Pegasus. It is still a fine spring.

Revised by J. R. S. Sterrett.

Hippoda'mia (in Gr. Ἱπποδαμεία): daughter of Œnomaus, King of Elis, and Asterope, one of the Pleiades. She was celebrated for her beauty, and her hand was sought by the noblest princes in Greece. But Œnomaus had been forewarned by a prophecy that his death would be brought about by his son-in-law. He determined, therefore, that he would not have a son-in-law, and in order to cool the ardor of the suitors he decreed that all suitors should contend with him in a chariot-race, under the conditions that if the suitor should be victorious he should marry Hippodamia, but if not, he should meet his death at the hands of Œnomaus, who owned horses of exceeding swiftness that had been presented to him by Poseidon. Œnomaus gave the suitors as a start the time it took him to offer a sacrifice to Poseidon; he then mounted the chariot which was guided by Myrtilus, placed his spear in poise, and pursued his would-be son-in-law, whom he transfixed in passing. Sixteen suitors perished in this way. Finally Pelops, son of Tantalus, King of Phrygia, appeared and promised Myrtilus, the charioteer of Œnomaus and himself a lover of Hippodamia, the privilege of one night with her if he would aid him in gaining the victory. Myrtilus agreed, and instead of the iron linch-pin inserted one of wax. Pelops reached the goal, but Œnomaus was dragged to death by his horses. When Myrtilus demanded his reward he was drowned in the sea by Pelops, a crime Poseidon, the father of Myrtilus, resented and avenged. For many years the marriage was a happy one, and many children blessed the union, but Hippodamia induced her sons Atreus and Thyestes to kill Chrysippus, the illegitimate son of Pelops by Axioche. Thereupon Hippodamia and her sons, Atreus and Thyestes, were banished, and fled for refuge to the court of Sthenelus, King of Mycenæ, who assigned them Midea in Argolis as a place of residence. Hippodamia died in Midea, but, in obedience to an order of the oracle, Pelops brought her bones back to Elis, and erected a heroon in her honor. J. R. S. Sterrett.

Hippodrome [from Gr. ἱππόδρομος, hippodrome, liter., place to race horses; ἵππος, horse + δραμεῖν, run]: the name anciently given in Greece and Constantinople to the ground where chariot and other horse-races took place. Of these races, those in chariots were the most popular. In these races many competitors for the prize entered the race, which was consequently attended with much danger to the drivers —a danger much increased by the limited size of the hippodrome and the consequent necessity of frequent turning of goals. The hippodrome at Olympia was long the most famous. Pausanias describes it, and though he gives much information in regard to the construction of the hippodrome, still the subject is full of difficulties. In Olympia the double race-course was about 4 stadia, or, in other words, the length of the hippodrome was about 1,200 feet, or 400 yards by 125 yards in width. The hippodrome in Constantinople was vaster still; it was begun by Septimius Severus and finished by Constantine the Great. It was so vast that the palace of the emperors and the great Church of St. Sophia had to be oriented with reference to it. It was adorned with the works of Grecian artists in marble and bronze, and one of the most venerable relics of antiquity, the bronze serpent dedicated at Delphi by assembled Greece in commemoration of the victory at Platææ, still stands in the hippodrome. Naturally the hippodrome acquired great renown, and the whole populace of the empire was divided in its social and political relations by factions (the Blues and the Greens), which had their origin in the hippodrome. The remains of it (still called At Meïdan, the Turkish equivalent of hippodrome) are considerable, but its exact dimensions can not be given until excavations on the site shall have been made. See Curtius, *Olympia* (Berlin, 1852; popular); Grosvenor, *The Hippodrome of Constantinople* (London, 1889; popular); Pollack, *Hippodromica* (Leipzig, 1890). Revised by J. R. S. Sterrett.

Hippol'ytus [Gr. Ἱππόλυτος, loosing horses; ἵππος, horse + λύειν, let go, loose]: according to the Grecian mythology, was a son of Theseus by the Amazon princess Antiope. After her death Theseus sent the child to Troezen to be cared for by his own mother, Æthra. In the meantime Theseus married Phædra, the second daughter of Minos, King of Crete. When Hippolytus, now grown to manhood, came to Athens to be present at the celebration of the mysteries, his stepmother, Phædra, fell in love with him, and accused him to his father in order to avenge herself for his coldness. Theseus then cursed his son, and asked Poseidon to destroy him, but after the death of Hippolytus the king learned the innocence of his son and fell into great grief; Phædra killed herself. The story has been told in the *Hippolytus* of Euripides and in the *Phèdre* of Racine. According to the Roman mythology, Hippolytus was restored to life by Æsculapius, and placed in a grove at Aricia by Diana, where he received divine worship under the name of Virbius.

Revised by J. R. S. Sterrett.

Hippolytus, Saint: bishop and martyr. There is some uncertainty about the dates and the events of his life, but probably he was born after the middle of the second century, and in Italy, though he traveled in the East, and was also a disciple of Irenæus of Gaul. His diocese was probably at Portus Romanus, 15 miles from Rome, at the northern mouth of the Tiber. In 235, under the Emperor Maximinus, he was banished, along with the Roman bishop Pontianus, to Sardinia, and is supposed to have suffered martyrdom by drowning in the year following, but whether in Sardinia or after returning to Italy can not be determined. His statue, in a sitting posture, with a list of his writings inscribed upon the back of the chair, was dug up in 1551 near the basilica of San Lorenzo in Rome. By far the most important of his writings is the *Philosophumena, a Refutation of All Heresies*, in ten books. Until recently only the first book was known to be extant, and this was ascribed to Origen. The second, the third, and the commencement of the fourth book are still wanting. The rest were discovered at Mt. Athos in 1842 by Minoides Mynas, a learned Greek, sent by M. Villemain, Minister of Public Instruction under Louis Philippe, to make researches in the Greek monasteries. *Philosophumena* was first published at Oxford by Miller in 1852, as a work of Origen. But the best edition is that of Duncker and Schneidewin (Göttingen, 1859). This treatise is one of great value historically, philosophically, theologically, and critically. The works of Hippolytus are in Migne, *Pat. Gr.*, x.; Eng. trans. in vol. v. of *The Ante-Nicene Fathers* (New York). See also monographs by Baron Bunsen (London, 1852; 2d ed. 1854); Döllinger (Eng. trans. Edinburgh, 1876); Wordsworth (London, 1853).

Revised by S. M. Jackson.

Hippo'nax [= Gr. Ἱππῶναξ]: a Greek satirical poet of the sixth century B. C., of whom about 100 lines are still extant. He was banished from his native city, Ephesus, on account of his satires, and lived afterward at Clazomenæ. Ugly, scrawny, misshapen, he was a fine subject for the chisels of Bupalus and Athenis, and in revenge for their caricatures Hipponax lampooned the two sculptors so severely that they are said to have hanged themselves. He was a hard hitter and merciless foe of everything except freedom, a hopeless vulgarian, and hence a curiosity in Greek literature. On the verse which he invented, the *choliambus* or *Hipponacteus*, see Choliambus. The fragments were collected and edited by F. G. Welcker (Göttingen, 1817, 4to); also in Bergk's *Poetæ Lyrici Græci*.

Revised by B. L. Gildersleeve.

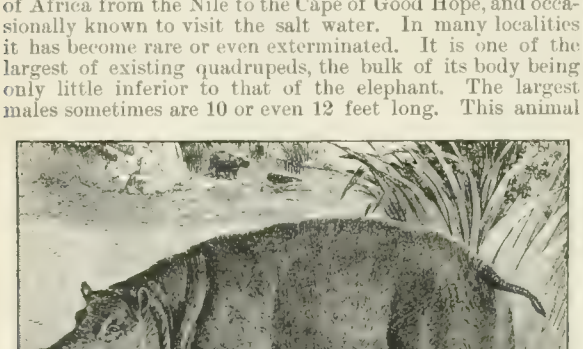
Hippoph'agy [from deriv. of ἱπποφάγος, horse-eating; ἵππος, horse + φαγεῖν, eat]: the eating of horseflesh. From the earliest times the northern races of Europe ate the flesh of the horse, and, in consequence of religious associations, sacrificed it to their gods. Owing to this, early Christian missionaries made the abstinence from horseflesh a test of religion. In the eighth century the popes anathematized it, and Gregory III. declared *immundum est et execrabile*—"it is foul and vile." In the Njall saga a converted Icelander, taunting an enemy, tells him that he has but lately eaten horseflesh. In time it was popularly believed that horseflesh was unwholesome. The French were the first to doubt this, and in the retreat from Moscow Larrey killed his horses to make broth for the sick. According to experiments and reports made by Baron Guerrier de Dumost, horseflesh contains one-seventh more nutriment than its equivalent weight of beef. In 1842 Dr. Perner, of Munich, began to combat the prejudice against horseflesh, and in 1845 the sale of it was legalized in Bavaria. At the same time hippophagic societies were formed in Paris and Berlin. Since 1855 horse-butcheries have been established throughout Germany. In Paris the first were opened in 1865 in the

quarters of St.-Marceaux and Popincourt. But it was not until the privations of the siege of 1870-71 had taught all Paris by experience the real excellence of horseflesh that it became popular, and from that time the sale has increased rapidly. Horseflesh has a pleasant taste, and expert cooks in Paris excel in dressing it so as to make it resemble venison. The meat is dark in color, but, taking it of relative ages and feeding, it is better than beef under the same conditions. Since 1889 the law in Great Britain requires that all horseflesh exposed for sale shall be plainly labeled.

Hippopotam'idæ [Mod. Lat., liter., belonging to the hippopotamus tribe; Gr. *ἱπποπόταμος* (see HIPPOPOTAMUS) + patronymic ending *-ίδαι*, descended from]: a family of artiodactyl ungulates distinguished by the massive body, phalangigrade feet, and well-developed external toes, round snout and nostrils opening upward and sidewise, overhanging upper lips, and inguinal mammæ. The canines are very large and furrowed along their posterior surfaces. This family includes two recent genera, which are so different as to have been differentiated as distinct sub-families—HIPPOPOTAMUS (*q. v.*), including a large species, and *Chœropsis*, established for a smaller species found in Liberia. Only two living species are known, both of which are confined to Africa; one (*Hippopotamus amphibius*) is the animal often seen in menageries, and is found in most of the African rivers; the other (*Chœropsis liberiensis*) is a very small species confined to Liberia. In geological epochs the family was widely extended, and remains have been found in England and other parts of Europe, as well as in India. The nearest relations of these animals are the hogs (*Suidæ*); they have no affinity with the rhinoceroses or tapirs.

Revised by F. A. LUCAS.

Hippopot'amus [from Gr. *ἱπποπόταμος*, river-horse, hippopotamus; *ἵππος*, horse + *ποταμός*, river]: the common as well as generic name of a large, even-toed mammal (*Hippopotamus amphibius*) once inhabiting most of the rivers and lakes of Africa from the Nile to the Cape of Good Hope, and occasionally known to visit the salt water. In many localities it has become rare or even exterminated. It is one of the largest of existing quadrupeds, the bulk of its body being only little inferior to that of the elephant. The largest males sometimes are 10 or even 12 feet long. This animal



Hippopotamus.

is only 5 feet high, and, its legs being very short, its belly almost touches the ground. The color is reddish brown, and the body is covered with a dark, oily exudation. It is usually inoffensive and quiet, but has been reported as occasionally attacking beasts, and even men, with unaccountable fury. It is an unwieldy beast, living chiefly upon soft water-plants, but quite often visiting cultivated fields, where it does sad havoc, trampling under foot even more than it eats. It is hunted for its flesh, which somewhat resembles pork, and for its skin, which is tanned and makes leather sometimes an inch thick, used as a material for buffing-wheels and heavy belts, and for other mechanical purposes. Its teeth also furnish a very considerable amount of the best ivory, used in making philosophical instruments, etc. Its fat, of which a thick layer is found immediately under the skin, is salted and eaten under the name of lake-cow bacon.

Revised by F. A. LUCAS.

Hip'po Re'gius: the royal city of the Numidian kings, and a Tyrian colony on the west side of the Gulf of Bona. The flourishing period of its history belongs to the first centuries of our era, and it was famed as the see of St. Augustine, who died there Aug. 28, 430. It was captured by the Vandals, after a siege of fourteen months, in Aug., 431. About the middle of the seventh century it was destroyed by the Arabs, and its materials were used in building Bona, the present Algerine city, 2 miles N. of the ancient site.—HIPPO ZARITUS, or DIARRHYTUS, now *Biserta*, was a Tyrian and afterward a Roman colony, near the extreme northern point of Africa, on the sea, at the entrance to a lagoon called *Hippanitis Palus*.

Revised by G. L. HENDRICKSON.

Hippu'ric Acid [*hippuric* is from Gr. *ἵππος*, horse + *οὖρον*, urine]: an acid ($HC_9H_8NO_3$) existing in the urine of herbivorous animals, and in small quantity in that of man. Hippuric acid is readily converted into benzoic acid, the change often taking place in the animal organism. When horses are kept in the stable or lightly worked the urine contains hippuric acid; when they are put to hard work it contains benzoic acid. Cows' urine contains about 1·3 per cent. of hippuric acid; that of oxen sometimes as much as 2·1 to 2·7 per cent.; of horses, 0·38; the quantity varies with the food and other conditions. Benzoic acid taken into the alimentary canal appears as hippuric acid in the urine; the same is true of quinic acid. Hippuric acid is readily separated from cows' urine in an impure form by the addition of an excess of hydrochloric acid. When purified and recrystallized, it forms colorless, transparent crystals. Its taste is bitter; it reddens blue litmus, dissolves in 600 parts of water at 32° F., is readily soluble in boiling water and in alcohol. Like uric acid, it dissolves readily in water containing ordinary phosphate of sodium, in such quantity as to change the reaction from alkaline to acid. Liebig attributes to this fact the acid reaction of fresh urine. Hippuric acid is converted by a ferment in the presence of an alkali, and by boiling with strong acids, into benzoic acid and glycin:

Hippuric acid. Glycin. Benzoic acid.
$$HC_9H_8NO_3 + H_2O = C_2H_5NO_2 + HC_7H_5O_2.$$

Revised by IRA REMSEN.

Hippuri'tes [Mod. Lat., from Gr. *ἱππουρις*, horse-tailed; *ἵππος*, horse + *οὐρά*, tail]: a remarkable genus of fossil bivalve shells, characteristic of the Cretaceous strata. The Hippurites, with Radiolites and Sphærulites and a few related forms, constitute the unique family of Lamellibranchs called Rudistes by Lamarck and Hippuritidæ by Woodward. The whole family is confined to the Cretaceous system, and became extinct at its close. They are characterized by the great development of the lower attached valve, which in some Hippurites was a meter in length and of inverse conical form, the peculiar lid-shaped, free upper valve, the deep pit-like cavities in the lower shell, and extravagant processes extending downward from the inside surface of the free valve. The texture of the shell is also quite different from that of most mollusca. The Hippurites were marked on the exterior by three inflexions of the shell, and are mainly confined to the Upper Cretaceous, though less common in the Middle Cretaceous. In Radiolites there are no inflexions of the surface, and it ranges throughout the Cretaceous.

H. S. WILLIAMS.

Hi'ram, called also **Hirom** and **Huram** [Phœnic. *Chīrōm*, for *Achīrōm* (?), friend of the noble one (Baal); Heb. *Chīrōm*, *Chīram*, *Chūram*; Gr. *Εἴρωμος*, *Εἴραμος*]: a King of Tyre, contemporaneous with David and Solomon, and the ally of both. He sent a supply of cedar timber, with skilled craftsmen, to assist David in constructing his palace (2 Sam. v. 11), and in Solomon's reign supplied timber, treasure, and men for the temple at Jerusalem (1 Kings v. 10; 2 Chron. ii. 11, *sqq.*; 1014 B. C., Ussher). He is likewise spoken of as having been himself a great builder at Tyre, and is said to have reigned thirty-four years; he had a treaty of peace and commerce with Solomon, and was son and successor of Abibal.

Hiré, LAURENT, de la: classical painter; b. in Paris, France, in 1606; studied under Vouet, but endeavored to form a style of his own. His works are to be seen in Paris in the Carmelite and Capucine churches, as well as in others; his easel pictures were much prized and his landscapes are highly finished. He was one of the first members of the Academy of Painting and Sculpture, founded in 1648, and which is known now as the Academy of Fine Arts. D. in Paris, 1656.

W. J. S.

Hir-Hor: See HER-HOR.

Hiring: a contracting for the use of labor or property; specifically a species of bailment by which the use of a chat-

tel is contracted for, or labor or services affecting it are stipulated to be given for a compensation, express or implied. In this sense alone will the subject of hiring be here considered. Reference may be made for its other applications to the titles AGENT, CHARTER-PARTY, LEASE, MASTER AND SERVANT, and SHIPPING. Hiring as a form of bailment is of three varieties, whose names are expressed in Latin phrases: (1) *Locatio rei*, the hiring of a thing for temporary use; (2) *Locatio operis faciendi*, the hiring of work and services or care and attention to be bestowed upon articles delivered by the hirer to the person whose labor is engaged; (3) *Locatio operis mercium vehendarum*, the hire of the transportation of goods from one place to another, for the treatment of which see CARRIERS, COMMON.

(1) *Locatio rei.*—The hire of things constitutes a contract for the mutual benefit of both parties, since the owner receives a compensation, while the hirer becomes entitled to the use of the property; and the latter is accordingly bound to ordinary care and diligence, and is liable only for ordinary neglect; that is, he must exercise such care and diligence as a man of ordinary sagacity and reasonable soundness of judgment would exercise considering the nature of the property hired and the circumstances of the case. (See NEGLIGENCE.) But if injury is occasioned by some accident which a reasonable foresight could not have anticipated, or by theft or violence against which proper measures of protection had been taken, the hirer is not responsible, but the owner must bear the loss. The hirer becomes invested with a special property in the goods for the period during which his right of temporary use is to continue, and for any interference with his possession or injury to the property by third persons he has a right of action to recover damages for the loss sustained. If the hiring be for a definite time, as is usually the case, any attempt even by the owner to retake the property or to prevent its intended use will give the hirer a claim for redress. This rule is, however, subject to the qualification that if the hirer makes any unwarrantable misuse of the property the owner has a right to retake it, if he can do so peaceably, or to bring an action for its immediate recovery. The articles hired must only be used for the purposes contemplated by the contract, and the hirer's exclusive interest is defined and limited precisely by the stipulations agreed upon. They must be used also in the manner ordinarily appropriate, and must be surrendered when the time of the hiring has expired. The obligations of the owner of the property, other than those already stated, have not yet been definitely settled at common law. If he lets the property for a particular purpose he is liable, if he knows it to be unfit and does not disclose the defect, for injury sustained by the hirer in consequence; but it has been held that there is no implied warranty against injuries arising from latent defects. The contract of hiring may be terminated by the expiration of the time for which the contract was made, or the completion of the intended purpose, or a breach of the contract of hiring by the hirer, when the property reverts to the owner, who has a claim for whatever compensation was agreed upon, or, if no definite arrangement had been made, to whatever sum might be deemed reasonable under the circumstances.

(2) *Locatio operis faciendi.*—The degree of *care* required of a person whose labor and services are hired is governed by the principles which apply in the case of *locatio rei*. Ordinary care is required, and the measure of obligation is estimated by the value and nature of the articles delivered.

The degree of *skill* required also constitutes a large part of the obligations of the workman. He is held responsible for the exercise of such a degree of skill and careful workmanship in fulfilling the task imposed upon him as is requisite in the ordinary labors of his trade or profession. In accepting an engagement to perform a particular kind of work he impliedly represents himself as competent for such an undertaking, and may be made to respond in damages for injuries sustained through any exhibition of unskillfulness or incapacity. If, however, his incompetence were known to the person engaging his services, the hirer must suffer the consequence without remedy. If any instructions be given to the workman as to the manner in which his labor is to be performed, they must be adhered to strictly. If there be a material deviation from them, he can recover nothing for his services, unless the deviation be attributable to some unavoidable cause or be acquiesced in by his employer. The employer's assent need not be indicated by any express agreement, but may be presumed from his conduct, if he has knowledge of the deviation from the terms of the contract before its execution is completed, and makes no objection.

The *compensation* ordinarily depends upon the completion of the work. If the bailee only completes a portion of the desired work, he can claim a proportionate compensation if the benefit of what was actually performed was received in its incomplete state by the assent of the employer; but if the employer insist on full performance or declines to make compensation on account of some substantial imperfection in the workmanship or some injury which the goods have sustained, the workman is not only entitled to no reward, but may even be held liable for the original value of the goods. The acceptance of the goods by the employer is not of itself sufficient to constitute an assent to a deviation from the contract, since an owner has a right to the possession of his goods. If the property is destroyed by some unexpected casualty, without any fault on the part of the workman, or is carried away by robbers notwithstanding the use of reasonable precautionary measures for security, since the absolute ownership remains continually in the employer he must sustain the loss. If any labor has been expended upon it before the disaster occurs, the workman is, according to the general rule of the common law, entitled to a proper recompense for services actually rendered, unless the entire fulfillment of his engagement had been made a condition precedent to payment. Under the French law and the Code of Louisiana the employer in such a case loses the value of his materials and the employee the value of his labor.

The *loss of the property* falls upon the employer when the contract is strictly in the nature of bailment; and interesting questions sometimes arise as to whether a delivery of articles to a workman and an engagement of his services constitutes this relation. If cloth be given to a tailor or gold to a jeweler, and the identical piece of cloth is to be returned in the form of a suit, or the same gold to be made into an article of ornament, it is a case of bailment, even though additions be made to the original article delivered in the course of its alteration. But if the workman has liberty to expend his labor upon other materials of the same kind as those delivered, being under no further obligation than to return articles similar to those which would be made if the employer's goods were used, this is not generally considered as constituting a bailment, but only a species of barter or sale. The employer makes use of his goods to purchase others of the same nature in an altered form. The workman therefore owns the goods until his labor is complete and the finished product accepted; and if they are destroyed before that time the loss is his alone, and the employer has still a claim for the delivery of the article ordered. A similar question arises when grain is deposited in a warehouse or elevator with the understanding that a similar amount of the same quality may be returned instead of the very same grain delivered. The courts have generally adjudged an agreement of this kind to be a sale, and not a bailment, so as to make the bailee responsible in case of accidental loss. In all cases where a person is to furnish materials himself, and expend labor upon them, the contract is evidently not one of bailment, but rather one of sale, so that the employee is subject to all the obligations of a vendor.

The law concerning warehousemen, wharfingers, and innkeepers is also included under the head of *Locatio operis faciendi*, since such persons devote care and attention to the objects intrusted to them, but their liabilities will be considered under these several names respectively.

Revised by F. STURGES ALLEN.

Hirn, GUSTAVE ADOLPHE: French engineer; b. at Logelbach, near Colmar, Alsace, Aug. 21, 1815; made his first investigations in the dyeing-room of his father's cotton-mill, and afterward took charge of the mechanical department of the establishment. In 1845 he published his first essay *On the Mathematical Theory of Fan-blowers*, and in 1854 his well-known *Interpretation of the Phenomena caused in a Steam-engine by the Pressure of the Jacket*. His study of the steam-engine was conducted in so thorough and systematic a manner that, for the first time, it revealed to the engineering world the extent of the wastes of the modern engine. His principal papers are found in the *Bulletin de la Société Industrielle de Mulhouse*. D. Mar. 12, 1890. C. H. THURSTON.

Hiroshima, hēē-rō-shee'ma: a city of Japan, in the department of Aki; situated on the Inland Sea (see map of Japan, ref. 7–B). A military center. Close by, on an island, is the Imperial Naval College, removed hither in 1890 from Tokio. Pop. (1891) 91,000.

Hirpi'ni: an ancient people of Italy of Samnite race, inhabiting the central group of the Apennines between Lucania, Apulia, and Campania, and deriving their name from *hirpus*, the Samnite name of a wolf. They were subjugated by the Romans (probably together with the other Samnite tribes) before 268 B. C., at which time the Roman colony of Beneventum, which formed the strategical key to their country, was established. Immediately after the battle of Cannæ (216 B. C.) they declared in favor of Hannibal, but when he (in 209 B. C.) was driven toward the southern part of Italy, they bought peace on good terms from the Romans by betraying the Carthaginian garrisons in their cities. In the Social war (90 B. C.) they were among the first who took up arms against Rome, but they were soon reduced by Sulla, and after the end of the war their name as an independent nation is not mentioned.

Hirsch, Joseph: civil engineer; writer on steam and steam-engines; b. at Lyons, France, May 22, 1836; graduated at the École des Ponts et Chaussées, 1857; engineer-in-chief 1882; constructed a portion of the Canal de l'Est of France, and invented the Mittersheim siphon; director of the metallurgical works of Ars-sur-Moselle. He is professor on steam-engines at the École des Ponts et Chaussées and at the Conservatoire des Arts et Métiers, succeeding Gen. Morin and Gen. Tresca at the latter. He has translated Thurston *On the Steam-engine*, and published several scientific works of great value. W. R. Hutton.

Hirsch, Maurice, Baron: financier and philanthropist; b. in Bavaria in 1831 of Jewish parentage; his father, a wealthy merchant, was ennobled in 1869. Baron Maurice Hirsch accumulated a great fortune in the banking-house of Bischoffsheim & Goldsmid, and in various enterprises, such as building railways in Hungary. His gifts to the cause of education were very large. He endowed the schools in Galicia with $2,000,000; offered to give $10,000,000 to Russian schools if no distinction of race or religion were made therein; in 1891 spent about $15,000,000 in charity; and in 1892 gave $2,500,000 for the benefit of Russian Jewish emigrants to the U. S. D. at Presburg, Hungary, Apr. 20, 1896.

Hirschberg: a railway junction and manufacturing town of Prussian Silesia, beautifully situated at the foot of the Riesengebirge Mountains, 1,116 feet above the sea, and at the confluence of the Zacken and the Bober, 30 miles S. W. of Liegnitz. It has a Protestant church, a large Gothic edifice built in 1709 (one of the six so-called churches of mercy), four Roman Catholic churches, a synagogue, a gymnasium, an orphan asylum, and a chamber of commerce. It has a large trade in grain, linen, cement, and wine, and extensive manufactures of linen, cotton, lace, paper, wooden-ware, boxes, porcelain, artificial flowers, cigars, wine, and cider. Hirschberg is a very ancient town. Its prosperity dates from the introduction of linen and veil works in the sixteenth century. Pop., including garrison (1890), 16,214. B. B. H.

Hirschberg, Julius, M. D.: ophthalmologist; b. in Potsdam, Germany, Sept. 18, 1843; educated at University of Berlin; lecturer on Ophthalmology, University of Berlin, 1869–79, and professor since 1879; author of *Beiträge zur prakt. Augenheilkunde* (3d ed. 1878); *Mathematische Grundlagen der medizinischen Statistik* (1874); *Wörterbuch der Augenheilkunde* (1887); *Electromagnet in der Augenheilkunde* (1885); *Einführung in die Augenheilkunde* (1892); editor of *Centralblatt für Augenheilkunde* since 1877. C. H. T.

Hirst, Thomas Archer, Ph. D., F. R. S.: scientist; b. Apr. 22, 1830, in Yorkshire, England; early made the friendship of John Tyndall, and went in 1849 to join him in the study of mathematics, physics, and chemistry at the University of Marburg; studied in Berlin; succeeded Tyndall as professor at Queenwood College; Professor of Mathematics in University College, London, 1867; director of studies at the Royal Naval College 1873–83; one of the original members of the London Mathematical Society, and its president from 1872–74; member of numerous scientific societies. He is the author of a large number of original papers in mathematics and physics, published in the *Proceedings* of various societies. These include *On the Quadric Inversion of Plane Curves* (1865); *On the Correlation of Two Planes* (1875–77); *On Cremonian Congruences* (1883); *On Congruences of the Third Order and Class* (1885); and *On the Cremonian Congruences which are Contained in a Linear Complex* (1887). D. Feb. 16, 1892. C. H. Thurber.

Hir'tius, Aulus: soldier; belonged to a plebeian family, but played a conspicuous part in Roman politics on account of his personal friendship and intimate political connection with Cæsar. He served him in Gaul as legate, but after the outbreak of the civil war he seems to have been almost constantly at Rome, serving the interests of Cæsar. He lived much on his Tusculan estates, in the neighborhood of the villa of Cicero, with whom he was on friendly terms, and in whose correspondence his name frequently appears. He was chosen consul for the year 43 B. C., and with his colleague Pansa took the field against Antony, although at first, as a friend of Cæsar, he had taken sides with him. They led their armies before Mutina, where Antony held Dec. Brutus in siege, and on one day fought a double battle, in which the defeat of Pansa was retrieved by the victory of Hirtius, who perished, however, in a subsequent assault on the enemy's camp. He was a man of refined tastes and literary accomplishments, and the eighth book of Cæsar's *Commentaries* is generally supposed to have been written by him.

Revised by G. L. Hendrickson.

Hirudinei: See Leech.

His, hees, Wilhelm, M. D.: anatomist; b. in Basel, Switzerland, July 9, 1831; educated at the Universities of Berlin, Würzburg, Prague, Vienna, and Paris; Professor of Anatomy and Physiology, Basel, 1857–72; Professor of Anatomy, University of Leipzig, since 1872; author of *Crania helvetica* (Basel, 1864, with Rütimeyes); *Unsre Körperform und das physiolog. Problem ihrer Entstehung* (Leipzig, 1874); *Anatomie menschlicher Embryonen* (Leipzig, 1880–85); coeditor of *Zeitschrift für Anatomie*. C. H. T.

Hispania: the Latin name of Spain (*q. v.*).

Hispaniola: See Haiti and Santo Domingo.

Hissar' [i. e. fort]: province of Bokhara, occupying the region on the north side of the Oxus or Amu-Darya, between lons. 66° 30′ and 70°, and S. of the mountain range bordering the Oxus valley on the N. It is well watered and mountainous, with a healthful climate, and contains many flourishing towns, some of them of great antiquity; among them Hissar town, Shirabad, Baisun, and Kulab. The population is chiefly Uzbek, with many Tajiks and some Jews, Hindus, gypsies, Afghans, and others. Cotton and cereals are grown, and there is a considerable production of sheep and salt. Transportation is very primitive, wagons being unknown. Hissar has been long known in history, but has been explored only since 1875. In 1869–70 it was annexed by the Amir of Bokhara. Mark W. Harrington.

Hissar: a division, district, and town of the Punjaub, British India. The division contains the three districts of Hissar, Rohtak, and Sirsa; area, 8,355 sq. miles; pop. 1,350,000. The district forms the eastern portion of the Bikanir desert, and lies between lats. 28° 36′ and 29° 49′ N., and lons. 75° 16′ and 76° 22′ E. It is a sandy plain, insufficiently watered by the Ghuggur, a branch of the Indus, and diversified by scattered brushwood and rocky hills. Rice is the staple crop, and cotton is extensively grown, both by irrigation. Area, 3,540 sq. miles; pop. about 500,000, mostly Hindus. The climate is very dry, with hot westerly winds; the rainfall is about 15 inches. The Western Jumna Canal crosses the district from E. to W., and a railway from N. W. to S. E. The capital is Hissar, on the railway and canal. Pop. 15,000. Mark W. Harrington.

Hissarlik: site of *Ilium novum*; a few miles S. of the Dardanelles and N. of the modern village of Burnabashi. It was thought by Schliemann to be the site of ancient Troy (see his *Trojanische Alterthümer*, 1874), but the latter is now believed to have been farther S. M. W. H.

Histiæa (in Gr. Ἱστίαια): town, on the bank of the Calla river, in the broadest and most fertile plain (Hellopia) of Northern Eubœa. It was one of the oldest (mentioned by Homer) and most important towns of Eubœa. It became subject to Athens during the Persian wars, but at the instigation of Sparta it revolted in 446 B. C. By means of bribery Pericles brought about the return of the Spartan army and reconquered Histiæa; a colony of Athenian cleruchs was settled at Oreus (Ὠρεός) on a lofty hill a few miles W. of Histiæa. Later on the colony was transferred to the old site, which henceforth was called Oreus. It is now called Oreus. J. R. S. Sterrett.

Histiæ'us (in Gr. Ἱστιαῖος): tyrant of Miletus, under the suzerainty of Persia. He won the attachment and gratitude of Darius by guarding faithfully the bridge of boats over which the Persian army crossed the Danube on its expedition into Scythia in 513 B. C.—a service by which he saved

the army and the life of the Persian king. His adventurous and ambitious character, however, could not help exciting suspicion, and he was detained at the Persian court for thirteen years. At last he succeeded in raising his Greek countrymen in Ionia against Persia, but Darius had still so much confidence in him as to send him to put down the rebellion. The rebellion itself failed utterly, and the treachery of Histiæus was discovered by Artaphernes, the Persian satrap of Sardis. He now fled from place to place, stirring the different Greek colonies in Asia Minor into premature insurrections; but at last he was captured and put to death by Artaphernes, who sent his head to the Persian king. Darius, however, mourned deeply, buried the head with honors, and blamed Artaphernes for having acted hastily.

Revised by J. R. S. STERRETT.

Histol'ogy [Gr. *ἱστός*, web + *λόγος*, discourse]: that branch of anatomy which treats of the minute structure of the tissues of which living beings are composed. It is subdivided into *Human histology*, which treats of the tissues of man; *Comparative histology*, which treats of the tissues of the lower animals; and *Vegetable histology*, which treats of the tissues of plants. Each of these subdivisions may be again divided into *Normal* and *Pathological* histology—the first referring to the healthy tissues, the second investigating the changes they undergo in disease.

Histology may be said to date back only to the appearance of the *Anatomie Générale* of Bichat in 1801, for although many interesting observations had previously been made by Malpighi (1628–94), Leeuwenhoek (1632–1723), Swammerdam (1637–80), Ruysch (1638–1731), Lieberkühn (1711–58), Hewson (1739–74), and others, yet Bichat was the first who treated the subject in a comprehensive way, classifying according to their structure, so far as it was then understood, all the tissues of the human body, and giving a general view of their relations, both in health and disease. His work gave a great impulse to the study of the tissues, but the imperfect condition of the compound microscope at that time was a serious obstacle to progress, and it was not until the opticians succeeded in devising efficient methods of correcting the spherical and chromatic aberrations of that instrument that histology made any important advance beyond the position in which Bichat left it.

The next epoch in the development of histology is marked by the appearance of the works of Schwann (1838–39), who endeavored to show that the observations of Schleiden in vegetable histology were substantially true for animals also; that all tissues are formed by the transformation of nucleated cells; and that these arise *de novo* under favorable circumstances in a formless nutritive fluid or blastema. This theory was extended to pathological anatomy by Johannes Müller, and continued to be almost universally accepted until the appearance of the cellular pathology of Virchow (1858), which was speedily followed by the very general acceptance of his doctrine, that cells can only arise out of pre-existing cells, and that in both normal and pathological growth the cells of the growing part multiply by division, and thus give birth to all the elements ultimately produced. This doctrine seemed to be permanently established on a sure foundation, when the discovery of the wandering cells in living connective tissue by von Recklinghausen (1863), and the demonstration by Cohnheim (1867) that these movable elements are in fact white blood-corpuscles which have migrated from the blood-vessels, compelled a modification of opinion, and showed that the actual details of the growth and nutrition of the tissues are much more complex than had been previously supposed. Since the time of Schwann the number of histological investigators of reputation has multiplied so greatly that it would occupy more space than can here be given even to enumerate them. The names of a few of the more prominent living histologists are Kölliker, Ranvier, Stricker, Waldeyer, Meynert, Toldt, Retzius, Schwalbe, Leydig, Flemming, Stöhr, Klein, Schäfer, Golgi, Raymon y Cajal. In the present article a sketch of some of the more important and best-established elementary facts with regard to normal human histology is all that can be attempted in connection with the description of structure here given. The reader is referred to the articles under the names of the individual organs; those desiring more detailed information are referred to the special treatises and monographs.

The Elementary Tissues.—The structural unit of all living organisms, whether animal or vegetal, is *the cell*; in the lowest forms of life, represented in the animal kingdom by the primitive amœba, a single cell constitutes the entire organism, maintaining not only the life, but performing the functions of growth and reproduction, improvising such organs as may from time to time become necessary. In the higher animals the manifold needs of the complicated economy result in the corresponding multiplication and specialization of the structural elements, which are united into tissues and organs designed for the performance of some certain definite share of the whole labor of the organism.

In spite of its apparent complexity of structure, the body is resolvable into a very small number of elementary tissues, which may be conveniently grouped as—

1. *Epithelium*, forming tissues for covering, protection, and secretion.
2. *Connective substances*, for the support, attachment, and union of the more delicate and important structures.
3. *Muscle*, for the production of motion, whether voluntary or involuntary.
4. *Nervous tissue*, for the origination (the nerve-cells) and the transmission (the nerve-fibers) of nervous impulses.

Every tissue consists of two parts—the cells and the intercellular substance; upon the former depend the vitality and the growth, upon the latter the physical characteristics of the tissue.

The Cell.—The cell being the primary element, not only of the tissues, but for the entire organism, its nature and structure first claim our attention. In its simplest form, as seen in the colorless blood-corpuscle, a cell may be defined as *the smallest primary nucleated mass of living protoplasm, capable of the essential vital manifestations of assimilation, growth, and reproduction.* In the simple form instanced, the cell when active has no definite shape, since its outline continually changes; when at rest, this cell becomes an irregular spherical mass of granular *protoplasm*. Such elements, from their close resemblance to that primitive form of unicellular animal life, the amœba, are termed *amœboid cells*. The typical cell consists of (1) the body or *cell-contents*, embracing the general mass and determining the form of the element; (2) the *cell-wall*, usually a delicate, by no means constant, envelope surrounding the exterior of the cell, and formed by the specialization of the outer zone of the cell-contents; (3) the *nucleus*, a small vesicular body, oval or circular in outline, situated within the body of the cell of which it usually forms a conspicuous part, and from which it is separated by the *nuclear membrane*: and (4) the *nucleolus*, a minute variable body, sometimes multiple, lying within the nucleus in close relation to the nuclear network. While these parts may all be present in the typical cell, the absence of the cell-wall and nucleolus is common, the presence of essential parts—the cell-contents and nucleus—alone suffing for thee integrity of the cell. It is now customary to use the term *protoplasm*, as synonymous with the body or cell-contents of the cell; in this sense it will be here employed.

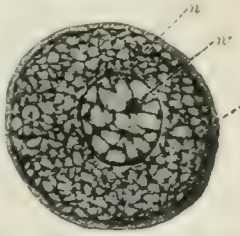


FIG. 1. Diagram of young cell: *p*, protoplasm composed of spongioplasm network and hyaloplasm; *n*, nucleus with intranuclear fibrils; *n'*, nucleolus.

Protoplasm composing living cells was long regarded as a homogeneous or finely granular substance, containing a variable number of larger granules, and often minute particles of oil, pigment, or other foreign matters; the improvement on the means and the methods of histological investigation during the last decade, however, have shown that protoplasm is not as simple in structure as was formerly supposed. It is now recognized that protoplasm consists of two parts: (*a*) the *spongioplasm*, occurring as fibrils arranged as a more or less perfect network throughout the body of the cell; and (*b*) the *hyaloplasm*, which occupies the interspaces between the threads of the spongioplasm. The irritability and contractility characteristic of the living cell are probably chiefly resident within the *spongioplasm*.

The *nucleus* likewise is composed of two parts: (*a*) an imperfect network of nuclear fibers composed of *chromatin*, a substance staining deeply in certain dyes and playing a most important part in the division of the cell; and (*b*) the less active *nuclear juice*, occupying the interspaces between the chromatin fibers, and, from its slight affinity for stains, called *achromatin*. The nucleus is defined from the remainder of the cell by the *nuclear membrane*. It is the

protoplasm and the nucleus of the cell therefore consist of active fibers, by which contraction and other vital manifestations are produced, and the more indifferent substances which occupy the intervals between the active fibers.

Multiplication of Cells.—Division or reproduction is the highest function of the cell, since by this process are produced the additional elements necessary for the formation of the new organism, as well as for the repair and maintenance of that already existing. The truth that all cells are derived from pre-existing elements, and never spontaneously, was long ago formulated by Virchow in the now classic phrase, *Omnis cellula e cellula*; to this law there are now admitted no exceptions. Multiplication of cells takes place in two ways: (1) by *direct* or *amitotic*, and (2) by *indirect* or *mitotic*, division. The direct method, formerly regarded as the usual manner of division, is now known to occur only among lowly organized cells and animals represented by the amœboid type; the division of the great majority of cells of the higher animals occurs only after the completion of the elaborate cycle of nuclear changes, presently to be described. In the *direct division* of the cell, such as the colorless blood-corpuscle, a portion of the protoplasm becomes constricted, and, after a longer or shorter interval, separated from the parent mass as a new element, capable of maintaining an independent existence and of performing all the functions of its ancestor.

Fig. 2.—Colorless blood-cell undergoing direct division.

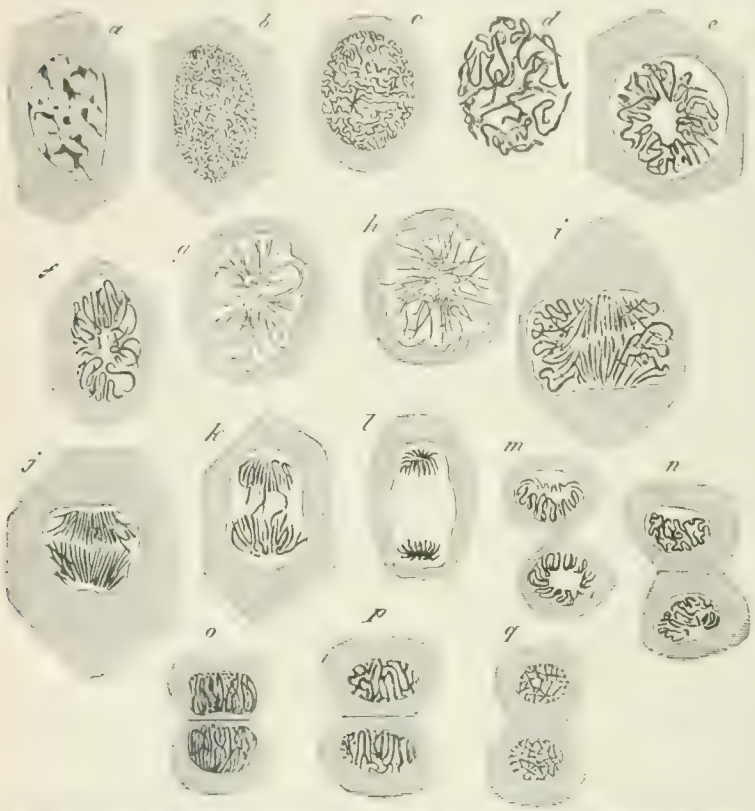


Fig. 3.—Indirect or karyokinetic cell division as seen in the skin of salamander larva. The various phases of karyokinesis are shown beginning with the resting condition of the parent cell (*a*) and ending with the formation of the new daughter cells (*q*).

The *indirect* or *mitotic* division of cells depends upon the active participation of the nucleus in a definite series of change, consisting in the temporary rearrangement of the chromatin fibers, which results in an accurate partition of the chromatin of the original nucleus between the two daughter nuclei of the new cells. The sequence of these changes is briefly as follows:

0. The nucleus in a condition of rest, presenting its usual appearance, the chromatin threads forming an irregular network throughout the nucleus. When the latter is about to undergo division, an increase in its size and chromatin fibers foreshadows the coming changes; the nucleolus disappears and the chromatin becomes arranged as

1. *The close skein*, consisting of densely convoluted threads. These become thickened, shortened, and straightened, and consequently more loosely disposed, resulting in

2. *The loose skein.* The chromatin filaments now gradually assume a grouping with reference to the already indicated pole of the nucleus. The peripheral ends of the loops now become divided, and the closed ends of the V-loops converge toward the clear area or *polar field* occupied by the pole of the nucleus, thus forming

3. The *mother star* or *aster.* When seen from the polar surface, this star appears as the wreath or rosette, sometimes described as a special nuclear figure. The nuclear membrane has entirely disappeared by this time. Shortly before the rearrangement of the V-loops about the polar field, the *polar spindle* appears within the last-named area, as a delicate elongated diamond of faint lines within the achromatin, the poles of the spindle coinciding with the positions of the future new nuclei. Following these changes,

4. *The longitudinal cleavage* of the V-loops takes place, by which the number of chromatin filaments is doubled. This is preparatory to

5. The *migration* of the V-loops toward the poles of the new nuclei along the guiding lines of the polar spindle. During the divergence and passage of the fibrillæ they are massed toward the center of the cell in a broad figure, known as the *equatorial plate.* The loops now pass toward the new poles, about which they converge, forming in reversed order

6. The daughter stars or diaster;

7. The loose skeins;

8. The close skeins; and finally pass into

9. The resting condition of the new nuclei.

About the time of the completion of the division of the nucleus, the body of the parent cell becomes constricted, and later divided into two parts, each of which incloses one of the new daughter nuclei.

Epithelial tissues constitute the coverings of those surfaces of the body which are directly or indirectly in communication with the atmosphere; such surfaces, in addition to the integument, are termed mucous membranes. The epithelial tissues are remarkable for the small amount of intercellular substance which they contain, this element being reduced to a minute layer of cement substance uniting the closely placed cells. Epithelium, therefore, is sometimes described as a tissue composed entirely of cells. The epithelia are divided, according to the character and arrangement of their cells, into the squamous and columnar varieties, each of which occurs as a single layer—*simple* or, as a multiple layer, *stratified.* By mutual pressure the surfaces of contact of the cells become straight lines, the cell territories appearing as polyhedral areas when viewed from the surface; it is evident that this appearance may be produced by both columnar and squamous elements, hence the terms *pavement* or *tessellated* are not distinguishing. The most usual variety of squamous epithelium is the many-layered or stratified,

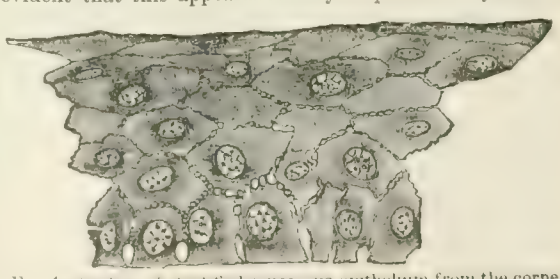


Fig. 4.—Section of stratified squamous epithelium from the cornea of the eye.

examples of which cover the skin and portions of the digestive and genito-urinary tracts; the columnar variety, on the contrary, frequently occurs as a single layer, covering,

Fig. 5.—Section of salivary gland showing glandular epithelium. *a a'*, terminal compartments of the gland, lined by the secreting cells; *d d'*, the ducts, clothed by the epithelial cells (*b*).

among others, the surface of the entire digestive tract from the stomach to its lower termination. The stratified columnar type exists upon the respiratory and some other surfaces.

An interesting modification of epithelial cells is found in connection with the depressed extensions of mucous surfaces constituting glands, the cells lining which are epithelial elements specialized to undertake secretion, hence called *glandular epithelium*. The most conspicuously modified cells of this class occur in connection with the organs of special sense, where as *neuro-epithelium* they constitute the essential part of the structures for the reception and translation of the impulses resulting in the special senses. The cells occupying the free surface of certain mucous membranes, as that lining the respiratory tract and part of the reproductive organs, are distinguished by the possession of minute hair-like appendages, or *cilia*, which during life are in constant agitation, producing definite currents of service in freeing the mucous membrane from foreign particles.

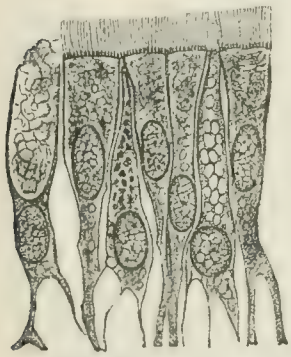


Fig. 6.—Ciliated columnar epithelium from the trachea; goblet-cell containing mucus on the left.

Connective Substances.—Under this name is included a large and exceedingly important group of tissues, which have in common an origin from the great mesodermic tract of the embryo; at first sight they seem to differ widely, but their variations, when critically examined, are found to depend chiefly upon differences in the physical character of the intercellular portion of the adult tissue rather than upon any inherent difference in the nature of the tissues themselves. This group may be divided into

1. Loose connective tissues, represented by the subcutaneous and intermuscular areolar tissues as well as by those uniting organs with surrounding structures and supporting their more essential parts.

2. Dense connective tissue, occurring as the densely felted structures forming the fasciæ, ligaments, tendons, and denser parts of various organs, as the outer coat of the eye.

3. Modified connective tissues, of which adipose tissue is an important representative, others being pigmented tissue, hyaline or glassy membranes.

4. Cartilage, in which the intercellular substance is still further condensed, the fibers being fused together by a cementing material into a ground substance or matrix which varies from being distinctly fibrous to apparently homogeneous in character.

5. Bone and dentine, in which group the connective tissues reach their greatest density and hardness, since the matrix becomes additionally impregnated with calcareous salts, resulting in the characteristic hardness of the members of this group.

From their close genetic relations the blood and lymph may with propriety be included within the connective-tissue group; it is, however, as a matter of convenience usual to consider these separately.

In all connective tissues the cells closely correspond, with the variation that in the looser forms the cells are larger and approximate more nearly their younger forms. The *cellular* elements of connective tissues are of two kinds: the connective-tissue cells proper or *fixed cells*, and the *wandering* cells, whose presence within these tissues is but an incident in their migrations. When young the connective-tissue cell is a plate-like body, which later becomes usually branched or stellate, and in the denser forms finally fusiform and greatly reduced in size. The wandering cells are small amœboid elements, which, while partly originating

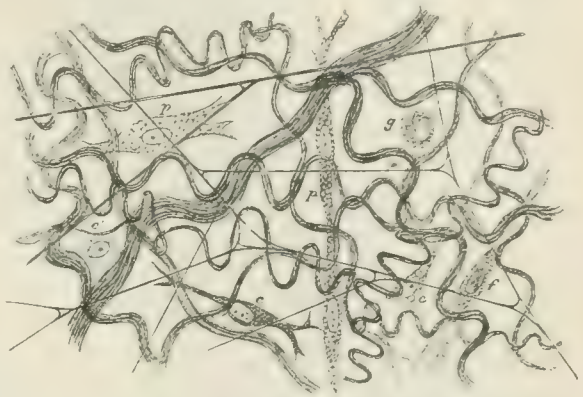


Fig. 7.—Young subcutaneous areolar tissue highly magnified; various forms of connective-tissue cells lie among the fibrous elements.

from the division of connective-tissue cells, are chiefly derived from the blood and lymph as migrated leucocytes.

Loose connective or areolar tissue enjoys the widest distribution, being present in some form in every organ of the body. In its typical condition, as seen in the subcutaneous or intermuscular tissue, it consists of wavy bundles of white fibrous tissue, loosely felted together, among which lie the fixed cells, with an occasional wandering element, the entire tissue being traversed by an open network of elastic fibers. Membranous envelopes of similar tissue, often, however, considerably condensed, form the capsules of the various organs, from whose exterior partitions of fibrous tissue extend toward the interior, while the delicate extensions of the same form the supporting framework of the softer and more important portions of the organs.

Dense connective tissue occurs as tendons and ligaments, as well as other robust structures forming parts of various organs. In tendons the white fibrous tissue predominates, and is disposed in long cylindrical parallel bundles, on

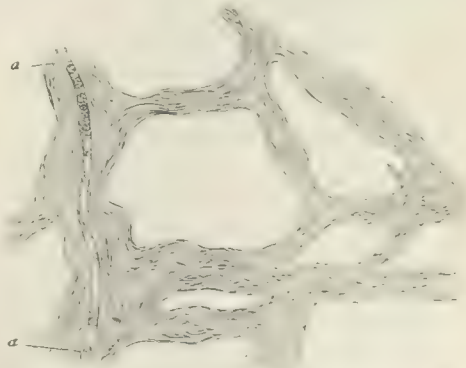


Fig. 8.—Dense adult fibrous connective tissue, containing few cells; *a*, capillary blood-vessel.

whose surfaces the connective-tissue elements, here called *tendon-cells*, are applied. Some ligaments, on the contrary,

are composed almost entirely of yellow elastic tissue, the cells, imbedded within a small amount of fibrous tissue, occupying the interspaces between the elastic fibers. In the denser connective tissues the fixed cells lie within cavities in the ground substance of corresponding shape; the minute channels or *canaliculi* which extend in all directions from these *cell-spaces* unite to form an intercommunicating system of nutritive *juice-canals* throughout the tissue; these spaces are also occupied in part by the wandering cells. A conspicuous example of this arrangement between the ground substance and the cells is seen in the relation of the corneal corpuscles and spaces. In some localities, particularly the eye, the connective-tissue corpuscles contain dark-brown particles which give to the entire cell the dark color characteristic of *pigment-cells*.

Adipose Tissue.—In many parts of the body the areolar connective tissue incloses in its meshes groups of cells containing fat. These cells, which are modified connective-tissue elements, are round or oval, sometimes polygonal, as from mutual pressure, and ·001 inch to ·005 inch in diameter. The presence of the fat conceals their nuclei, but after its extraction by ether, and the staining of the tissue by carmine, a nucleus can generally be observed in each, occupying the periphery of the cell. The groups of fat-cells contained in individual areolæ of the connective tissue are designated fat-lobules. Each is supplied with blood by one or more arterial twigs, whence proceed numerous capillaries so arranged that each of the larger cells at least is surrounded by its own capillary loops. In their embryological condition the fat-cells are at first nucleated masses of protoplasm, like other connective-tissue cells. The fat makes its appearance in the substance of the protoplasm in small drops, and there finally coalesces into a single large one, occupying the central portion of the cell. As the fat-drops grow still larger, the protoplasm becomes greatly distended, until only a thin membranous peripheral zone remains, with the nucleus imbedded in it.

A notable modification of the usual form of the connective-tissue cells is seen in the single layer of irregularly polyhedral plates covering the surfaces of cavities *not* in communication with the atmosphere. Such cells are termed *endothelium*, while the surfaces are *serous membranes*; these structures resemble in appearance the epithelium of the mucous membranes, but their true nature as elements nearly related to the connective tissues is demonstrated by a study of their mode of development as well as by the observation of direct transitions between the endothelial plate and the branched connective-tissue cell. Endothelium lines the heart, blood, and lymphatic channels, the large peritoneal, pleural, and pericardial cavities, the joints, and other closed cavities. The demonstration of these cells by silver and subsequent staining shows these cells to be closely united by lines of intercellular cement substance, and to possess oval nuclei. The peritoneal, pleural, and pericardial sacs represent the originally single general body-cavity or *cœlom*, which later becomes subdivided.

Cartilage.—This form of dense connective tissue consists of cells imbedded in an intercellular substance or matrix: the latter may be homogeneous, elastic, or fibrous, and accordingly three varieties of cartilage are recognized—hyaline, elastic, and fibrous cartilage. Hyaline cartilage forms the cartilages of the ribs, the ensiform cartilage, the articular cartilages of the bones, the cartilages covering the opposed surfaces of the symphyses, the nasal cartilages, the principal cartilages of the larynx, and the cartilaginous rings of the trachea and bronchial tubes. In this variety of cartilage the cells (cartilage corpuscles), when single, are usually oval, on an average from ·005 inch to ·001 inch in long diameter, and consist of a delicate granular protoplasm containing a large oval nucleus. They lie in cavities, or *lacunæ*, hollowed out in the matrix. Sometimes the lacunæ are of larger size and contain two or more cells, which have resulted by the division of the original element. Sometimes groups of two, four, or more such cells, with their adjacent sides flattened, lie quite near together, but are separated by a narrow layer of matrix. In living or perfectly fresh cartilage the cells almost entirely fill the cavities in which they lie, but on the addition of water, or even of indifferent fluids, and after death the cells shrivel and separate from the walls of the lacunæ, so that they appear to be surrounded by a clear transparent space; or they may shrivel irregularly, remaining attached at points so as to present a stellate appearance. At the same time the matrix becomes more or less distinctly granular. The matrix when fresh is apparently homogeneous and quite transparent, no traces of the existence of fibers or cell-territories being observable even

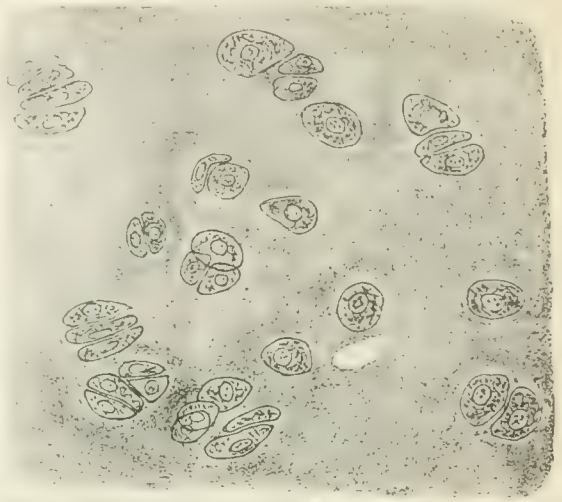


FIG. 9.—Section of hyaline cartilage from the ribs; cells are arranged in groups, separated by the cartilage matrix.

with the highest powers. After the action of certain reagents, however, the matrix indicates its true structure of fibrillæ united into an apparently homogeneous ground-substance. It is not improbable that minute canals connect the adjacent lacunæ. If cartilage be boiled in water for some time, the matrix yields chondrin, just as white fibrous tissue produces gelatin.

Where cartilage is continuous with connective tissue there is no abrupt boundary between the two, but the one passes by a gradual transition into the other. As we proceed from the cartilage to the connective tissue, the matrix becomes first indistinctly, then distinctly fibrillated, and is continuous with the connective-tissue matrix, while the cells are more and more elongated until they present the character of connective-tissue corpuscles. The cartilage of certain localities, as in the epiglottis, external ear, etc., differs from the ordinary hyaline variety in the character of the matrix, which in these cases is permeated with numerous elastic fibers, giving rise to *elastic cartilage*. Immediately around the cartilage-cell, however, the matrix retains its hyaline character, the elastic fibers being limited to the spaces between the homogeneous areas. The third variety, *fibrous cartilage*, closely resembles, in the general character of its matrix, fibrous connective tissue, the fibrous tissue, at first sight, appearing to constitute the entire matrix; this, however, is not entirely true, for around the nests of cartilage cells limited homogeneous areas represent the clear matrix of the hyaline type. Fibrous cartilage is limited in its distribution, being found in the intervertebral disks and interarticular cartilages.

Fibro-cartilage (*Reticular Cartilage, Yellow Cartilage*).—The cells of fibro-cartilage are quite like those of hyaline cartilage, but the matrix consists chiefly of a plexus of anastomosing fibers resembling elastic fibers. Between these, however, a homogeneous substance similar to the matrix of reticular cartilage no doubt exists, since these cartilages yield a small proportion of chondrin on boiling. This homogeneous substance, in certain situations, is most abundant immediately around the cells, where it is visible under the microscope as a clear or slightly granular area in which no fibers are discerned. When fibro-cartilage is anatomically continuous with connective tissue, the fibers of the matrix are continuous with the yellow elastic fibers. Fibro-cartilage, as above described, forms the cartilages of the ear and of the Eustachian tube, the epiglottis, the cartilages of Wrisberg, and a part of the intervertebral cartilages. Cartilage contains neither blood-vessels, lymphatics, nor nerves.

Bone, like cartilage, consists of a dense connective tissue, whose cells are imbedded in a compact matrix, apparently homogeneous but really fibrous, in which a deposition of calcareous salts has taken place, to the presence of which mineral matter the well-known hardness of the tissue is due. (See BONE.) In thin sections of dried bone the position of the cells is marked by the presence of small stellate cavities

about ·0008 inch in average length, and rather less than half as broad—the *bone-lacunæ*, from which radiate delicate canals, ·00005 inch in diameter, the *canaliculi*. The cana-

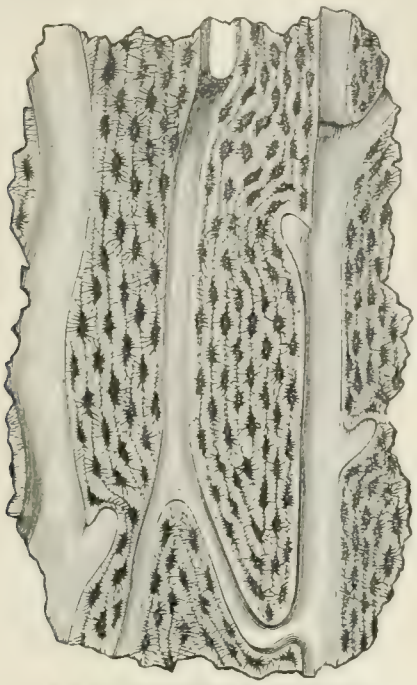


Fig. 10.—Longitudinal section of bone.

liculi of adjacent lacunæ anastomose freely. Examined by transmitted light, the lacunæ and canaliculi appear dark, the matrix transparent; by reflected light the former appear white and opaque, the latter translucent. These appearances depend upon the fact that in dried bone the lacunæ and canaliculi are hollow and contain air, as may be demonstrated by first flowing turpentine upon a thin section while under microscopical observation, and then permitting it to dry. In recent bone, and especially in growing bone, the lacunæ are filled with nucleated masses of protoplasm, which send processes into the canaliculi; these are the proper *bone-cells*. Osseous tissue is very vascular, the capillaries in the compact substance of the long bones occupying a series of longitudinal anastomosing channels—the canals of Havers—which are continuous with the larger canals containing the nutritive arteries, with the areolar spaces of the spongy extremities of the bones, and with the marrow cavities. In transverse sections of the compact shafts of the long bones the Haversian canals appear as rounded or oval openings, with the lacunæ arranged regularly around them in concentric rows. In longitudinal sec-

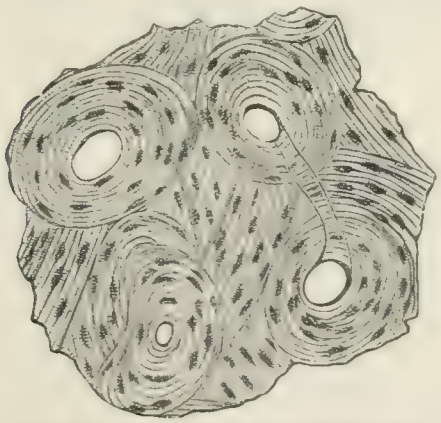


Fig. 11.—Transverse section of decalcified bone.

tions, on the contrary, the canals appear as a network with elongated interspaces, in which the lacunæ lie in rows parallel to the canals. In the cancellous or spongy bone occupying the extremities of the long bones and forming the chief mass of many irregular bones, thin sections display an irregular reticulum of osseous trabeculæ, in which the lacunæ, with their bone-cells, are arranged more or less in rows parallel to the margins of the bony trabeculæ.

If bone be treated with dilute acids the earthy matter of the matrix is dissolved, and a material resembling cartilage is left behind, which, however, does not yield chondrin on boiling, but gelatin. When transverse sections are made through the shaft of a long bone so treated the matrix no longer appears homogeneous, but is disposed in a number of thin concentric layers, *Haversian lamellæ*, around each Haversian canal, the sum of the lamellæ about each canal constituting a *Haversian system*. The spaces between the systems of lamellæ thus formed are occupied by *intermediate* or *ground lamellæ*, which run without any definite relation to the course of the adjoining Haversian lamellæ, representing the remains of the original network of the primary spongy bone; lastly, just beneath the periosteum is a series of *circumferential lamellæ*, the course of which is parallel to the surface of the bone.

The medullary cavities of the long bones are filled with a delicate, very vascular connective tissue, rich in fat-cells—*the marrow*. The areolæ of the spongy extremities of the long bones and of the spongy bones also contain a delicate vascular connective tissue, which contains very few fat-cells, and is therefore called the *red* marrow, in contrast to the yellow color of the tissue filling the shafts of the long bones; this tissue abounds in round granular cells and masses of protoplasm, some of which, *the myeloplaxes*, contain many nuclei. The red marrow plays an important *rôle* in producing the colored blood-cells after birth.

Development of Bone.—In early fœtal life the skeleton is entirely cartilaginous, and bone first makes its appearance by a transformation of the cartilaginous skeleton, commencing at certain definite centers or points of ossification. There are usually several such centers to each bone, which are separated by cartilage until the growth of the bone is complete. The cartilaginous septa thus left, of which those between the epiphyses and shafts of the long bones may be taken as types, maintain their dimensions by a continual growth, while their margins are constantly being transformed into bone. Besides this development of bone in cartilage or *endochondral formation*, it is also developed in connective tissue—*intermembranous formation*. This is the case with the thin cranial and certain facial bones, in which a primordial cartilaginous stage does not exist. A similar formation of bone from connective tissue takes place beneath the periosteum of all growing bones. It is by this *periosteal* formation, for example, that the long bones increase in thickness, while their increase in length takes place by the growth and ossification of the cartilages between the shaft and epiphyses. The earlier histologists supposed that the formation of bone from cartilage occurred by a deposit of earthy salts in the matrix of the cartilage, transforming it directly into bone-matrix, the cartilage-cells at the same time being metamorphosed into bone-cells. Subsequent observations have shown, however, that the process is by no means so simple. The first formation of bone in the fœtal cartilaginous skeleton is preceded by an ingrowth of blood-vessels, surrounded by a delicate layer of cells (fœtal marrow), into the substance of the cartilage, which is absorbed to permit the entrance of the new tissue. Shortly after a deposit of earthy salts takes place in the matrix of the cartilage at the point of ossification, forming the *zone of calcification*.

The cartilage-cells, meanwhile, have enlarged and arranged themselves in perpendicular rows, while the lacunæ of those next the newly formed marrow cavity open into the latter by the absorption of the interposed matrix. As the result of this process, the zone of calcification consists of irregularly outlined processes of calcified matrix, which extend into the marrow cavity as a ragged fringe, the individual processes being separated by the broken down and absorbing cartilage lacuna; the cartilage-cells which these spaces contain disappear, and are probably disintegrated when the areolæ are opened. The vascular tissue occupying the primary marrow cavity contains great numbers of small active cells, which arrange themselves as a layer covering the surface of the processes of calcified cartilage matrix.

Through the agency of these young connective-tissue cells the layer of new osseous tissue is deposited *upon* the free surface of the old cartilage trabeculæ, a certain number of the cells themselves becoming gradually inclosed within

the new bone matrix; these marrow elements, from their active participation in the formation of the bone, are called *osteoblasts*; the inclosed osteoblast within the bone matrix becomes the *bone-cell*. As the layer of new bone upon the cartilage trabeculæ increases in thickness by the deposition of new lamellæ, the inclosed masses of calcified cartilage gradually undergo absorption, so that at a certain distance away from the zone of calcification the cartilage remains no longer are present, the entire trabeculæ being composed of the new bone, by their union forming the central network of primary spongy bone. The latter, however, is only transient, since soon after its formation it is absorbed in the

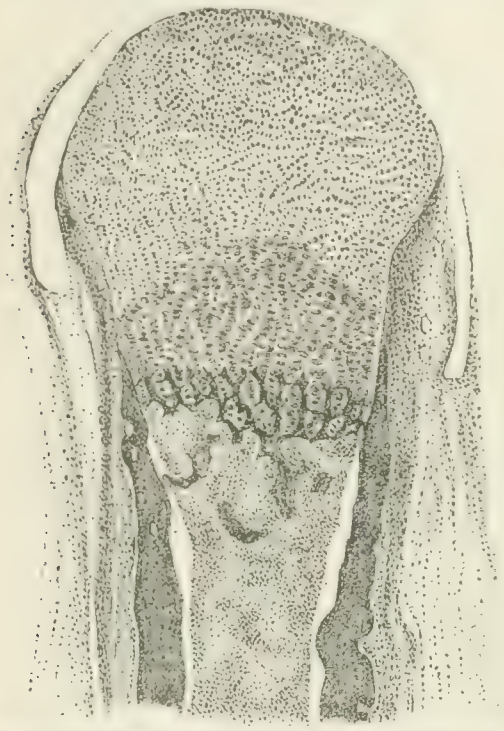


FIG. 12. Longitudinal section through part of developing finger-bone. The upper rounded zone is the embryonal cartilage; the slightly darker area is the zone of calcified cartilage, which is followed by the network of trabeculæ of new bone. The center is occupied by the marrow-tissue, bounded laterally by the new periosteal bone.

center of the long bones, its space being occupied by the central mass of primary marrow; this absorption keeps pace with the formation of new bone at the ends of the shaft, resulting in the extension of the central marrow cavity toward the ends of the bone. The only remains of the primary central spongy bone in the young subject are found as the spongy bone of the extremities. Coincident with the changes producing the bone in the axis of the shaft, at the periphery, the periosteum has been active in forming an outer zone of osseous tissue, which incloses that occupying the middle of the bone. The details of the formation of this periosteal bone are practically the same as those described, with the omission, of course, of everything pertaining to the cartilage, which in this process does not take part. At certain stages of the development, therefore, a transverse section of the young bone shows a peripheral zone of spongy periosteal osseous tissue, within which lies a central mass of endochondral bone. As already indicated, practically all the central bone is absorbed; this fate also awaits the inner zones of the periosteal bone, since the layers next the marrow cavity must disappear to compensate for the additions made to the outer surface, since the shaft of the bone is not solid but remains tubular. The periosteal bone, which is originally also spongy, becomes compact by a secondary deposition of lamellæ within spaces between the partially absorbed trabeculæ of the spongy structure: by this deposition on the walls of these spaces a system of concentric lamellæ is formed within each of these cavities in the center of the series, a cylindrical channel marking the position of the remains of the original space; these concentric lamellæ constitute the Haversian system surrounding the Haversian canal, while the remains of the trabecula of the original spongy bone are the ground or interstitial lamellæ. The intramembranous formation of bone is very similar to the periosteal, in both cases the cartilage being uninvolved. In these processes, whenever osseous tissue is removed, it is by the agency of large multinucleated cells, which from their function of bone-destroyers are called *osteoclasts*.

Muscular Tissue.—There are two varieties of muscular tissue, the *non-striated* and the *striated*; the former is also called *involuntary*, since it is beyond the influence of the will, while the latter is the *voluntary* muscle, because usually responsive to volition. The *non-striated* muscles are composed of spindle-formed contractile fiber-cells with elongated or rod-like nuclei. These occur in the muscular coats of the intestinal canal, the middle coat of the arteries and veins, the posterior part of the walls of the trachea and bronchial tubes, the ciliary muscle and the iris, the skin (where they constitute especially the minute muscles erecting the hairs), the lymphatic glands and spleen, the walls of the gall-bladder and biliary ducts, the ureters and urinary bladder, the uterus and Fallopian tubes, etc. The fiber-cells are composed of a contractile substance, which is either homogeneous or faintly striated longitudinally; in this, besides the nucleus, a number of strongly refractive granules are imbedded, a pyramidal group of them generally appearing at each extremity of the nucleus. Sometimes the extremities of the fiber-cells are divided into two or more branches. In length these cells for the most part range between ·0015 and ·008 inch; their average breadth is about ·0004 inch, and their nuclei range from ·0005 to ·001 inch in diameter. They are united into larger or smaller fasciculi by a delicate connective tissue consisting of a homogeneous matrix, with scattered stellate, anastomosing cells. On a transverse section through these fasciculi the divided fiber-cells present irregular polygonal outlines. The fasciculi are

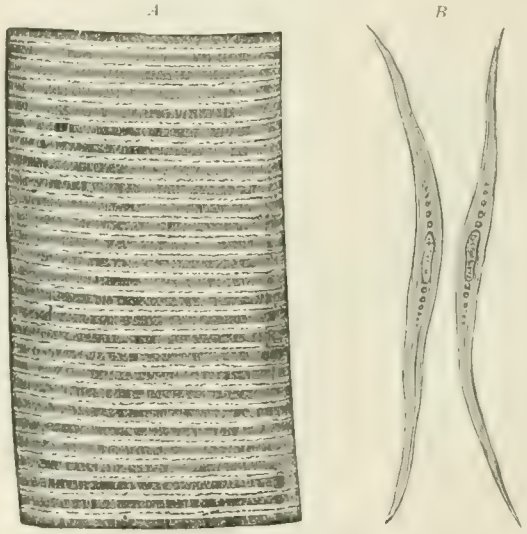


FIG. 13.—*A*, Portion of muscle-fiber very highly magnified, showing the striations. *B*, Isolated cells of involuntary muscle

united by septa of ordinary fibrillar connective tissue. The arteries and veins supplying the muscular tissue lie in these septa; the capillaries enter the muscular fasciculi and are distributed between the fiber-cells. The relation of the muscular fiber-cells to the nerves will be described in connection with the nerves. The *striated muscles* consist of cylindrical or somewhat fusiform fibers, ·0004 to ·0025 inch in diameter, which in short muscles extend from one insertion of the muscle to the other; in long ones, seldom exceed an inch and a half in length. These are marked transversely by close parallel lines, the well-known transverse striæ. Each fiber is invested by a delicate structureless sheath, the sarcolemma, beneath which, and on the exterior of the muscular substance proper, over nuclei, the so-called muscle-corpuscles are scattered at irregular intervals.

While the appearance of the characteristic light and dark striæ has long been known, the interpretation of these in the structural details of the tissue is far from easy, and has been the subject of patient investigation and even more extended discussion and disagreement; without attempting a

review of the several theories concerning the structure of striated muscle, recent investigations warrant the acceptance of the following view as being the most trustworthy. Within the nucleated envelope of the fiber, the sarcolemma, two substances are contained: the one, the *sarcoplasm*, is a clear, singly refracting indifferent substance, in which the second, in the form of the highly specialized, doubly refracting, *contractile elements* are imbedded; upon the latter the characteristic contractility of the tissue depends. The contractile substance is disposed as delicate filaments composed of spindle-shaped segments whose ends are connected by bridging threads of great delicacy; the lateral apposition of numbers of these filaments produces the appearance of a dark band corresponding to the position of the thickest part of the contractile filaments, while a clear band appears opposite the position of the delicate bridging threads; the faint line of dots—Krause's membrane—seen within the clear band depends upon the pearl-like enlargements upon the delicate threads. The contractile elements are separated laterally by a thin zone of sarcoplasm, while several elements are grouped into delicate bundles which, in turn, form the larger colonies, producing, in transverse sections of muscle-fibers, the fields of Cohnheim, while the smaller bundles correspond to the dots of which the fields are made; all these groups are separated by the clear, indifferent sarcoplasm. The muscular fibers are bound together into fasciculi by a delicate connective tissue resembling that which unites the fiber-cells of organic muscles. The fasciculi are united by septa of ordinary fibrillar connective tissue, in which the nutritive blood-vessels lie. The latter give off a system of capillaries which form a network between the individual muscular fibers. The termination of the nerves in striated muscular fibers will be described hereafter. All the voluntary muscles of the body, and certain of the involuntary ones also, among which the most notable is the heart, consist of striated muscular fibers. In the heart the muscular fibers offer several marked peculiarities. They are without sarcolemma; their nuclei are not limited to the periphery and surface of the fiber, but may occur at any depth within the muscular tissue; they branch and anastomose with each other, forming thus a continuous network, and they are divided by highly refractive transverse lines into segments ·002 to ·003 inch in length, each of which has a single nucleus in its center, so that they have been described as chains of muscle-cells. Besides this, they frequently contain numerous fat-molecules, even when apparently quite healthy. In their transverse striation, and most of the details of their minute structure, however, they resemble the other striated muscles. Heart-muscle must be regarded as a form of contractile tissue midway in its development between the ordinary voluntary muscle and the more lowly differentiated non-striped type.

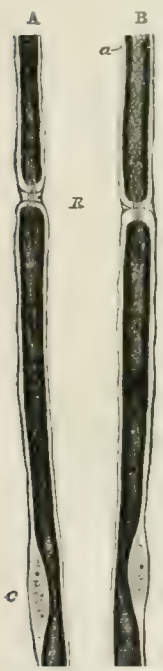


FIG. 14.—Portions of medullated nerve-fibers; *R*, nodes of Ranvier, at which medullary substance is wanting and the axis-cylinder is seen crossing the intersegmental substance; *a*, neurilemma; *c*, nerve-nuclei.

Nerves and Nerve-centers.—The nervous system consists of a series of branching cords, the nerves, which originate in the brain, spinal marrow, and ganglia, and are distributed to the tissues, where, for the most part, they end in certain special terminal organs. The *nerves* consist either of single nerve-fibers, or of fasciculi, of fibers united by vascular connective tissue. In most of the cerebro-spinal nerves, with the exception of their central and peripheral terminations, the nerve-fibers consist of a central portion, the *axis-cylinder*, surrounded by the medullary substance, the white matter of Schwann, and this again covered by a delicate investing membrane, the sheath of Schwann, or *neurilemma*. Such fibers are designated medullated nerve-fibers. The neurilemma is a transparent, structureless membrane, like the sarcolemma of the muscular fibers. The medullary sheath is a peculiar, highly refractive, oily substance containing protagon, which, when the fibers are torn across, exudes from their extremities as the so-called myelin drops. The axis-cylinder consists of a bundle of extremely minute fibrils united by a delicate granular material; the axis-cylinder is probably inclosed within a special sheath, the *axilemma*. Medullated nerve-fibers range for the most part from ·0002 to ·0008 inch in diameter; when perfectly fresh they appear smooth and round, with here and there an oval nucleus, but in a short time the medullary substance undergoes a kind of coagulation, changing it into a granular semi-transparent mass, which shrinks away from the peripheral sheath in some places and encroaches upon the axis-cylinder in others, so as to present very irregular contours. Medullated nerve-fibers branch toward their peripheral terminations, the axis-cylinder dividing into two or more portions, each of which is invested with a medullary layer, and a sheath of Schwann continuous with those of the primitive fiber. The secondary nerve-fibers thus produced are individually smaller than the one from which they spring, but in the aggregate the thickness of the branches is usually greater than that of the original fiber. Still further toward the periphery both the neurilemma and the medullary substance disappear, the latter sometimes before the former, and the axis-cylinder which alone remains then divides and subdivides until it is broken up into its primitive fibrillæ, which are extremely minute, ·00002 inch or less in diameter, and often present a delicate beaded appearance. Another variety of nerve-fibers

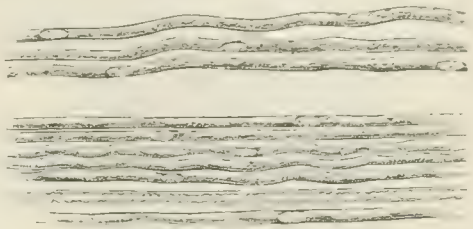


FIG. 15.—Non-medullated nerve-fibers.

is found in the branches of the great sympathetic nerve, which, on account of the absence of the medullary substance, have been called *non-medullated fibers* (also Remak's fibers). These correspond in size for the most part to the medium and smaller medullated fibers, and when fresh are smooth or somewhat granular, often marked by faint longitudinal striations. They consist of a peripheral sheath, identical with that of the medullated nerve-fibers, enveloping a bundle of primitive nerve-fibers united by a finely granular interfibrillar substance. The medullated nerve-fibers of the brain and spinal cord are destitute of the neurilemma, to the absence of which, together with the delicacy of the tissue in which they are imbedded, the softness of the white matter of the nerve-centers is due. From the foregoing it will be understood that the primitive nerve-fibrils are the characteristic elements of all nerve-fibers. After leaving the nervous centers, the nerve-fibers become associated into groups or bundles, the *funiculi*, which in turn are united by connective tissue to form the nerve-trunk, such as the sciatic or other nerve. The individual fibers are held together by delicate tissue, the *endoneurium*; the funiculi are enveloped by a fibrous sheath, the *perineurium*; while the general connective tissue of the trunk is the *epineurium*. The nerve-fibers in transverse section appear as minute round cells, the deeply stained apparent nuclei of which are the cut axis-cylinders.

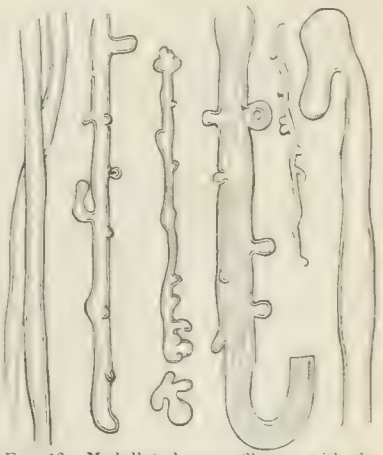


FIG. 16.—Medullated nerve-fibers; with the exception of those on extreme left, the fibers show post-mortem change.

The Nerve-centers.—The brain and spinal marrow consist, in addition to the medullated and non-medullated nerve-fibers, of numerous nerve-cells, characteristic elements in which nervous impulses originate; both cells and fibers

are united and supported by the delicate sustaining tissue, the *neuroglia*, augmented in places by additional bands of connective tissue. The nerve-cells are rounded, oval, or stellate bodies .0002 to .003 inch in diameter, consisting of a granular protoplasm, with a round or oval nucleus which usually contains a nucleolus. Each cell gives off one or more protoplasmic processes many times longer than the diameter of the cell. According to the number of these the cells are called unipolar, bipolar, or multipolar. The large multipolar nerve-cells in the anterior horns of the gray matter of the spinal cord are particularly available for study. In each of these cells all the processes but one branch frequently, until finally the ramifications escape observation. The exceptional process, as first demonstrated by Deiters, pursues its course without branching, and becomes ultimately the axis-cylinder of the medullated nerve-fiber.

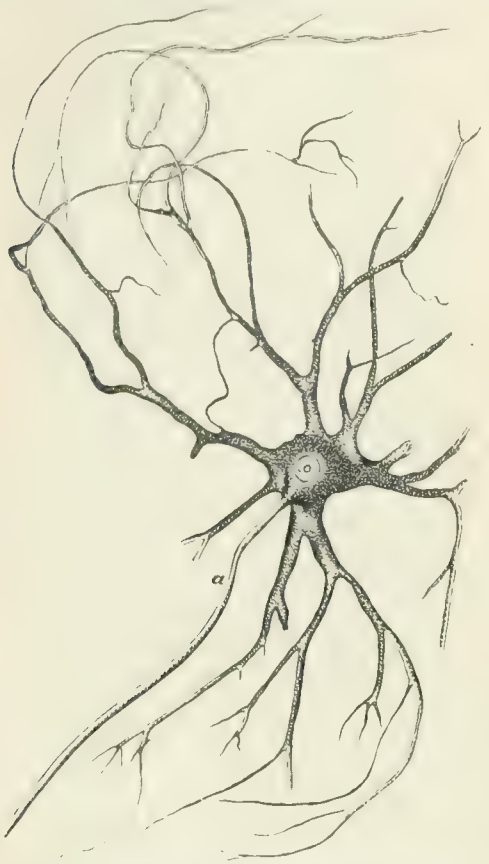


FIG. 17.—Nerve-cell from spinal cord; numerous branched protoplasmic processes; at *a*, the axis-cylinder process is seen.

Like the axis-cylinder, this process consists of delicate fibrils united by a granular interfibrillar material. Cells essentially similar to these, though smaller, are found in the gray substance of the cerebrum and cerebellum. Besides these, there are, in the gray substance of the brain especially, an immense number of small cells in which peripheral processes are demonstrated only after certain stainings; recent methods of Golgi have shown that branched protoplasmic processes are in general much more numerous than was supposed, and, further, that they end in the finest fibrillæ without apparently joining with other processes; in many cases, moreover, the axis-cylinder process breaks up into a number of fibrils without joining a nerve-fiber.

The nerve-cells and nerve-fibers of the brain and spinal cord are imbedded in a delicate supporting tissue, the *neuroglia*, consisting of branching cells and delicate elastic fibers imbedded in a finely granular matrix. The sympathetic ganglia are traversed by medullated and non-medullated fibers, and contain numerous nerve-cells, which, like those of the spinal cord, give origin to fibers, all being united by delicate connective tissue. Some of the nerve-cells are multipolar, while others are unipolar; in this case the single process, like the peripheral process of the cells of the spinal cord, is continuous with the axis-cylinder of a nerve-fiber. Beale has described a form of cell in the sympathetic ganglia of the frog which gives off two processes, one of which winds spirally around the other.

The Peripheral Terminations of the Nerves.—The terminations of the sensory nerves occur either as free-endings or in connection with some form of special terminal structure; in the former, and most usual, case the axis-cylinder divides into the fibrillæ, which join to form a delicate plexus immediately beneath the epithelium, from which terminal threads extend into the epithelial layer, to end between the cells of the same. The special nerve-endings are found in almost all localities endowed with a high degree of sensibility, as well as in connection with the organs of special sense. A number of these nerve-endings will be described in connection with the several organs, the termination of the nerves in muscle and in the Pacinian bodies alone finding place here. In the case of the voluntary muscles, medullated nerve-fibers terminate in peculiar organs, or *muscle plates*,

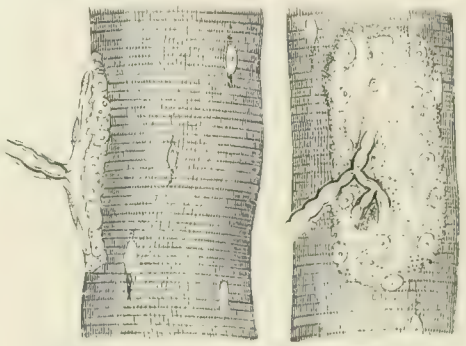


FIG. 18.—Termination of nerve in voluntary muscle.

situated immediately beneath the sarcolemma. At the point where the nerve-fiber joins the muscular fiber the neurilemma becomes continuous with the sarcolemma, while the medullary substance ends abruptly, and the axis-cylinder, penetrating beneath the sarcolemma, expands into a delicate, more or less branched terminal figure, which is separated from the striated substance of the muscular fiber by an elliptical granular protoplasmic mass in which several nuclei are imbedded. Every striated muscular fiber has at least one of these end-plates, while the longer fibers receive several of them. In the case of the non-striated muscles the nerve-fibers first lose their medullary sheaths, then branch, and finally split up into their ultimate fibrils, which form a plexus between the fiber-cells of the muscle; from this plexus, short delicate branches are given off which terminate between the muscle-cells without entering their substance. The Pacinian bodies are peculiar terminations of

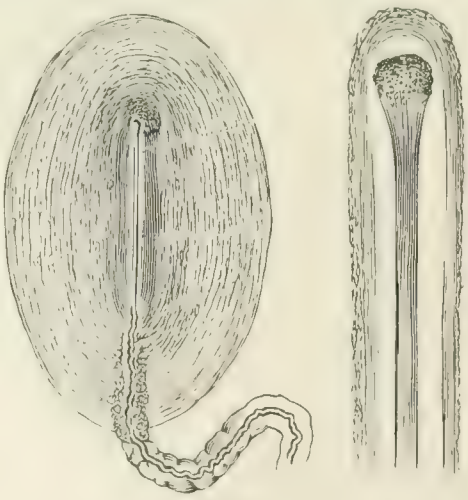


FIG. 19.—Pacinian body.

the sensory nerves, which in man are found in the subcutaneous connective tissue of the sides of the fingers and toes, in the intermuscular spaces, in the vicinity of joints, and in a number of other localities. They are elliptical bodies

·04 to ·1 inch in long diameter, which consist of numerous concentric layers of delicate connective tissue, forming a laminated capsule with a narrow elongated central cavity. A single medullated nerve-fiber enters one extremity of the capsule. Its external and medullary sheaths disappear shortly after its entrance, while the axis-cylinder penetrates the central cavity, and having extended nearly its whole length, forms a terminal expansion. In addition to the corpuscles of Pacini and the tactile corpuscles of the integument (Meissner), a number of other special nerve-endings have been described, the more important of which include the simple and compound end-bulbs, the corpuscles of Grandry (in birds), the spherical end-bulbs, the cylindrical end-bulbs, and the corpuscles of Herbst (in birds). For an account of the structure of these complicated bodies, the reader is referred to the special text-books.

The *blood* consists of a colorless liquid, the liquor sanguinis or blood-plasma, in which float two kinds of cellular elements, the red and white corpuscles, with which a third element, the *blood-plates*, must be recognized. When the blood coagulates, fibrin in a more or less distinctly fibrillated condition separates from the plasma, entangling the corpuscles in its meshes. The remaining fluid portion or serum consists of albumen and certain salts dissolved in water. The *red blood-corpuscles* in man are flattened biconcave disks, the average diameter of which is usually stated at $\frac{1}{3200}$ of an inch. Welcker makes them ·00774 of a millimeter, or ·0003 inch very nearly, the usual variations being between ·0064 and ·0086 of a millimeter. Their number has been estimated by Vierordt at 5,000,000 to a cubic millimeter. They consist of a homogeneous colored matrix in their adult condition, are destitute of a nucleus, and are not invested with a special membrane or cell-wall. In the majority of mammals the blood-corpuscles are similar in form to those

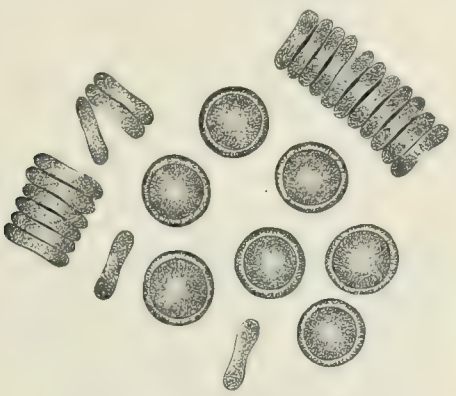


Fig. 20.—Human red blood-corpuscles.

of man, but differ somewhat in size. On this diversity in size alone the attempts to identify human blood by the microscope for legal purposes are based. It should be remembered, however, that the corpuscles of certain animals, particularly the monkey and the dog, so closely approximate the dimensions of those of human blood that it is quite impossible to discriminate between them by the microscope even in fresh blood; since after soaking out a blood stain the original size of the blood-corpuscle is not always exactly reproduced, it becomes even more difficult to distinguish human blood under such conditions from the blood of a considerable number of animals, the corpuscles of which approximate those of man in size. In the camel and llama the corpuscles are elliptical, but possess no nuclei. In birds, reptiles, amphibians, and fishes the corpuscles are elliptical flat disks possessed of an oval nucleus, which, when the edge of the corpuscle is turned toward the eye, is seen to project on each side above the surface of the disk. The largest red blood-corpuscles at present known are those of the amphiuma, one of the tailed amphibians; the hugh oval nucleated blood-cells of this animal measure ·075 mm. in length by ·046 mm. in breadth, being readily distinguishable by the unaided eye. The following are the mean dimensions of the corpuscles of a few animals, as given by Welcker, in decimals of a millimeter:

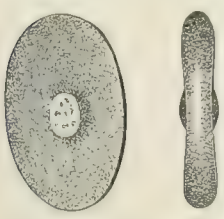


Fig. 21.—Red blood-corpuscles from a reptile.

Circular Corpuscles.		*Elliptical Corpuscles, long diameters.*	
Man	·0077	Llama	·0080
Dog	·0073	Pigeon	·0147
Cat	·0065	Frog	·0223
Rabbit	·0069	Triton	·0293
Sheep	·0050	Proteus	·0582
Moschus javanicus	·0025	Sturgeon	·0134

The *white blood-corpuscles*, as seen circulating in the living blood-vessels, are spherical granular bodies, most of which in man have rather greater diameter than the red (on the average nearly ·0004 inch). Each is a little mass of protoplasm which contains one or more nuclei. When a drop of human blood is watched with the microscope while the temperature is kept about 100° F. and evaporation is prevented (by means of the hot stage and moist chamber), it will be observed that the majority of the white corpuscles assume the most diverse forms, and very slowly creep across the field of view with a motion resembling that of the amœba. Similar amœboid motions are observed in transparent living tissues in white blood-corpuscles which have migrated from the vessels. The so-called third corpuscular elements of the blood, the *blood-plates*, are difficult of observation, since they very readily undergo disintegration unless special precautions are taken for their preservation. These bodies are colorless disks, about one-quarter to one-third the diameter of the red corpuscles; they readily break down into granules which become aggregated into irregular masses. The blood-plates are supposed to bear a close relation to the coagulation of the blood, but regarding their exact nature much remains to be learned. Lastly, the blood contains considerable numbers of still more minute particles which result from the disintegration of cells. The white corpuscles in all vertebrated animals are essentially similar to those of man, but the amœboid motions in those of the cold-blooded animals take place at a lower temperature. Their differences in dimensions in the various classes of animals are much less than in the case of the red corpuscles. The white corpuscles are much less numerous than the red. Welcker estimates the proportion at 1 to 335, but it varies with age and sex, and indeed in different individuals and in the same individuals at different times, being greatly influenced by the processes of digestion.

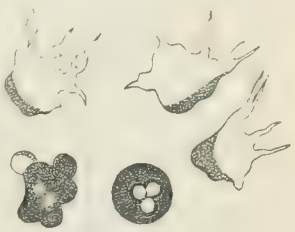


Fig. 22.—Colorless blood-corpuscles showing amœboid movements.

The Blood-vessels.—The heart and blood-vessels, including the capillaries, are lined throughout by an endothelium consisting of a single layer of flattened nucleated cells, the boundaries of which are best displayed by the imbibition or injection of dilute solutions of nitrate of silver and subsequent exposure to light. The nuclei may afterward be demonstrated by carmine staining. These cells range usually from ·001 to ·004 inch in length; the nuclei on an average are about ·0005 inch long. The walls of the true capillaries appear to consist merely of this single layer of cells, which are irregular in outline, and vary considerably in form in the capillaries of different organs. As the capillaries pass into the small arteries the endothelial cells become more fusiform; in the small veins they approach an irregularly polygonal form. In the line of junction between these cells

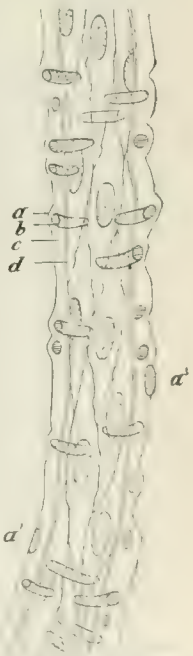


Fig. 23.—Small artery: *a*, tunica adventitia; *a'*, nucleus of tunica adventitia; *b*, muscle nucleus; *c*, elastic internal tunic; *d*, lining membrane of endothelial cells.

small, irregular openings, the so-called stomata, are mapped out by the action of silver, especially on the smaller veins. Proceeding from the capillaries toward the heart, both veins and arteries acquire an investment of connective tissue, in which a layer of circular muscular fiber-cells soon makes its appearance. After this three distinct coats can be distinguished in both arteries and veins: the inner or *intima* consisting of the endothelial lining, reposing upon a thin layer of connective tissue, rich in elastic fibers, many of which run longitudinally; the *media* or muscular coat, consisting of involuntary muscular fiber-cells disposed circularly and united together by connective tissue abounding in elastic fiber; and the external coat, or adventitia, composed of fibrillated connective tissue. The coats of the veins are considerably thinner than those of arteries of the same size, and contain less elastic tissue. On the other hand, the thick middle coat of the larger arteries is distinguished by the great quantity of elastic tissue which it contains. Longitudinal muscular fiber-cells occur in the adventitia of some of the larger arteries and veins. The coats of the veins within the cranium, in the bones, and in the maternal portion of the placenta contain no muscular fibers. The larger arteries and veins are nourished by a system of vessels, the *vasa vasorum*, which ramify in the external coat and send capillary branches to the muscular layers beneath. Nerves enter the middle coat of both larger and smaller vessels (with the exception of the true capillaries), and terminate in the muscular fiber-cells in the manner already described.

FIG. 24.—Lymphatics; central tendon diaphragm of rabbit: *a*, lymph vessels; *c*, connective tissue with serous canals, into which larger channels open at *b*.

The *lymphatics*, like the blood-vessels, are lined by a single layer of flattened endothelial cells, the boundaries of which are best displayed by the action of silver, while their nuclei can be demonstrated by the subsequent use of carmine. In the smaller lymphatics and in the lymphatic capillaries these cells are distinguished by the sinuous character of their margins, and by the large size and great number of the stomata between them. The larger lymphatics possess a middle muscular and an external connective-tissue coat, resembling the corresponding tunics of the veins. The stomata of the lymphatic network communicate with the system of spaces already described as existing in the connective tissue. These form a system of plasma or juice canals, which vary in size and form in various parts of the body, and are best demonstrated by the action of silver, which blackens the intervening matrix, leaving the plasma canals uncolored.

A peculiar form of tissue, consisting of a reticulum crowded with small cells, known as *lymphatic* or *adenoid* tissue, exists widely distributed throughout the body. In many localities special masses of such tissue occur, and are called *lymphatic "glands,"* from the fact that the older anatomists gave them this name; such structures are not, however, to be confounded with the true secreting glands. (See GLAND.) The lymphoid tissue composing the glands presents variations in its density; in the compound glands, when a number of simple follicles are grouped together, the denser tissue occupies the central parts of the divisions of the organs. The *lymphatic glands* are interposed in the course of the lymphatics. When these vessels, on their way from the peripheral portions of the body, arrive at a gland (vasa afferentia), they ramify on its surface, and enter its substance from the periphery. The branches leading from the gland toward the larger lymphatic trunks (vasa efferentia) escape from the hilus of the gland. The lymphatic glands are invested by a capsule of connective tissue, and consist essentially of a delicate reticulum of connective tissue, the meshes of which are filled with small granular cells resembling the white corpuscles of the blood. The connective-tissue capsule gives off to the interior of the gland a series of trabeculæ which forms a network of interlacing imperfect partitions, dividing the gland into a number of intercommunicating compartments occupied by the lymphoid tissue. This latter is not of uniform density throughout the compartments, but is much denser in the center of these spaces than next the connective-tissue trabeculæ; near the periphery of the organ these dense masses are called *cortical follicles*, while their elongated continuations within the center of the gland form the *medullary cylinders*; the spaces between these dense tracts and the trabeculæ are occupied by a much looser form of lymphoid tissue, and constitute the *lymph-sinuses*, being the paths through which the lymph traverses the gland. The lymphoid elements of this coarse reticulum within the lymph-path are easily detached, and are constantly carried away by the current of the lymphatic circulation, and as constantly renewed. The lymph-sinus communicates directly with the vasa afferentia at the periphery of the organ, and with the vasa efferentia at the hilus. Connected with the lymphatic plexuses of the mucous membrane of the alimentary canal especially are certain glandular bodies, the *lymphatic follicles*, the parenchyma of which is very similar in its structure to that of the cortical follicles just described, and which, for this reason, and on account of their relations to the lymphatic vessels, are to be regarded as minute lymphatic glands. The solitary glands and glands of Peyer in the intestines, the closed follicles of the tonsils, pharynx, and back of the tongue, are of this nature.

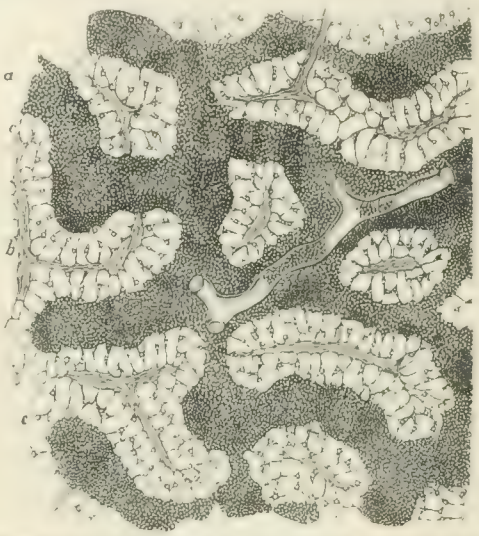


FIG. 25. Lymphatic gland: *a*, cords of dense lymphoid tissue; *b*, trabeculæ; *c*, lymph sinus

The *lymph* is the colorless, slightly opalescent fluid contained within the lymphatics. Its morphological elements, the lymph-corpuscles, are in all respects identical with the white corpuscles of the blood, which in fact are continually recruited by the lymph-corpuscles entering the subclavian veins through the thoracic duct and the lymphatic duct of the right side; on the other hand, white blood-corpuscles which have migrated from the blood-vessels into the serous canals of the connective tissue continually enter the lymphatic capillaries and become once more lymph-corpuscles. The lymph which leaves the lymphatic glands by the vasæ efferentia is so much richer in corpuscles than that which enters them as to leave no doubt that these glands constitute an important seat of the formation of the lymph-corpuscles, and consequently of the colorless blood-cells. They originate by the multiplication of the cells of the parenchyma, a similar formation of white corpuscles taking place in the spleen,

and probably also in the lymph-follicles and the marrow of the bones.

The *serous membranes* consist of a thin layer of connective tissue coated on the side next the serous cavity by a single layer of endothelial cells. These are flattened polyhedral, nucleated elements, generally with sinuous margins, which are best displayed by the action of silver. It is then seen also that numerous sharply defined, rounded, or irregular spaces, the so-called stomata, exist between the margins of the cells. The membrane on which this endothelium reposes consists of a network of interlacing bundles of fibrillar connective tissue with stellate fixed corpuscles and elastic elements. It contains, besides blood-vessels and nerves, a rich plexus of lymphatic capillaries, which appear to communicate freely with the serous cavities by means of the stomata. In consequence of this arrangement, milk or colored fluids, such as carmine solution, introduced during life into serous cavities—as, for example, the peritoneum or the pleural sacs—are speedily taken up by the lymphatics, a natural injection of which may thus be effected. The lymphatic capillaries may also be demonstrated by soaking the membrane in nitrate of silver and exposing it to the light. The connective-tissue matrix is thus blackened, while the blood-vessels and lymphatics appear as light-colored channels lined by their characteristic endothelium. From the abundance of these lymphatics, and the readiness with which they take up fluids introduced into the serous cavities, the latter are regarded as belonging to the lymphatic system.

The Spleen.—The spleen is invested externally by the peritoneum, immediately beneath which is a firm connective-tissue capsule. From the inner surface of the capsule numerous processes (trabeculæ) proceed into the substance of the organ, uniting with each other to form a network, the areolar interspaces, which are filled with the splenic pulp. Both the capsule and the trabeculæ contain a considerable number of involuntary muscular fiber-cells and elastic elements. The splenic pulp consists of lymphoid elements resembling those of the lymphatic glands; these elements are united by a delicate reticular, tenacious intercellular substance. In the mass thus formed, according to Frey, an anastomosing system of passages, lined by an imperfect endothelium consisting of a single layer of plate-like cells, is hollowed out. These passages communicate with both

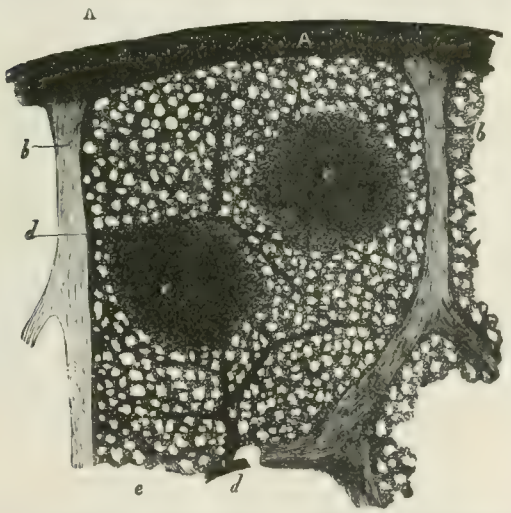


FIG. 26.—Section of human spleen: A, capsule; *b*, trabeculæ; *c c*, Malpighian corpuscles; *d*, injected arterial twigs; *e*, splenic pulp.

the arteries and veins, and serve for the transmission of blood. The splenic artery, after entering the organ, breaks up into smaller branches, some of which continue throughout the entire extent of the trabeculæ, fading away into the vascular channels of the splenic pulp when the supporting tissue passes into the delicate reticulated tissue; other branches of the splenic artery diverge and enter the pulp to become ensheathed by cylindrical masses of dense lymphoid tissue; these masses constitute the characteristic Malpighian bodies of the spleen. These are from ·01 to ·04 inch in diameter, and are readily recognized by the naked eye on account of their whitish color. They consist of cells resembling those of the splenic pulp, closely held together by a fine intercellular reticulum, which, toward the periphery, becomes denser, without, however, forming a complete capsule; the parenchyma of the Malpighian bodies is thus continuous with the splenic pulp. The arteries and veins of the spleen are united by a plexus, imperfectly defined channels, which ramify in the substance of the splenic pulp. The lymphatics of the spleen form a close plexus in the capsule of the organ, whence numerous branches are given off into its interior; there a second plexus is formed, the larger branches of which for the most part accompany the arteries.

The Skin and its Appendages.—The skin consists of a superficial epithelial layer, the *epidermis*, and a deeper layer, the *corium* or true skin. The corium is from ·02 to ·1 inch thick, and is composed of dense connective tissue, many of the fixed corpuscles of which are stellate, especially in its more superficial portions, where also they are smaller and more numerous. The fibrillated matrix of this connective tissue is so disposed as to form a dense network with small intercommunicating meshes, which are largest in the deeper parts of the corium, and there contain groups of fat-cells. Still deeper, the network becomes continuous with the loose connective tissue of the subcutaneous fat. Networks of

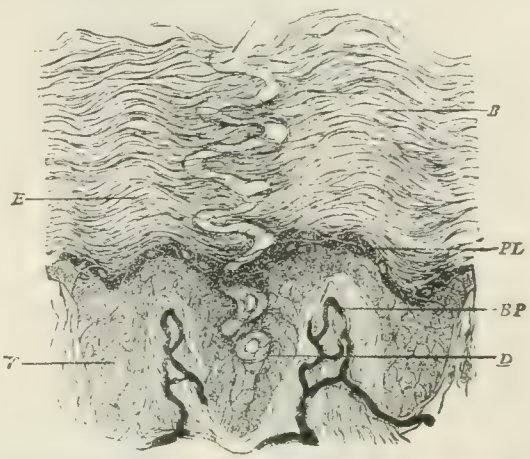


FIG. 27. Section of skin: BP, vascular papillæ of the corium of true skin; all above these represents the epidermis, of which the outer layer (E) is the superficial horny stratum corneum; V, deepest layer of epithelial cells; PL, stratum granulosum; D, duct of sweat-gland opening on free surface at *p*.

coarse and fine elastic fibers mingle with the bundles of fibrous tissue. On its exterior surface the corium presents great numbers of little elevations, the *papillæ*. These are merely rounded projections over the greater portion of the body, but in some situations, especially in the palmar surface of the hands and fingers, become conical elongated processes ·004 inch in length or longer. They are divided into vascular and nervous, the first containing capillary loops, the second the terminations of nerves. The blood-vessels of the corium form in its deeper portion a close plexus, whence numerous branches are given off toward the surface. These form, in the most superficial portion of the corium, a second still closer plexus, from which the capillary loops of the papillæ are derived. There are also two plexuses of lymphatics, a superficial and a deep—the first situated just beneath the superficial plexus of blood-vessels, the second just beneath the deep vascular plexus. The lymphatic capillaries of these plexuses communicate with the communicating areolar interspaces of the connective tissue of the skin, which here, as elsewhere, are to be regarded as lymphatic passages.

The nerves of the skin are composed of medullated nerve-fibers, part of which terminate in the peculiar corpuscles of Meissner and Pacini, situated within the nervous papillæ, while others loose their medullated sheath, and, after breaking up into bundles of fibrils, form a plexus in the superficial portion of the corium. Innumerable single fibrils, given off from this plexus, penetrate the epidermis, and terminate between the epithelial cells of its deeper layers. The corpuscles of Meissner (tactile corpuscles) are contained in the nervous papillæ, and are most numerous in the palmar surface of the hand and fingers. They are oval bodies about as long as the papillæ in which they are contained, but rather narrower, composed of a modified connective tissue with transversely disposed nuclei, and marked superficially with trans-

verse lines. Each is penetrated at its inferior extremity by a medullated nerve-fiber which runs toward the opposite extremity, either straight or in a spiral manner, terminating in a mode not yet fully made out.

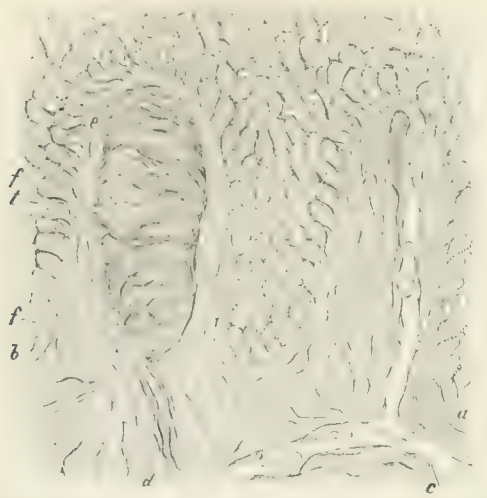


FIG. 28.—Tactile corpuscles: *a*, vascular papilla; *b*, nerve-papilla; *c*, blood-vessel; *d*, medullated nerve-fiber; *e*, tactile corpuscle; *f*, transverse section of contained nerve-fiber.

The *epidermis* varies in thickness from ·002 to ·15 inch, and is composed of numerous strata of epithelial cells, the deeper ones being soft and polygonal, while the more superficial are flattened and horny; it is hence divided into a mucous and a horny layer. The cells of the mucous layer are nucleated masses of granular protoplasms. Those of them which are immediately in contact with the corium are elongated or columnar, and about ·0004 inch in average length. Next above these the cells have about the same diameter, but are rounded or polygonal from mutual pressure, and succeeding strata increase in size toward the surface of the mucous layer, becoming more and more flattened, till the uppermost cells have a transverse diameter of ·001 inch or more, with less than half the thickness. The horny layer consists of strata of cells flattened into mere polygonal scales, ·001 to ·0015 inch or more in diameter, and extremely thin. In most of them no nucleus can be made out. The most superficial cells of this layer are constantly being thrown off, while the superficial cells of the mucous layer continually undergo the horny transformation, and thus replace the loss. To maintain this process a constant development of new elements goes on in the deeper parts of the mucous layer.

The dark color of the skin in certain races is due to the deposit of pigment-granules in the cells of the lower part of the mucous layer.

The *hairs* consist entirely of modified epidermic cells, the corium taking no part in their formation. These structures vary considerably in thickness in different situations, the long soft hairs of the head, beard, etc., usually range between ·0015 and ·004 inch in thickness; the short stiff hairs of the eyelashes, eyebrows, nostrils, and auditory meatus, from ·0025 to ·006 inch; and the downy hairs of the general surface of the body from ·0005 to ·001 inch. The proper substance of all these varieties of hairs can be broken up by the action of sulphuric acid into flat elongated fiber-cells ·002 inch in average length. Each hair is coated externally by a *cuticle* composed of a single layer of flattened scales, which overlap each other like the shingles on a roof; internally, in the coarser hairs, at least, is a central *medulla* or *pith*, composed of granular polygonal cells ·0006 to ·0008 inch in diameter, in the midst of which in many hairs, but by no means in all, masses of air are contained. The color of the hair is due to pigment-granules deposited both in the medulla and the proper hair-substance. Each hair is surrounded throughout its imbedded portion by a modified epithelial structure, the *hair-follicle*, derived from the ingrowth of the epidermis; at its bulbous extremity the hair-follicle is indentated by a projection of the surrounding connective tissue, which forms the papilla in which a vascular loop is contained. The hair-follicles are from ·08 to ·25 inch long, and extend deep into the corium—in the case of the larger hairs quite through it. The connective tissue of the corium immediately adjoining them is so condensed as to form an external sheath, the fibers of which run parallel to the hair. The portion of this sheath nearest to the follicle is more homogeneous, and is known as the glassy membrane. The mucous layer of the epidermis is continued into the sheath, which it lines as far as the papilla, lying next to the vitreous membrane, and is called the *external root-sheath*. Between the latter and the hair is a second thinner stratum, composed of the two delicate layers of Henle and of Huxley, which together are designated the internal root-sheath. The hair-papillæ are vascular processes of connective tissue which project into the bottoms of the follicles; they are conical in shape, with constricted necks. At the bottom of the follicle the cells of the outer root-sheath pass uninterruptedly over the hair-papillæ, at which point they are cylindrical and rapidly undergo specialization; those cells over the summit of the papillæ are converted into the fiber-cells of the hair-substance, while those more laterally placed are converted into the cuticle of the hair and into the inner root-sheath. Two small arteries enter each papilla; these usually unite to form a single trunk, which break up into a capillary network from which two emergent veins proceed. A small artery and vein also ramify in the substance of the external sheath of the follicle. Nerves have been traced as far as the outer root-sheath, but their mode of termination remains uncertain. When the hair has completed its life, the root undergoes degeneration, its place, however, after a time being taken by a new hair, which grows from the remains of the old follicle; the new shaft finally displaces the former hair, which then drops out.

The *erector muscles of the hair* are narrow bands of muscular fiber-cells ·0018 to ·009 inch in thickness, which arise in the upper part of the corium and run obliquely inward to be inserted into the hair-follicles just below the sebaceous glands. Each hair-follicle enters the skin obliquely, forming an acute angle with the surface, and, as the muscle lies in the corresponding side, its contraction erects the hairs in the opposite direction, producing the so-called "gooseflesh."

One or more *sebaceous glands* open into each hair-follicle just below the level of the general surface of the corium. Each of these glands consists of from two to twenty somewhat oval sacculi ·005 to ·014 inch in long diameter, composed of a transparent basement membrane, filled with nucleated cells, resembling the cells of the mucous layer of the epidermis. The cells nearest the walls of the sacculi often contain no oil, while in the more central cells oil is usually present in drops of various sizes imbedded in the cell-substance. The size of the sebaceous glands is quite independent of the size of the hairs with which they are connected, and sometimes, though rarely, they open directly upon the surface of the skin without being connected with any hair.

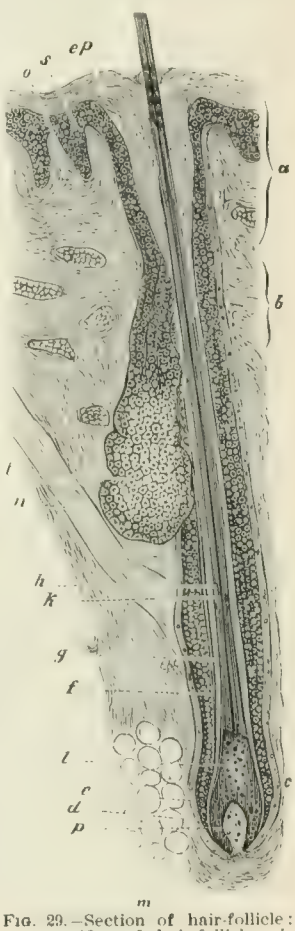


FIG. 29.—Section of hair-follicle: *a*, orifice of hair-follicle; *b*, neck of follicle; *c*, bulbous extremity of follicle; *d*, outer layer of fibrous sheath; *e*, inner or glassy layer of same; *f*, outer root-sheath; *g*, inner root-sheath; *h*, substance of hair; *k*, medullary substance of hair; *l*, root of hair; *m*, adipose cells; *n*, arrector pili; *t*, sebaceous gland; *o*, papillæ of skin; *p*, hair-papilla; *s*, mucous layer; *ep*, horny layer projecting into mouth of hair-sac.

The *sweat-glands* are modified simple tubular glands, each consisting of a delicate sheath, lined by a single or

double layer of low columnar nucleated cells, which leave in the center a narrow cylindrical passage. The diameter of the tube averages about ·0025 inch; its deepest extremity forms a coil or glomerulus ·008 to ·016 inch in diameter, which is surrounded by a plexus of blood-vessels, and lies in the lower part of the corium or in the subjacent adipose tissue. From this coil the tube pursues a nearly straight path to the surface of the corium, where both the sheath and the columnar cells terminate, and the central passage becomes continuous with a spiral canal hollowed out between the cells of the epidermis, which opens on the external surface of the horny layer. The hairs, sebaceous glands, and sweat-glands are developed from the mucous layer of the epidermis, cylindrical outgrowths of which invade the corium and undergo the requisite transformations. Simultaneously, the adjacent layers of the corium are metamorphosed into the outer fibrous sheaths of the hair-follicles and glands.

The *nails* are to be regarded as special modifications of the epidermis, and consist, like it, of a mucous and a horny layer, the latter being the true nail. In the fold of skin from which the root of the nail grows the corium is elevated into papillæ projecting forward, which in the true bed of the nail are replaced by a series of parallel longitudinal ridges or laminæ ·002 to ·008 inch high. These papillæ and ridges are abundantly supplied with blood-vessels, and numerous medullated nerve-fibers exist in the subjacent connective tissue, which lose their medullary sheath on entering the corium, and break up into fine branches, the ultimate termination of which is not fully known. An active development of cells takes place in the mucous layer at the hindmost part or root of the nail; as a similar development occurs, though less actively, in the mucous layer of the nail-bed, the nails are at once pushed forward and increased in thickness toward their free margins. The horny layer, or nail-substance, is composed of irregular polygonal cells intimately united, but these can be isolated by reagents, as, for example, by maceration in solution of potash.

The Digestive Organs.—The *mouth* is lined by a mucous membrane which is directly continuous with the skin, and like it consists of a vascular layer of connective tissue beset with papillæ and a many-layered squamous epithelium, the superficial cells of which are flattened scales, the deeper ones polygonal, and those next the connective-tissue layer columnar. The connective-tissue layer, however, is much thinner than the corium; in the epithelium a horny layer can not be discriminated as in the epidermis, and the large superficial epithelial scales contain oval nuclei. The papillæ of the mucous membrane vary in size and shape in different parts of the oral cavity; they are particularly conspicuous on the upper surface of the tongue, where three varieties are discriminated—viz., the filiform, fungiform, and circumvallate. The filiform papillæ are pretty uniformly distributed over all portions of this surface. They are conical elevations of the mucous membrane, the apices of which terminate in a number of secondary papillæ, the whole being covered with a thick layer of epithelium, which, at the apices, breaks up into a number of slender processes, each composed of epithelial cells adhering together. The fungiform papillæ are situated at the anterior part of the tongue, chiefly on its tip and edges. They are club-shaped projections of the mucous membrane with narrow necks, beset upon the surface with small secondary papillæ, and smoothly covered over with epithelium. The circumvallate papillæ, from eight to ten in number, are arranged in the form of a Λ at the root of the tongue. They are flattened elevations, somewhat constricted at their bases, beset, like the fungiform, with small secondary papillæ, and surrounded by a circular elevation of the mucous membrane, from which they are separated by a narrow depression. All these varieties of papillæ are provided with both blood-vessels and nerves. Connected with the nerves are special organs of taste, the so-called gustatory bulbs, which are situated chiefly on the sides of the circumvallate papillæ, but also exist, though less plentifully, on the fungiform papillæ. They have the form of round-bellied flasks, about ·003 inch long, and rather more than half as broad, which occupy cavities in the epithelium, resting below on the connective-tissue layer of the mucous membrane. They are composed of flattened, spindle-shaped nucleated integumentary cells, which inclose a number of more delicate columnar elements closely related to the filaments of the nerves of special sense. The central cells of these bulbs are believed to be the true gustatory cells, while the others are regarded as protecting in their nature, and are so arranged as to leave at the apex of the bulb a circular opening about ·00014 inch in diameter, the gustatory pore, through which sapid solutions gain access to the gustatory cells. The oral cavity is provided with a considerable number of small mucous glands ·03 to ·16 inch in diameter, similar in structure to the mucous salivary glands, and designated, according to their situation, labial, buccal, palatine, and lingual glands.

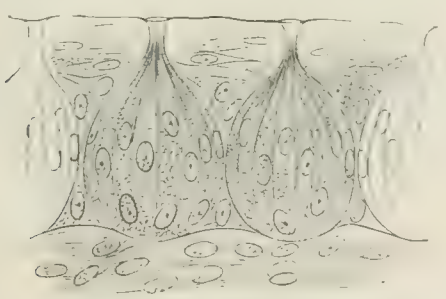


FIG. 30.—Taste-bulbs.

The *salivary glands* are racemose glands, the ducts of which are lined with a cylindrical epithelium and branch in a tree-like manner, terminating finally in sacculi or alveoli ·0015 to ·003 inch in diameter, and lined with polygonal secreting cells ·0004 to ·0007 inch in diameter. The whole is united into a mass by a delicate connective tissue in which numerous blood-vessels and nerves ramify. The alveoli and smaller ducts are limited by a delicate connective-tissue envelope, the membrana propria; in the larger ducts it forms a comparatively thick layer. The secreting cells lining the alveoli vary in appearance according to the character of their secretion; certain of the salivary glands, as the parotid and pancreas, are albuminous or serous in type, while the sublingual and submaxillary glands in man

FIG. 31.—Vertical section of tooth *in situ*: *c*, pulp cavity; *1*, enamel; *2*, dentine or ivory, with tubules; *3*, cement or crusta petrosa; *4*, dental periosteum; *5*, bone of lower jaw.

are respectively mucous and muco-serous. In the serous glands the secreting cells are spherical, deeply granular, and conspicuously nucleated; in the mucous type, on the contrary, the cells are more columnar, very clear, with their nuclei displaced and pressed against the basement membrane. The nerves connected with the salivary glands have been traced to the alveoli, which they surround; regarding their supposed termination in connection with the secreting cells little is accurately determined. The oral fluid consists of the secretion of the salivary glands mixed with that of the small racemose glands above described. It always contains large numbers of flattened epithelial cells, derived from the surface of the oral mucous membrane, together with small round granular cells resembling the white corpuscles of the blood after they have been somewhat swollen by immersion in a fluid of the density of the saliva. The latter are known as the *salivary corpuscles*, and are migrated lymphoid cells which escape into the cavity of the mouth from the masses of lymphoid tissue within the oral cavity.

The *tonsils* are two masses of lymphoid tissue, each consisting of from ten to twenty sacculated depressions of the mucous membrane, in the walls of which are numerous oval lymphatic follicles ·008 to ·02 inch in diameter. The parenchyma of these follicles consist of a fine reticulum of connective tissue, the meshes of which are stuffed with lymphoid elements. The follicles are united by a connective tissue rich in blood-vessels and lymphatics. At the root of the tongue there are a number of small lymph-follicles similar in structure to the tonsils, but simpler, each consisting of a single saccular depression of the mucous membrane, the walls of which are lined by lymphoid tissue. The oral mucous membrane is well supplied with lymphatics, which are especially abundant on the surface of the tongue and about the tonsils.

The Teeth.—The teeth consist of three substances: The dentine, enamel, and cementum. The *dentine*, or ivory, which constitutes the principal portion of the substance of the teeth, consists of a calcareous matrix containing great numbers of delicate dentinal canals ·00005 to ·00015 inch in diameter, which branch and anastomose as they radiate from the pulp cavity toward the periphery of the dentine. The crown of the teeth is covered with a harder material, the *enamel*, made up of hexagonal prismatic enamel-fibers ·00012 to ·00018 inch in diameter, arranged perpendicularly to the surface, or nearly so. The roots of the teeth are covered with a thin layer of true bone, the crusta petrosa, or *cementum*. The tooth-pulp occupies the central cavity of each tooth, and is a delicate mass of connective tissue containing both blood-vessels and nerves. Its external layer consists of large nucleated cells, the *odontoblasts*, provided with long processes which extend within the dentinal canals. In the development of the teeth a longitudinal furrow in the mucous membrane of the gum is formed, from the bottom of which a cylindrical epithelial process grows into the underlying connective tissue; this epithelial structure becomes the *enamel organ*, into which a papillary outgrowth from the adjacent connective tissue extends to form the *dental papilla*. The enamel originates by the transformation of portions of the epithelium of the primary enamel organ, while the peripheral cells of the dental papillæ are transformed into odontoblasts, between the processes of which the calcareous matrix of the dentine is deposited. The permanent teeth are developed in the same manner as the temporary, the enamel organ of the second teeth sprouting from that of the first teeth during the development of the latter.

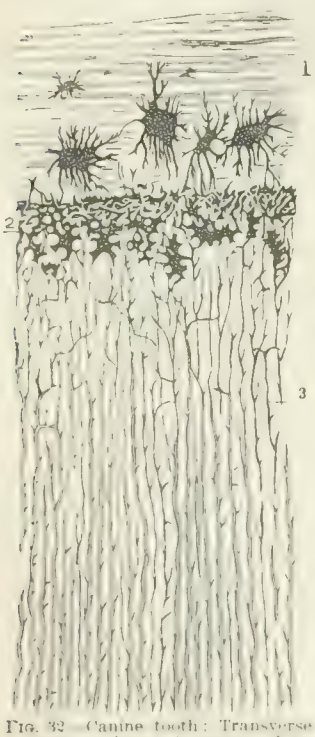


Fig. 32.—Canine tooth: Transverse section of root: 1, cement; 2, interglobular spaces; 3, dentinal tubules.

The *pharynx* is lined by a mucous membrane resembling that of the mouth, except in the portions adjoining the posterior nares and the orifices of the Eustachian tubes where the pavement epithelium is replaced by one composed of ciliated columnar cells like those of the nasal mucous membrane. The mucous membrane is well supplied with vessels, nerves, and lymphatics, and contains a considerable number of racemose glands resembling those of the oral cavity, as also numerous lymphatic follicles, arranged around sacculi like those at the root of the tongue or in the tonsils.

A laminated pavement epithelium, like that of the pharynx, also lines the *œsophagus* as far as the cardiac orifice of the stomach, where it abruptly terminates, and is replaced by the columnar epithelium of the stomach. The œsophageal epithelium reposes upon a vascular layer of delicate connective tissue, the proper mucous membrane, which is separated from the more loosely meshed submucous connective tissue by a thin stratum of muscular fiber-cells, the muscle of the mucous membrane, or muscularis mucosæ, which commences with a few scattered fiber-cells in the upper part of the œsophagus, and becomes a continuous layer farther down. A few small racemose glands lie in the submucosa and open by minute ducts on the mucous surface. The external muscular coat of the œsophagus consists of an internal circular and external longitudinal layer; in its upper third these are composed entirely of striated muscular fibers; in the next third the striated and non-striated varieties of muscle are represented; while in the lower third the muscular coat is wholly composed of the non-striped fiber-cells. Externally the muscular coat is invested by a sheath of fibrillated connective tissue.

The walls of the *stomach* consist of a mucous membrane, a layer of submucous connective tissue, a muscular coat, and the peritoneum. The epithelium of the mucous membrane consists of a single layer of nucleated columnar cells ·0008 inch in average length, among which occur certain peculiar cup-shaped elements, the so-called goblet-cells. Beneath the epithelium and between the gastric glands the mucous membrane resembles lymphoid tissue, consisting of

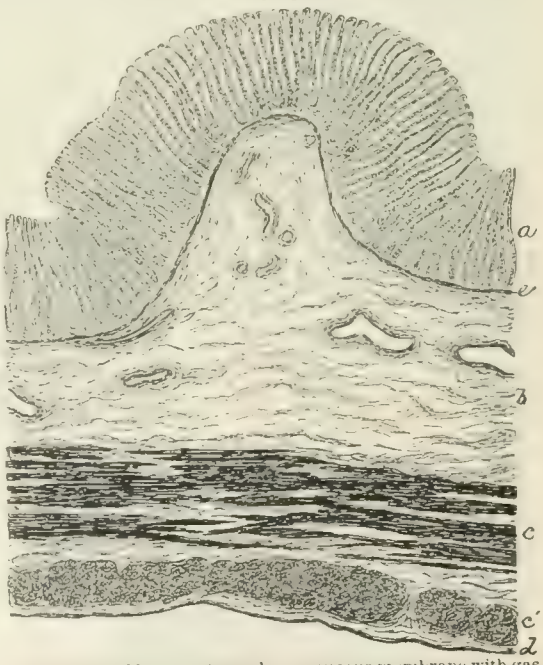


Fig. 33.—Section of human stomach: *a*, mucous membrane with gastric glands; *b*, submucous coat, containing blood-vessels, lymphatics, and nerves; *c c'*, muscular tissue; *d*, serous coat.

a delicate reticulum, the meshes of which are filled with lymphoid elements, as in the lymphatic glands and follicles. In this adenoid tunica propria innumerable tubular glands, ·015 to ·06 inch long and ·002 to ·003 inch broad, are arranged perpendicularly to the mucous surface, and placed so closely

side by side as to occupy more space than the intervening tissue. In the vicinity of the pyloric orifice of the stomach these glands are lined throughout by a columnar epithelium. In the rest of the stomach this columnar epithelium only lines the upper portion of the glands, the rest being filled with spheroidal granular elements. The cells lining the peptic glands consist of two kinds, those situated next to the lumen of the gland and preponderating in numbers, the *chief* or *central* cells; and those situated peripherally, beneath the basement membrane, which in places is bulged out by the cells, called the *acid* or *parietal* cells; these latter are more numerous near the constricted neck of the glands, and do not occur within those of the pyloric end of the stomach. The pyloric glands are usually branched and lined throughout with albuminous cells. The mucous membrane is separated from the submucosa by a stratum of non-striated muscle, on an average about ·002 inch thick, consisting of an internal circular and external muscular layer. The submucosa is a layer of rather loose connective tissue, which unites the muscle of the mucous membrane to the external muscular coat. The latter is ·02 to ·08 inch thick, and consists most internally of an incomplete series of oblique fasciculi, next of a circular layer, and still more externally of a longitudinal layer, all composed of non-striped muscle. Lastly, the serous coat, or peritoneum, which has the structure of serous membranes generally, is united to the external muscular coat by a thin layer of subperitoneal connective tissue. The blood-vessels of the stomach ramify in the submucosa, and there form a network whence numerous small branches proceed to the mucous membrane, where they form a close capillary plexus around the tubular glands. The external muscular coat and the peritoneum are partly supplied by branches given off by the vessels as they pass through them, partly by branches derived from the submucous plexus. The nerves of the stomach form in the submucosa a plexus in which numerous small ganglia are found. A second plexus, also with numerous ganglia, exists between the circular and longitudinal layers of the external muscular coat. The ultimate relations of the nerves to the mucous membrane are yet uncertain. The lymphatics form three networks—one in the mucous membrane between the tubular glands, the second in the submucosa, the third in the peritoneum.

The description of the coats of the stomach just given applies, with certain modifications, to both small and large *intestines*. The lining epithelium is similar throughout, as is the structure of the mucous membrane, except that the tubular glands, which in the intestines are called the glands or crypts of Lieberkühn, are shorter, ·01 to ·02 inch long, do not branch, and are lined throughout by columnar epithelium. What has been said of the muscle of the mucous membrane, the submucosa, the external muscular coat, the peritoneum, and the general distribution of blood-vessels, lymphatics, and nerves of the stomach, will apply with but little alteration to the intestinal canal. The more important points of difference are as follows: In the *small intestine* the mucous membrane, besides being thrown, in its upper portion especially, into numerous transverse folds, the *valvulæ conniventes*, presents a great number of conical elevations ·008 to ·04 inch long, the so-called *villi*. These consist of the adenoid tissue of the mucous membrane, and are coated externally by its cylindrical epithelium. Each contains a central lymph-vessel, here called *lacteal*, which terminates by a slightly expanded blind extremity, which is the commencement of the lymphatics. Between this and the periphery of the villus lie the blood-vessels, consisting of one or more minute arteries which break up into a capillary network, the blood from which is collected by a small vein. Each villus also contains a number of longitudinally arranged muscular fiber-cells, which are continuous below with the muscle of the mucous membrane. The crypts of Lieberkühn open on the surface of the mucous membrane between the villi, and are so arranged that the deeper portions of those adjoining opposite sides of the bases of the villi appear as close together as the others. Lying partly in the mucous membrane, partly in the upper portion of the submucosa, there are a number of lymph-follicles, ·015 to ·08 inch in long diameter, which either occur singly (the solitary follicles), or are aggregated together in groups consisting of twenty or more follicles placed side by side (the patches of Peyer). These follicles are somewhat flask-shaped, their apices penetrating into the mucous membrane almost or quite to the epithelium, while their rounded bases lie in the submucosa. Their parenchyma is identical in structure with other lymphatic follicles. They are surrounded by a vascular plexus which sends capillary branches into their substance, and are partially enveloped by rather wide lymph-channels. Immediately above each follicle the villi are absent. On the surface of the patches of Peyer, however, villi are often found on the mucous membrane between the individual follicles. The solitary follicles are found in all parts of the intestinal tract; the patches of Peyer, on the other hand, occur chiefly in the lower portion of the small intestine, especially in the ileum. In the upper part of the small intestine the submucosa contains a number of small racemose glands about ·04 inch in average diameter, the *glands of Brunner*, the ducts of which perforate the mucous membrane and open into the intestinal canal. The muscular coat of the small intestine is from ·015 to ·02 inch thick, and consists of an internal circular and external longitudinal layer. The lymphatics form a network in the mucous membrane which surrounds the crypts of Lieberkühn, and are continuous with the central lymph-sinuses of the villi and the coarser plexus in the submucosa. The peritoneum has its own plexus of lymphatics, as in the stomach. On account of the milky appearance of their contents during the digestion of fatty matters, the lymphatics of the intestinal mucous membrane and of the mesentery are known as lacteals. As in the stomach, there are in both small and large intestines two nervous plexuses provided with numerous ganglia; the first, situated in the submucosa, is known as the plexus of Meissner; the second, between the circular and longitudinal layers of the muscular coat, is the plexus of Auerbach. In the *large intestine* there are no villi; in other respects its mucous membrane closely resembles that of the small intestine, except that it is rather thicker, the crypts of Lieberkühn somewhat longer, and the muscle of the mucous membrane a little better developed. Solitary follicles rather larger than those of the small intestine, but otherwise resembling them, and having similar relations to the lymphatics, occur at intervals. The external longitudinal layer of the muscular coat is much thinner than the circular, except in three longitudinal bands, in which the two layers are of equal thickness, together measuring about ·025 inch.

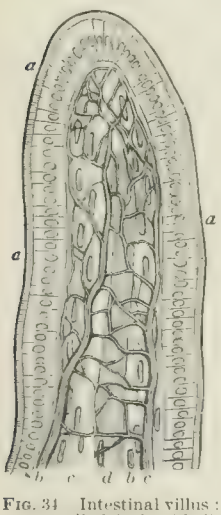


FIG. 34. Intestinal villus: *a*, cylindrical epithelium; *b*, capillary blood vessel; *c*, involuntary muscle cells; *d*, central lymphatic radicle.

The Liver.—The liver is the largest gland in the body, and is classed as the modified compound tubular type. Since the blood-vessels largely determine the arrangement of the other parts of the organ, their description is first in order. The connective tissue enveloping the periphery of the organ is continued into the interior, affording a means by which the blood-vessels and bile-ducts enter and escape. Two sets of blood-vessels enter the liver and ramify in it side by side—branches of the hepatic artery and of the portal vein. The blood from these is carried by a common system of capillaries into the radicles of the hepatic vein, the blood brought by the artery being for the nutrition of the tissue alone. The hepatic artery and portal vein are accompanied in their ramifications by the branches of the biliary duct, and the three are united together by a delicate connective tissue, the sheath or capsule of Glisson, in which lie also the nerves and the deep lymphatics of the organ. By the final ramifications of the hepatic artery and portal vein the parenchyma of the liver is mapped out into irregular polygonal lobules or acini, ·025 to ·08 inch in diameter, which, however, in the human liver are not invested with a well-developed connective-tissue capsule, as in the liver of the pig and some other animals, and are consequently but indistinctly defined. The ramifications of the hepatic vein lie in a direction perpendicular to the course of the other vessels, so that their ultimate radicles occupy the centers of the acini, and hence are called *intralobular* veins; while the radicles of the portal veins lying between the lobules are called *interlobular* veins. A capillary network with comparatively small meshes lies in the substance of the acini, and conveys the blood from the interlobular to the intralobular vessels. The parenchyma of the

liver consists of granular polygonal cells, ·0005 to ·001 inch in diameter, containing one or two rounded or oval nuclei, and frequently oil-drops. Between these cells, which occupy the meshes of the capillary plexus of the acini, there ramifies a plexus of extremely fine capillary bile-ducts ·00004 to ·00008

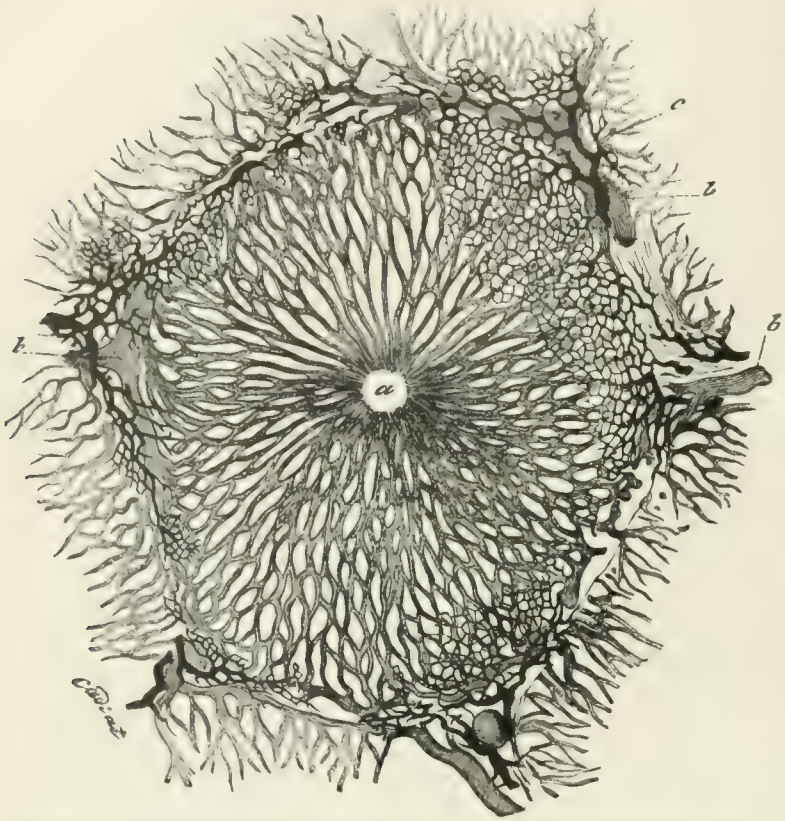


FIG. 35. Lobule of injected liver: *a*, central vein; *b b*, peripheral or interlobular veins; *c*, interlobular bile-duct.

inch in diameter, which do not, however, possess any proper walls, but are bounded by the hepatic cells themselves. The bile capillaries represent the intercellular lumen of the tubular acini of other glands. These bile-channels lie between the adjoining faces of the hepatic cells even more frequently than at their angles, and are arranged in such a manner that every hepatic cell is related, by at least one of its sides, to a capillary bile-duct, which, however, never separates the cell from the capillary blood-vessel. The capillary bile-ducts open, at the periphery of the lobule, into the finest interlobular bile-ducts, which are passages channeled in the connective tissue accompanying the interlobular vessels, and

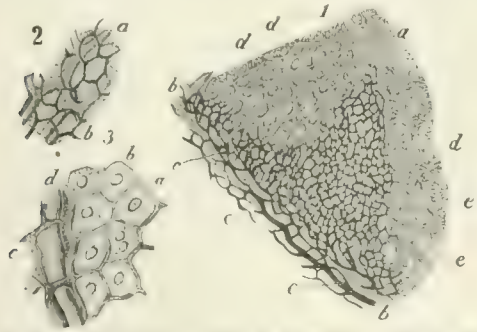


FIG. 36. Liver of rabbit: 1, part of a lobule. *a*, central vein; *b*, portal vein; *c*, bile ducts; *d*, capillaries of portal vein; *e*, bile-capillaries. 2. *a*, portal blood-capillaries; *b*, bile-capillaries. 3. *a*, bile-capillaries; *b*, hepatic cells; *c*, bile-ducts; *d*, capillary blood-vessel.

lined by a single layer of polygonal cells. The larger ducts are lined by a columnar epithelium, and have a wall of muscular and connective tissue which becomes thicker as the tubes increase in diameter. In this wall numerous racemose mucous glands are imbedded, the excretory canals of which open into the bile-ducts. The liver is coated externally by a very thin capsule of connective tissue, and this again is covered, over the greater part of the surface of the organ, by the peritoneum. In the peritoneum and the subjacent connective tissue lies an abundant plexus of superficial lymphatics. The deep lymphatics, which penetrate the substance of the organ, lie in the capsule of Glisson, as has already been mentioned. The nerves of the liver are composed chiefly of non-medullated, with a few medullated, fibers. They enter the liver with the portal vein, and for the most part accompany its branches. They have not been traced into the substance of the acini, and their relations to the hepatic cells remain undetermined.

The *gall-bladder* is lined throughout by a single layer of columnar epithelial cells, supported upon a membrane of connective tissue, in which there are numerous decussatory fasciculi of non-striated muscles. Externally, it is in part coated by the peritoneum, in part comes into immediate contact with the hepatic tissue.

The *pancreas* agrees in its structure with the serous salivary glands so closely that no separate description of it need be given.

The Respiratory Organs.—The cartilages of the *larynx* are all of the hyaline variety, except the epiglottis and the cartilages of Wrisberg and of Santorini, together with parts of the arytenoid cartilages, which are composed of elastic cartilage. The muscles are of the striated variety. The interior of the larynx is lined by a mucous membrane covered throughout its greater part with ciliated columnar epithelium, and is connected with the cartilages, ligaments, and muscles by a layer of submucous connective tissue. The epithelium of the mucous membrane on the upper part of the larynx and on the principal surfaces of the epiglottis is usually squamous in character. The ciliated epithelium consists of a layer of columnar cells ·001 to ·0016 inch long, attached to the mucous membrane by narrow elongated prolongations, while on their free margins they are provided with a number of hair-like processes about ·00015 inch long (the cilia), which during life keep up a constant waving motion. Between the ciliated cells are occasional goblet-cells containing mucus. The true vocal cords are composed chiefly of yellow elastic tissue, covered by folds of the mucous membrane, on the surface of which the ciliated epithelium is replaced with a layer of pavement cells. A number of small racemose glands are found in the submucous connective tissue of the larynx, and open by their ducts upon the free surface of its mucous membrane. Similar glands occur abundantly in the trachea, which is lined by a mucous membrane in all respects resembling that of the larynx. The rings of the trachea are composed of hyaline cartilage, and are united together by a mixture of connective tissue and elastic fibers. Posteriorly, the rings are incomplete, the spaces thus left being occupied by a layer of transversely disposed involuntary muscle.

The Lungs.—On entering the lungs the bronchial tubes branch in an arborescent manner, and finally terminate, when about ·01 inch in diameter, in groups of infundibula, or funnel-shaped terminal expansions, upon each of which open a number of polygonal cavities, the air-vessels or alveoli. The infundibula of each group are connected with the small bronchial tube to which they belong by thin walled passages, the alveolar ducts, which differ from the finest bronchial tubes chiefly in the character of their epithelium, and in having their walls beset by air-vesicles which open into them. Down to about ·04 inch in diameter the bronchial tubes consist of four layers—an external fibrous coat in which are imbedded a series of incomplete rings and plates of hyaline cartilage; a thin layer of involuntary muscle; an

internal fibrous coat rich in elastic fibers; and, lastly, an epithelium similar to that of the trachea. Scattered groups of fat-cells lie in the outer portion of the external fibrous coat; in its inner portion there are a number of racemose

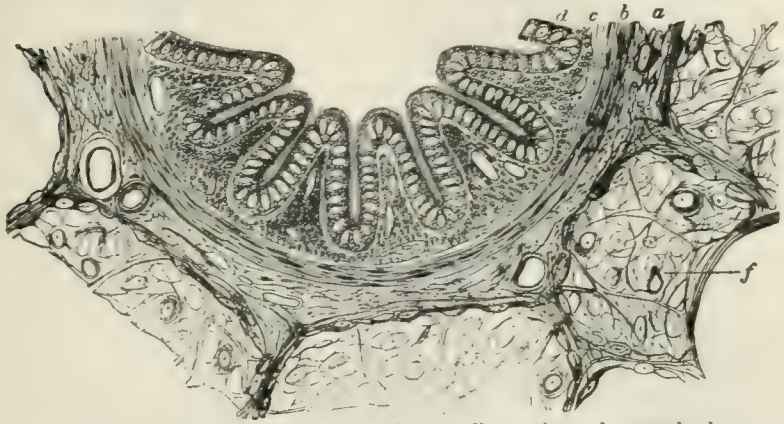


Fig. 37.—Section of small bronchial tube from lung: *a*, fibrous tissue; *b*, muscular layer; *c*, mucous membrane in folds, covered by ciliated cells (*d*); *f*, surrounding alveoli or air-sacs.

mucous glands, the ducts of which open into the lumen of the tube. In bronchial tubes of less than ·04 inch in diameter the external fibrous coat becomes thinner and thinner; the plates of cartilage and the mucous glands become more and more scanty, and finally disappear, and the muscular layer is gradually reduced to a few scattered fasciculi; the elastic inner fibrous coat is, however, prolonged upon the finest bronchial tubes, and is continuous with the elastic walls of the alveoli. The ciliated epithelium also continues in the smallest bronchial tubes, but its cells become shorter and shorter, and finally, at the transition from the bronchial tubes to the alveolar canals, lose their cilia and acquire the characters of the epithelial lining of the alveoli. The bronchial tubes are nourished by branches of the bronchial artery which supply the mucous membrane with a close capillary plexus. Their walls also contain numerous nerves and lymphatics. The air-vesicles, when undistended, measure from ·006 to ·01 inch in diameter, but can be blown up to twice these dimensions, or even more. Their walls are composed of a transparent connective tissue in which characteristically arching elastic fibers are plentifully imbedded, and in which the capillaries derived from the pulmonary arteries form a close plexus with rounded or oval meshes. They are lined at birth by a layer of flat, granular, nucleated, hexagonal epithelial cells, which form a continuous lining for both the air-vesicles and the alveolar passages. After continued expansion by the inhaled air, the cells are transformed into thin expanded plates. This epithelium is best demonstrated by the silver method. The adjacent elastic walls of air-vesicles belonging to the same infundibulum coalesce to form a single septum. The walls of adjacent vesicles belonging to different infundibula are for the most part separated by a small quantity of interstitial connective tissue. The whole lung is made up of the bronchia and infundibula described, with blood-vessels, nerves, and lymphatics, held together by connective tissue. The nerves for the most part accompany the bronchial tubes and blood-vessels, and are largely distributed to their muscular fiber-cells. The lymphatics begin as anastomosing lacunæ in the walls of the air-vesicles, whence proceed lymphatic capillaries, which unite to form trunks accompanying the bronchial tubes and the larger blood-vessels. There is, besides, an abundant superficial lymphatic network which lies just beneath the pleura.

Fig. 38.—Epithelium of air-vesicle of lung.

Urinary Organs.—The *kidney* represents a high development of a compound tubular gland, consisting of a great number of secreting tubes lined by epithelium, the tubuli uriniferi. These, with the blood-vessels, nerves, and lymphatics of the organ, are held together by a delicate connective tissue. The entire kidney is composed of two parts—the *cortex*, embracing the outer third of the organ, and the *medulla*, forming the inner part. The cortex appears deeply colored and granular, while the medulla presents series of converging light and darker striæ, which meet in the summits of the Malpighian pyramids which occupy the inner zone of the organ and open into the central cavity, or pelvis. The uriniferous tubules commence in the cortical portion of the organ as globular expansions, the capsules of Bowman, which embrace peculiar tufts of capillaries, the glomeruli of Malpighi. These, which are usually from ·005 to ·008 inch in diameter, consist of a number of capillary loops held together by connective tissue. The capsules of Bowman, which embrace them, are lined by a layer of large pavement epithelial cells, best demonstrated by the action of silver, and are continuous by constricted necks with the uriniferous tubes. Each uriniferous tube, which at first is about ·002 inch in average diameter, pursues for a short distance a very tortuous path, followed by a short spiral course; it then rather suddenly diminishes in size to half its

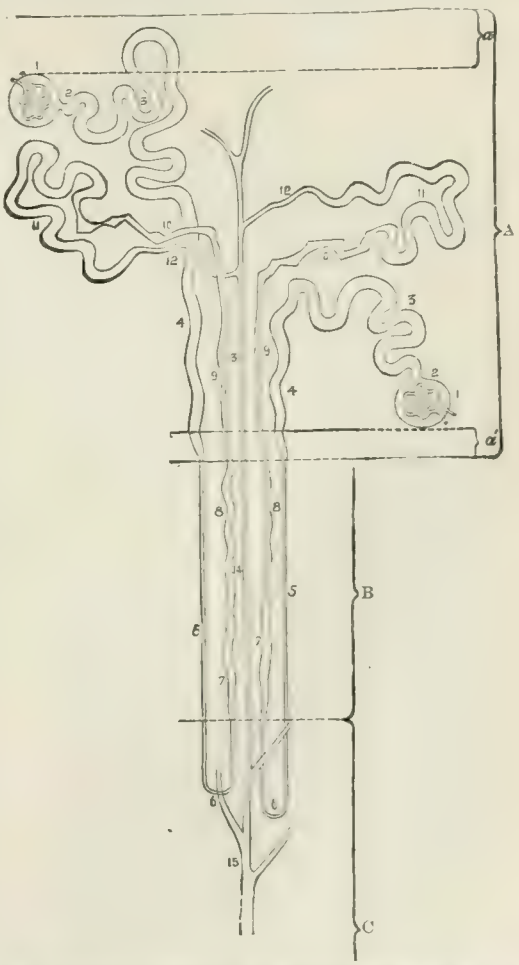


Fig. 39.—Diagram of course of uriniferous tubules of kidney: A, cortex; B C, boundary and papillary zones, together constituting the medulla; *a a*, layers free from Malpighian bodies; 1, Malpighian bodies, consisting of expanded blind end of tubule—capsule of Bowman—and tuft of blood-vessels, the glomerulus; 2, neck; 3, proximal convoluted tubule; 4, spiral tubule; 5, 6, 7, 8, and 9, various parts of the descending arm, loop, and ascending limb of the loops of Henle; 10, irregular tubule; 11, distal convoluted tubule; 12, arched collecting tubule; 13, 14, 15, parts of collecting tube.

original diameter, or less, and runs in nearly a straight line into the nearest pyramid, in which, at a variable depth, it turns back upon itself, forming a narrow loop (the loop of Henle), and returns to the cortical portion, where, after a time, it again becomes wide and tortuous, then again constricted, and finally unites with one or more tubuli which have pursued a similar course to form a straight collecting tube. This collecting tube runs toward the pyramid, receiving at first a few additional tubuli, after which it pursues a solitary course into the pyramid, where adjacent collecting tubes coalesce in pairs; so that the number of passages which finally open at the apex of each pyramid is very much smaller than the original number of tubuli. When sections of the kidney are examined with a low magnifying power, a number of striæ (medullary rays) are seen proceeding from the bases of the pyramids almost to the surface of the cortical portion. These consist of the straight collecting tubes, of the straight narrow portions of tubuli, returning after having formed the loops of Henle, and of the spiral portion of the tubules. The glomeruli and the convoluted part of the tubuli lie in the parenchyma between these medullary rays, known as the labyrinth. The walls of the uriniferous tubules consist of a delicate basement membrane lined by a single layer of epithelial cells. These consist, in the first tortuous portion of the tubule, of a granular protoplasm, without distinct cell-walls. In the narrow part of the tubule, forming the loop of Henle, the epithelium appears as an attenuated layer of protoplasm, with swellings containing nuclei at intervals. In the loop and its ascending limb the cells assume more of a columnar character, while, when the tube again becomes tortuous, the epithelium again assumes the character it possessed in the first tortuous portion, and finally, in the collecting tubes, is represented by a single layer of well-defined columnar epithelial elements.

The renal arteries divide in the sinus of the *kidney* into a number of branches, which, on reaching the bases of the pyramids, ramify between these and the cortical portion of the organ, and send into the latter a series of straight twigs, the arteriæ interlobulares. These give off a number of short side-branches, each of which supports a glomerulus on its extremity. The efferent vessel of each glomerulus, after leaving it, speedily breaks up into a capillary plexus continuous with that formed by adjacent efferent twigs, and surrounds the convoluted portions of the tubuli uriniferi. The venous radicles which collect the blood from this plexus open into the veins which accompany the interlobular arteries. In the medullary portion of the kidneys the capillary network which surrounds the uriniferous tubules is derived from a series of straight vessels, the so-called arteriæ rectæ, which in part arise from the arterial branches ramifying between the cortical substance and the bases of the pyramids; in part are not arteries at all, but the unusually prolonged efferent veins of the glomeruli adjacent to the bases of the pyramids. A superficial plexus of lymphatics is situated in the fibrous capsules of the kidneys. The deep lymphatics accompany the larger blood-vessels; their ultimate relations to the parenchyma of the organ are not yet known. The same remark applies to the nerves of the kidneys, which also accompany the vessels. A number of small ganglia occur in connection with these nerves.

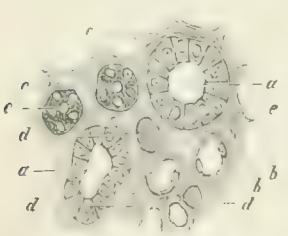


FIG. 40. Transverse section through the medulla. *a*, collecting tube; *b*, descending arm of looped tube; *c*, ascending arm; *d*, blood vessel; *e*, connective tissue.

The *ureters* and *urinary bladder* are lined by an epithelium consisting of several layers of cells. The most superficial are polygonal and somewhat flattened; to these succeed a layer of elongated cells, the upper extremities of which are rather broad, while the lower portions are prolonged into narrow processes, between which is a third layer of columnar cells. This epithelium rests on a layer of rather dense connective tissue, beneath which is the muscular coat composed of non-striated muscle. Externally to this is a second layer of fibrous tissue. The fundus of the bladder is, besides, coated by the peritoneum.

Generative Organs.—The space assigned to this article permits only a brief sketch of the most characteristic organ of each sex. The *testicle* is another example of a highly developed tubular gland, and consists essentially of a number of secreting tubes lined by epithelium, the seminiferous tubules. The organ is inclosed in a dense capsule of connective tissue, the tunica albuginea, from the inner surface of which a number of septa proceed, dividing the gland into pear-shaped lobules 100 to 250 in number, each containing one to three convoluted tubuli seminiferi. These unite in the corpus Highmori, and form a network whence proceed twelve to fourteen canals, the convolutions of which constitute the epididymis. In the epididymis these canals unite and form finally a single excretory duct, the vas deferens. The tubuli seminiferi in the lobules are ·008 inch in average diameter, and consist of a membrana propria, lined by epithelial cells. The epithelium of the seminiferous tubules is engaged in the complicated process by which the nuclei of the inner cells, produced by the division of those situated more peripherally, are converted into the spermatic filaments, or *spermatozoa*; this process is known as *spermatogenesis*, one of the most complicated series of change presented for study, and one regarding the details of which much still remains to be definitely determined. The spermatozoa are passed into the epididymis while still somewhat imperfectly developed, the sojourn within the long convoluted tube of the epididymis affording ample time for the completion of such changes. The testicles are abundantly supplied with blood-vessels, lymphatics, and nerves. The lymphatics originate in wide passages between the tubuli seminiferi, lined by characteristic epithelium, which forms a partial coating for the tubuli, and which is best demonstrated by the action of silver. The terminal branches of the nerves can be traced to the membrana propria of the tubules. The spermatozoa, the characteristic elements of the seminal fluid, are about ·0016 inch in average length in the human subject, and have the form of thread-like filaments, enlarged at one extremity into an oval *head*, followed by a short *middle-piece* and long delicate *tail*.

The *ovary* consists of a stroma of vascular connective tissue in which are imbedded numerous cyst-like formations of various sizes, the Graafian follicles, containing the ova in various stages of development. The surface of the ovary which projects into the peritoneal cavity is covered by a layer of columnar cells, the so-called germ-epithelium. All the Graafian follicles, and the ova which they contain, are developed from ingrowing buds of this epithelium, which invade the connective-tissue stroma as gland-like tubules. A portion of the epithelial cells of these tubules are transformed into ova, while the remainder retain their epithelial character, and become the lining cells of the Graafian follicles. Thin sections of the adult ovary show great numbers of unripe ova immediately beneath the surface of the organ. They appear as oval, nucleated cells, surrounded by an epithelium-like layer. Deeper in the organ ova are encountered in a more advanced stage of development, surrounded by an epithelial layer of several rows of cells, between which fluid accumulations occur followed by an increase in the size of the follicle. The fully formed Graafian follicles are from ·02 to ·25 inch in diameter. They con-

FIG. 41. Section of ovary: *a*, epithelium of surface; *b*, *c*, immature follicles; *d*, developing follicle containing ova *e*, *f*; *g*, *h*, *i*, parts of wall of follicle; *k*, degenerated follicle; *l*, blood-vessel; *m*, interstitial cells.

sist of an envelope of connective tissue, which is merely a condensation of the ovarian stroma, lined by several strata of nucleated cells—the epithelium of the follicle or the *membrana granulosa*—and filled with a transparent albuminous fluid—the liquor folliculi. The elements of the epithelium of the follicles are accumulated at some one point into a little mass—the discus proligerus—in which the ovum is imbedded.

The human ovum, when fully developed, is a round or slightly oval vesicle ·008 to ·01 inch in diameter. Its investing membrane, of considerable thickness, exhibits a delicate radial striation, and is known as the *zona pellucida*; this incloses a granular protoplasm, the *vitellus* or yolk, in which is imbedded a distinct round nucleus ·0016 inch in average diameter—the *germinal vesicle*, and this again presents a round prominent nucleolus—the *germinal spot*. The ovum of man and mammals differs from the eggs of birds and reptiles in that in these an ovum similar to that of the Mammalia is surrounded by a quantity of secondary yolk, as well as by additional protecting layers acquired during its passage through the oviducts. As fluid continues to accumulate in the cavity of the ripening Graafian follicle, it approaches more and more to the surface of the ovary, until, finally, it ruptures and permits the ovum to escape. This is followed by hæmorrhage from the vascular walls of the follicle, which is speedily filled with coagulated blood; numbers of proliferated cells shortly after penetrate the clot, and an organization of its constituents takes place, which acquires a yellow color, the structure being then known as the *corpus luteum*. Subsequently, connective tissue is developed in the substance of the corpus luteum, which becomes smaller and smaller until finally a mere cicatrix remains.

Organs of Special Sense.—A brief account of the special nerve-terminations in the organs of touch and taste has already been given. We recognize as the essential organs of *smell* certain nerve-terminations in the nasal mucous membrane. This mucous membrane is coated for the most part by a ciliated epithelium, closely resembling that of the respiratory organs; but in the proper olfactory region, which is limited to the uppermost part of the nasal cavities, extending downward three-quarters of an inch to an inch from the cribriform plate of the ethmoid bone, the epithelium covering the olfactory region is modified, representing the highly specialized neuro-epithelia; this consists of two varieties of cells—tall columnar elements with oval nuclei, which support the less conspicuous olfactory cells, and are therefore known as the *sustaining cells*; and the slender, elongated elements, with round nuclei, which are those especially related to the nerves of smell, and hence are called the *olfactory cells*. These latter are usually assumed to be connected at their inner ends with the filaments of the olfactory nerve; while such a relation is probable it has not been, so far, directly demonstrated.

In the case of the *eye* space permits only brief descriptions of the cornea, the crystalline lens, and the retina, and the reader is referred to the article Eye for other details. The *corneæ substance* proper is composed of connective tissue with stellate cells and a homogeneous matrix. It is coated anteriorly with a laminated squamous epithelium, consisting of a stratum of columnar cells, several layers of rounded or polygonal cells, and several layers of flattened cells; posteriorly it is covered by an elastic membrane and a single layer of flattened endothelial cells. The stellate cells of the proper substance of the cornea are designated corneal corpuscles. They are granular, flattened cells about ·001 inch in long diameter, containing rounded, oval, or irregular nuclei. Each gives off a variable number of protoplasmic processes which anastomose with those of the adjacent cells. Besides these fixed cells, a certain number of wandering leucocytes are always present. The corneal corpuscles are not visible in perfectly fresh corneæ, but become so after the lapse of a short time. When the cornea is soaked in a solution of nitrate of silver and exposed to sunlight, the matrix is stained brown, and a series of light-colored, stellate, anastomosing figures make their appearance, which are the corneal spaces. These represent the serous canals of the matrix, in which the corneal corpuscles lie. The exquisite sensibility of the cornea is explained by its rich supply of nerves, best demonstrated by the action of gold, which gives them a dark-purple color. Twenty or thirty medullated nerve-fibers enter at its margin, and soon lose their medullary sheaths, while the axis-cylinders break up into fasciculi composed of a number of ultimate fibrils, with oval nuclei scattered along their course. These fasciculi branch and anastomose, forming a rich plexus in the cor-

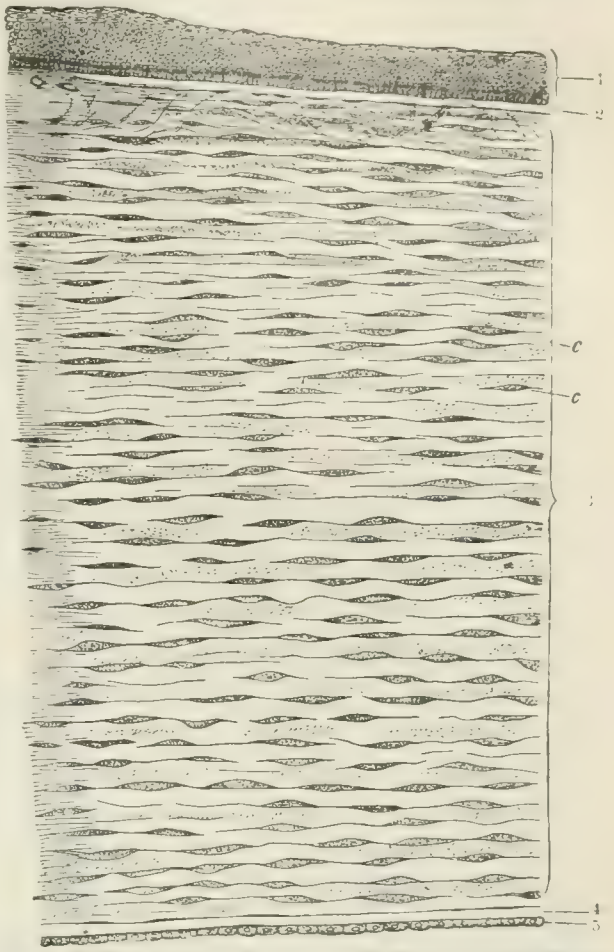


Fig. 42.—Vertical section of cornea: 1, epithelium; 2 3 4, connective tissue forming the substantia propria, condensed at 2 and 4 into the anterior and posterior elastic lamina; 5, layer of endothelium covering the inner corneal surface; *c*, corneal corpuscles lying in spaces between the lamellæ of fibrous tissue.

neal substance, and finally break up into ultimate nerve-fibrils, the extremities of which are lost between the epithelial cells on the anterior face of the cornea. The *crystalline lens* consists of an extremely thin anterior and a thick

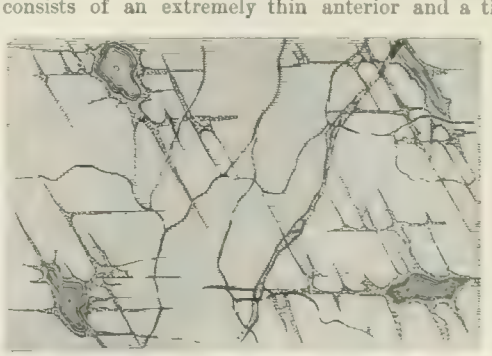


Fig. 43.—Corneal corpuscles within the fibrous substance; numerous nerve-fibers are also seen.

posterior layer. The former is composed of a single layer of flattened, polygonal, nucleated cells, which toward the margins of the lens become more and more elongated, and finally, at its equator, pass by gradual transitions into the lens-fibers, of which practically the entire lens is composed. The fibers of the lens are flattened, six-sided elements ·0002 to ·0004 inch in breadth, and rather less than half as thick, and

unite to form curved lamellæ which cover each other concentrically, somewhat like the coats of an onion. The lens is developed from an ingrowing bud of the epidermis of the embryo, and its fibers are to be regarded as greatly elongated epithelial cells. It is inclosed in a transparent, apparently structureless capsule. The *retina* is composed of the special terminal elements of the optic nerve, united together by delicate supporting tissue, the whole forming a layer ·008 inch thick in its posterior portion and less than half as thick anteriorly. Its intricate structure has been the object of many investigations, of which those of Max Schultze are classic.

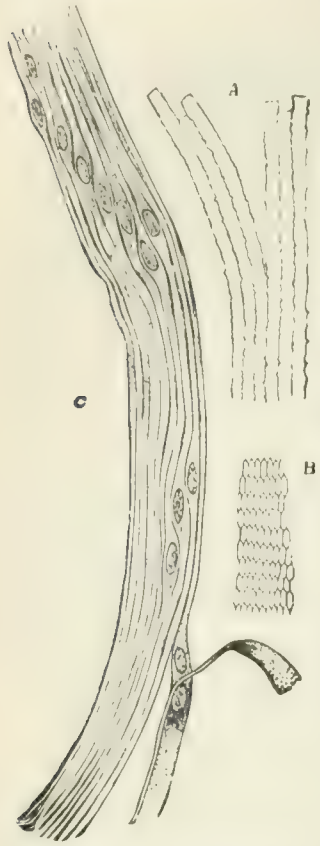


FIG. 44.—Fibers of the crystalline lens: A, fibers in longitudinal section, showing serrated outlines; B, fibers in transverse section; C, fibers in longitudinal section from equator of lens, containing nuclei.

The retina consists of three parts: (1) Of the outer *pigment layer*, which receives the ends of the percipient elements; (2) of the *neuro-epithelium*, comprising the layer of the rods and cones and the external nuclear layer; and (3) of the *cerebral portion*, consisting of the terminal filaments and associated ganglion cells of the optic nerve; this portion embraces several layers usually named as the nerve-fiber layer, the layer of ganglion cells, the inner reticular layer, the inner nuclear layer, and the external reticular layer. Space forbids any attempt to describe these structures in detail. Suffice it to say that the retina presents two sets of elements, those especially concerned in the appreciation and transmission of the stimulus produced by the light-waves and those supporting the more delicate parts. While the relation between the rod and cone visual cells and the filaments of the optic nerve must be a close one, yet regarding their exact anatomical connections we are at present uninformed. The rods and cones are not equally distributed, the cones in man appearing alone in the area of most acute vision—the fovea centralis; while toward the periphery the rods are more numerous. Regarding the other important structures of the eye, whose consideration space forbids, it may be noted that the outer coat, composed of the sclerotic and cornea, are made up of dense connective tissue; the middle coat, embracing the choroid ciliary body and iris, is essentially the vascular tunic, and consists of numerous blood-vessels supported by a delicate connective-tissue stroma, in addition to which in the iris and ciliary body masses of involuntary muscle are present. The pigment layer, belonging to the inner nervous tunic, is closely applied to the inner surface of the vascular coat, and contributes the characteristic dark color of this tunic seen on opening the organ. The vitreous body is a modified connective tissue, while the chamber of the aqueous humor is regarded as a lymph space.

In connection with the *ear*, space permits only a brief mention of the *organ of Corti*, which appears to be to the sense of hearing what the retina is to the sense of sight. For other details regarding the organ of hearing, the reader is referred to the article EAR.

The internal ear is composed of a bony labyrinth, whose complicated cavity is closely reproduced by a much narrower membranous sac, the membranous labyrinth; the intervening space between these two is occupied by a fluid, the *perilymph*, and bands of fibrous tissue holding the smaller tube in place. Within the membranous sac a second fluid, the endolymph, is contained, which fills and communicates with all parts of the complicated tube, including the cochlea, saccule, utricle, and semicircular canals. The spiral canal of the cochlea is nearly divided in two by a thin plate of bone, the lamina spiralis. From the edge of this lamina two membranes proceed to the walls of the cochlear canal, which is thus divided into three passages—the scala vestibuli, the central canal of the cochlea, and the scala tympani. The membrane which divides the scala vestibuli from the central canal of the cochlea is extremely delicate

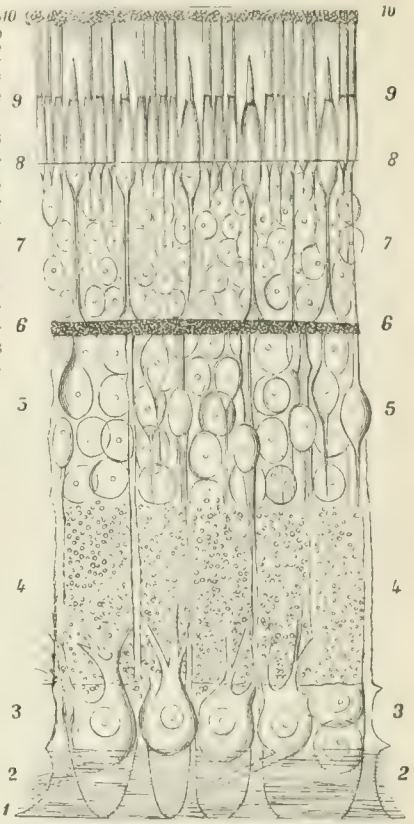


FIG. 45.—Section of human retina: 10, pigment layer; 9, layer of rods and cones, including the outer and inner segments of these structures; 8, external limiting membrane; 7, outer nuclear layer, composed of the nucleated inner portions or body-fibers of the visual cells; from 9 to 7, inclusive, represents the neuro-epithelium; 6, outer reticular layer; 5, inner nuclear layer, composed largely of nerve-cells; 4, inner reticular layer, through which extend the long supporting fibers of Müller; 3, layer of ganglion-cells, with which fibers of optic nerve connect; 2, layer of nerve-fibers, pierced by the expanded bases (1) of Müller's fibers; this layer also contains the capillaries, here not shown.

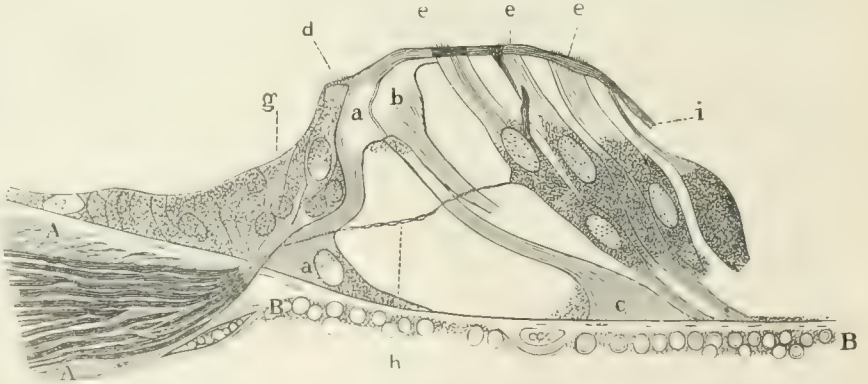


FIG. 46.—Vertical section through organ of Corti: A B, membrana basilaris; *a c*, inner and outer rods of Corti; *d*, hairs of inner hair-cell; *e e e*, outer hair-cells; *f*, bundle of nerves; *g*, epithelium of sulcus spiralis internus; *h*, nerve-fibril; *i*, lamina reticularis.

and is known as the *membrane of Reissner*. That which divides the central canal from the scala tympani below is known as the *basilar membrane*.

The central canal of the cochlea is lined by epithelium, which over the inner half of the basilar membrane is specialized into neuro-epithelium, and constitutes the remarkable *organ of Corti*. The epithelium is composed of two varieties of cells—the sustaining cells and the auditory or hair cells, so called from the hair-like appendages on their free inner ends. The sustaining cells are further modified at one point into the long conspicuous pillars of Corti, two highly specialized elements which lean toward each other and join at their inner ends, forming a series of arches, beneath which is a canal, the *tunnel of Corti*. On either side of this tunnel lie rows of the auditory cells, at the inner side only a single row, on the outer side a quadruple file. The hair-cells are separated by the sustaining elements, and reach only part way to the basilar membrane; the ends of the hair-cells are in close relation with the terminal filaments of the auditory nerve, which are conveyed along spiral canals with the bony crest projecting from the axis of the cochlea. The various groups of the sustaining cells on the outer side of the arch of Corti have received special names, as the cells of Deiters, Hensen, and Claudius, being in all cases, however, but the modified epithelium of the canal. Within the outer portions of the membranous labyrinth, in the saccule, utricle, and semicircular canals, certain portions of the wall are distinguished by specializations of the epithelium for the reception of the filaments of the auditory nerve, forming the maculæ and cristæ acusticæ. For the details regarding the middle and external portions of the auditory apparatus, see EAR.

The foregoing outline, which is necessarily extremely meager, will, however, it is hoped, serve to give the reader accurate elementary ideas with regard to normal human histology. For an account of the tissue changes accompanying disease, the reader is referred to INFLAMMATION, TUMORS, and other articles treating of abnormal or pathological processes. Revised by G. A. PIERSOL.

Histology, Vegetable: that branch of histology which treats of the tissues of plants. In the study of plant histology it is always necessary to use a compound microscope with magnifying powers ranging from 200 to 1,000 or more diameters. Moreover, it is generally necessary that the material for study should be carefully prepared by proper sectioning, staining, and mounting. The general method of treatment is as follows:

All of the ordinary soft parts of plants are first soaked for a time in a weak solution (1 per cent.) of chromic acid, or a saturated aqueous solution of picric acid, or a dilute solution of acetic acid (in order to "fix" the protoplasm), and then slowly dehydrated by soaking them successively in 20, 35, 50, 75, 90 per cent., and absolute alcohol. From the latter they are put into equal parts of turpentine and paraffin and warmed slowly, and finally into melted paraffin and kept for a number of hours at a temperature of 50° C. (122° F.). The paraffin after a while infiltrates into the cells and intercellular spaces, so that when cold it firmly adheres to the specimen. Thin sections of such a prepared specimen may now be made by slicing both the paraffin and the specimen by means of a microtome. The successive slices are laid in order upon an ordinary glass slip, and the paraffin removed by heat and turpentine. Staining fluids (as hæmatoxylin, fuchsin, saffranin, carmine, gentian violet, Bismarck brown, etc.) may now be applied. Alcoholic stains may be added at once, but for the aqueous stains the turpentine must first be removed by alcohol. When the staining is completed, the specimen is dehydrated by alcohol, washed with turpentine or clove oil, and finally mounted in Canada balsam.

There are many modifications of the processes, very briefly sketched above, but what is here given may serve as an illustration of histological methods.

All parts of all plants are composed of "cells," which originally were nucleated masses of protoplasm, usually covered with a cell-wall. As seen under the microscope, protoplasm is usually a colorless, granular, soft substance; occasionally it is hyaline (i. e. without granules), and by drying (as in seeds) it may become quite hard. It may be a homogeneous and compact mass (Fig. 1, A), as it usually is in young cells, or it may be more or less filled with water cavities (vacuoles), as in all older cells (Fig. 1, B, C).

The nucleus is a rounded body within the protoplasm, from which it differs in being more dense and more readily absorbing staining fluids. Its structure is quite complex; the mass of the nucleus is composed of a hyaline substance,

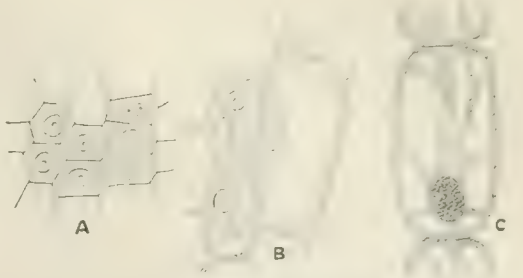


FIG. 1.—A, young cells with homogeneous protoplasm; B and C, older cells with vacuoles.

which takes stains less readily, and hence is called achromatin; this is permeated with a multitude of minute tangled threads which absorb stains with great readiness, hence the substance of which they are composed bears the name of chromatin (Fig. 2). This structure can be made out only by the most careful preparation and the application of staining fluids.

In the division of the nucleus (in the so-called "indirect" division of the cell) the chromatin threads undergo many interesting changes, some of which are shown from B to G in Fig. 2. After the threads have become more distinct (B) they arrange themselves in a stellate form, when each splits lengthwise into two "daughter threads," which then separate into two groups, one set of "daughter threads" going to one pole and the other to the opposite one (C, D, E). Here they gradually assume the form of tangled threads of chromatin for the new nuclei (F, G, H). These changes are referred to in histological papers as the "karyokinesis" of the nucleus, and the successive figures assumed by the chromatin threads as the "karyokinetic figures." These are seen best in the root-tips of the onion and English bean (*Vicia faba*), the cells of the stamen-hairs of spiderwort (*Tradescantia virginica*), the pollen mother-cells of some monocotyledons (*Fritillaria* and *Allium*), the development of the cells in the embryo sac of many plants (*Allium*, *Fritillaria*, *Pinus*, *Picea*, etc.), the division of epidermal cells in the formation of stomata in the Iris, etc.

Chloroplasts occur in the protoplasm of all green cells. (See CHLOROPHYLL.) Their deportment with stains (including chlorophyll itself) shows them to be at least some modification of protoplasm. They are usually minute, rounded granules, imbedded in the ordinary uncolored protoplasm, but in some of the common "pond scums" (*Spirogyra*) they are long ribbons which lie spirally within the cylindrical cell wall. (See Fig. 1 in the article CHLOROPHYLL.)

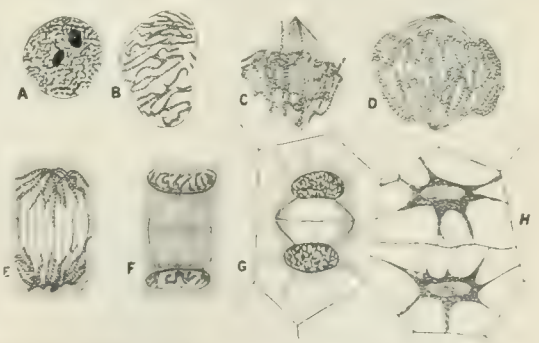


FIG. 2.—Cell nucleus in successive stages of division showing the chromatin threads.

Among the contents of plant-cells none are more common than starch granules ($C_6H_{10}O_5$). Their presence is immediately shown by the application of a solution of iodine, which turns them blue or purple. In this way starch is shown to be present in chloroplasts of leaves which have been exposed for some time to the sunlight. It occurs also in the cells of many seeds and stems. The various forms of the starch granules of different plants are shown in Fig. 3.

The cells of many seeds contain a nitrogenous substance, named aleurone, in the form of minute granules which are

quickly soluble in water, and on application of iodine take a yellowish-brown stain. It sometimes occupies the whole

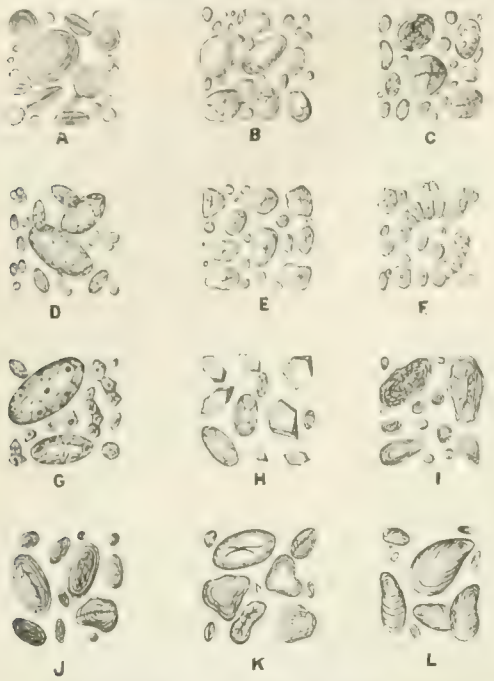


FIG. 3.—Starch granules from various plants (highly magnified): A, wheat; B, rye; C, barley; D, oats; E, Indian corn; F, buckwheat; G, rice; H, millet; I, pea; J, bean; K, vetch; L, potato.

cell, as in the inner bran-cells of rye, wheat, etc. (Fig. 4, B), while in other cases it is associated with starch granules, as in the cells of the embryo in the seeds of the pea, bean,

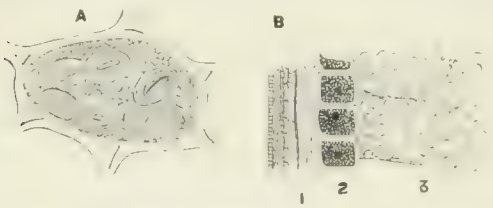


FIG. 4.—A, cell from seed of pea, containing starch and aleurone; B, a section from a rye grain—1, outer bran-cells; 2, aleurone-cells (inner bran); 3, starch-cells.

vetch, oak, chestnut, etc. In the study of aleurone the specimen must be mounted in a medium which will not dissolve it, as alcohol, glycerine, turpentine, oils, etc. Many cells in many species of plants contain crystals of calcium oxalate ($CaC_2O_4 + H_2O$), which present many modifications in size and form (Fig. 5). The slender needle-shaped crystals (Fig. 5, B, C) which occur in bundles nearly filling the cell are commonly distinguished as raphides. They are common in

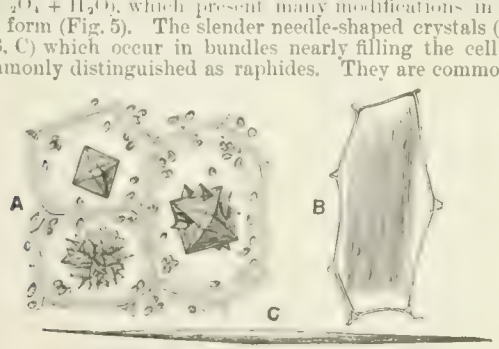


FIG. 5.—Plant crystals; A, in cells of begonia; B, in cells of *Lemna*; C, single crystal from *Lemna*.

the fuchsia, evening primrose, balsam, spiderwort, calla, etc. Ordinary crystals (Fig. 5, A) may be found in the begonia, onion, beet, pigweed (*Amarantus*), lamb's quarters (*Chenopodium*), elm, etc. Some crystals are composed of calcium carbonate ($CaCO_3$), and others of calcium sulphate ($CaSO_4$), but both are of comparatively rare occurrence. The latter may be observed in the "eddies" in the points of some desmids, e. g. *Closterium* and *Micrasterias*. In order to determine whether the crystals are composed of calcium oxalate, carbonate, or sulphate, they are treated with acetic acid which dissolves the carbonate with effervescence, while the oxalate and sulphate remain intact. Under treatment with hydrochloric acid the carbonate and oxalate dissolve, the former with effervescence, the latter without, while the sulphate remains intact.

The cell-walls of young cells are composed of cellulose ($C_6H_{10}O_5$); as they grow older they usually undergo greater or less changes in chemical composition, such as lignification (the woody modification), cuticularization or suberization (the corky modification), and the mucilaginous modification. Finally the substance of the cell-walls of the fungi has been found to differ considerably from true cellulose, hence it is separated under the name of "fungus-cellulose." These may be distinguished as follows:

SUBSTANCE.	Cellulose.	Wood.	Cork.	Fungus-cellulose.
Water.	Quickly permeable.	Slowly permeable.	Impermeable.	Quickly permeable.
Sulphuric acid	Soluble.	Soluble.	Insoluble.	Insoluble.
Cuprammonia	Soluble.	Insoluble.	Insoluble.	Insoluble.
Sulphuric acid and iodine.	Blue.	Yellow or brown.	Yellow or brown.	Yellow or brown.
Chloroiodide of zinc.	Violet.	Yellow or brown.	Yellow or brown.	Yellow or brown.

Cellulose walls may be stained by hæmatoxylin, alum carmine, aniline blue, and methyl blue. Lignified cell-walls stain readily with aniline colors, an alcoholic preparation of fuchsin being especially useful. Cork-cells stain with difficulty, but may be successfully treated by immersing for some time in a solution of fuchsin or saffranin in equal parts of alcohol and water.

The thickening of the cell-wall is rarely uniform. It may consist of isolated thickened areas, or the thickening may be general, with isolated spots of unthickened wall. These modifications, together with changes in the forms and contents of the cell, enable us to separate masses of plant-cells into a number of pretty well-marked tissues, as follows:

Soft tissue (parenchyma); cells with thin colorless walls (normally of cellulose) usually of about equal diameters, and very commonly more or less separated by intercellular spaces (Fig. 6, A). Very abundant, inasmuch as it constitutes the active part of every organ in the plant.

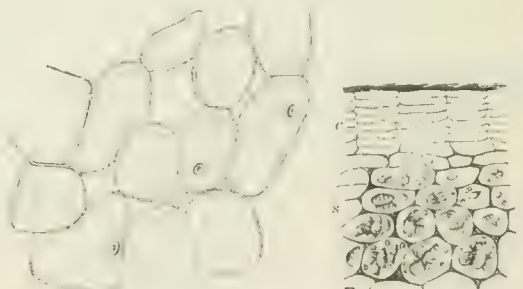


FIG. 6.—Soft tissue: A, from the flesh of an apple; B, from a potato tuber; *s*, ordinary soft tissue; *c*, cork-cells.

In the corky modification the cells are more nearly rectangular in shape, and intercellular spaces are wanting (Fig. 6, B, *c*). Cork-cells are produced by the formation of successive parallel divisions in a layer of cells known as the phellogen, the outermost cells soon becoming suberized and dying. Cork forms as a protective layer over living cells, and is especially abundant in the cortical (bark) parts of the stems of many plants.

Thick-angled tissue (collenchyma); cells with colorless walls of cellulose, with the longitudinal angles, only, thickened. The cells are elongated and prismatic, and occur in long bands immediately beneath the epidermis of herbaceous stems and leaves of higher plants (Fig. 7). Its cells commonly contain a few chlorophyll granules.

Stony tissue (sclerenchyma); cells with thickened, usually colored walls, which are more or less lignified, and much pitted and channeled (Fig. 8). The cells are usually short, and are commonly irregular in shape. They occur abun-

dantly in the hard coverings of many nuts and seeds, and also in the pith of many plants, where they often contain starch.

Fibrous tissue; cells with thickened, usually colored walls, which are strongly lignified and somewhat pitted (Fig. 9). The cells are always much elongated and are normally fusiform, their ends overlapping. Fibrous tissue occurs in the woody parts and the bark of the higher plants, to which it gives strength and toughness. Two varieties of fibrous cells are recognized, viz., bast-cells and wood-cells, occurring respectively in the bark and the wood of the higher flowering plants, or, speaking more precisely, in the phloem and the xylem portions of the fibro-vascular bundles of flowering plants.

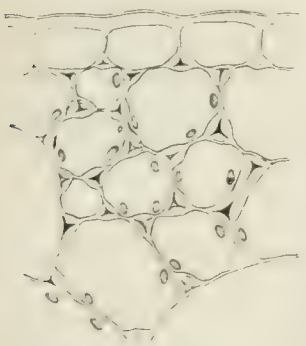


Fig. 7.—Thick-angled tissue, from a begonia-leaf.

Milk tissue (laticiferous tissue); distinguished at once by the milky contents of the cells or tubes, which in some cases appear to be transformed fibers, while in others they are modifications and fusions of parenchymatous cells (Fig. 10). The walls are soft and frequently thickened, but appear to be otherwise little if at all modified from true cellulose. The latex, as the milky fluid is called, is frequently white by reflected light, as in the poppy, spurge, milkweed, etc., but may be yellowish or red, as in bloodroot, celandine, argemone, etc. By transmitted light latex is commonly brownish. It commonly contains many granules, which in the spurges (*Euphorbia*) are composed of starch.

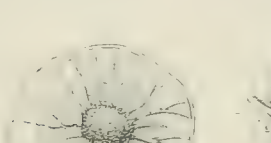


Fig. 8.—Stony tissue: A, stone-cell from walnut; B, stone-cell from leaf of camellia.

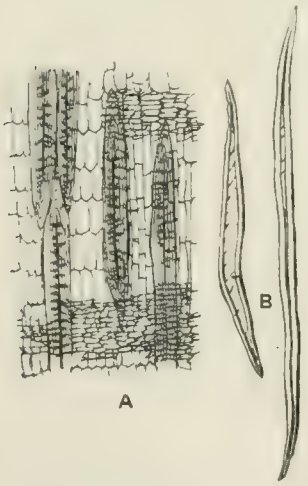


Fig. 9.—Fibrous tissue: A, bast-cells from bark of cinchona; B, wood-cells from beech.

Sieve tissue; composed of tubes of rather wide diameter, with colorless unlignified walls, which are pierced in many places by groups of large pores (Fig. 11). The transverse partitions, which are horizontal or oblique, are so fully perforated as to suggest the name *sieve* for the vessels in which they occur. The protoplasm is continuous through the sieve plates (Fig. 11, C).

Sieve tissue occurs in the phloem portions of the fibro-vascular bundles of the flowering plants and the fernworts, being, however, much better developed in the former than in the latter. In the dicotyledons, where it shows the highest development, it is one of the constituents of the bark, usually forming a column lying immediately external to the column of tracheary tissue, from which it is separated by the so-called "cambium zone." In a few families of plants, notably the *Cucurbitaceæ*, *Solanaceæ*, *Asclepiadaceæ*, etc., there is also a column of sieve tissue on the inner side of the fibro-vascular bundles, i. e. next to the pith.

Tracheary tissue occurs in the fibro-vascular bundles of the fernworts and flowering plants. It is composed of tubes of rather wide diameter, or of fusiform cells which have more or less communication with one another through their perforated extremities (Fig. 12). The lignified walls are always somewhat thickened, the special manner of thickening enabling us to distinguish a number of varieties. Thus we have *ringed* vessels where the thickening is almost confined to certain rings which occur at intervals (Fig. 12, A). In the *spiral* vessels the thickening occurs along one or more spiral lines separated by belts, in which the walls have thickened but little or not at all (Fig. 12, B). When the spiral thickening is close, the bands tend to anastomose, thus giving rise to the *reticulated* vessels (Fig. 12, C). From the latter the passage is an easy one to the so-called *scalariform* vessels, in which the anastomosing is quite regular (Fig. 12, D). In the *pitted* vessels the thickening proceeds a step further, much more of the wall being thickened, the unthickened spaces appearing as small spots or pits (Fig. 12, E, F). All these varieties grade insensibly into one another; it is a common thing to find a vessel with rings in one part and spirals in another; and so the spiral passes into the reticulated, etc.

Fig. 10.—Milk tissue of lettuce.

Differing somewhat from the foregoing varieties of tracheary tissue are the *tracheids* (Fig. 12, G and H), which are more like wood fibers in size and shape, but with the wall structure of spiral or pitted vessels. Spiral tracheids occur in the wood of many dicotyledons, intermingled with the genuine wood fibers. Pitted tracheids constitute the bulk of the woody parts of the stems of the conifers, as the pines, spruces, firs, etc. Occasionally the pitted tracheids have spiral thickenings also, as in the Douglas spruce (*Pseudotsuga taxifolia*).

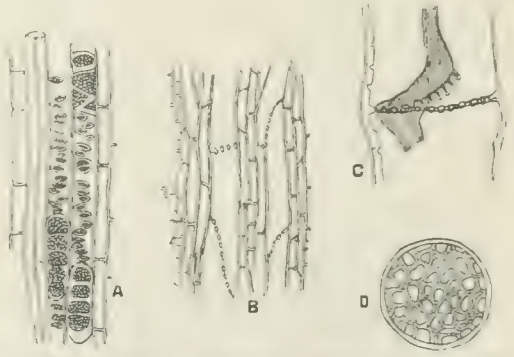


Fig. 11.—Sieve vessels: A, in linden; B, in grape; C, in gourd, showing contracted protoplasm; D, sieve plate of gourd seen in cross-section.

The foregoing tissues occupy definite positions in the plant-body in each species, and while their arrangement shows many differences, there is enough similarity to enable us to make some general statements. The tracheary, sieve, and fibrous tissues are almost invariably associated together so as to form strengthening columns, the *fibro-vascular bundles*, which extend through the parts of the plant-body. In the stems of flowering plants each bundle in the stem is composed of a column of sieve tissue, with more or less of bast fibers and soft cells (parenchyma) standing externally to a similar column of tracheary tissue, wood fibers, and soft cells (Fig. 13). Bundles of similar plan, more or less modified, extend into the leaves, floral organs, and fruits. From their position in the stems of dicotyledons the two columns constituting the bundles are called respectively the phloem and the xylem, the former including sieve, fibrous, soft, and other associated tissues, and the latter the tracheary, fibrous, soft, and associated tissues.

In the fernworts the tracheary tissue occupies the middle of the bundle and is encircled by the other tissues, while in young roots there are several columns of tracheary tissue

arranged radially about the axis, and alternating with an equal number of columns of sieve tissue. There are thus three principal modes of arrangement of the tissues in the bundles, viz., (1) in two parallel columns, called by de Bary

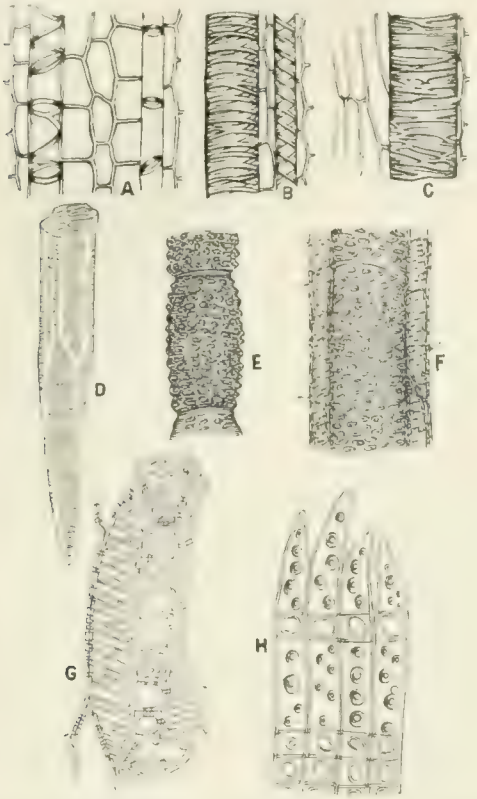


FIG. 12.—Tracheary vessels: A, ringed (one with rings and spirals); B, spiral; C, reticulated; D, scalariform; E and F, pitted; G, spiral tracheids; H, pitted tracheids.

the collateral type (Figs. 13 and 14, A); (2) the concentric type (Fig. 14, B); and (3) the radial type (Fig. 14, C).

The connection of the bundles with one another in the stem to make the framework or skeleton presents number-

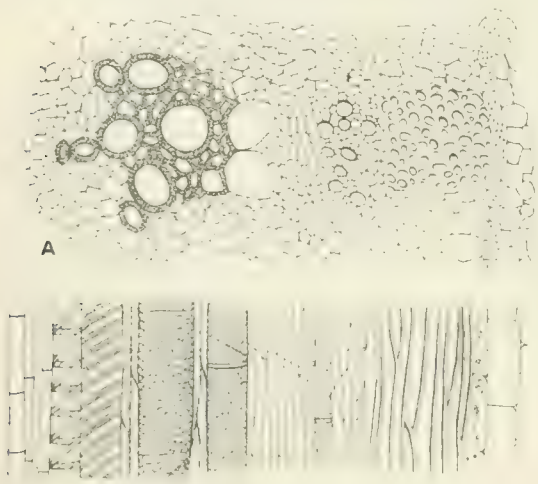


FIG. 13.—Fibro-vascular bundle of sunflower: A, cross-section; B, longitudinal section.

less variations, but some idea of how it is done may be obtained from the accompanying plans (Fig. 15).

The boundary layer of cells (rarely more than one) in all parts of the plant-body (the *epidermis*) is composed of somewhat modified soft tissue (*parenchyma*). The cell walls usually are thickened and stratified in the exposed portions of the cells, the other portions remaining thin. The protoplasm is generally hyaline, and chlorophyll is rarely present. The thickened external walls of the epidermis frequently develop a waxy or resinous matter which covers the

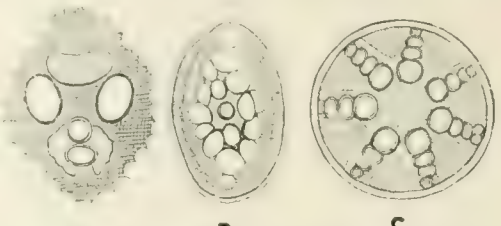


FIG. 14.—Diagrams of bundles in cross-section: A, collateral; B, concentric; C, radial.

surface with a whitish, granular, flour-like substance or a transparent, unctuous coating, to which the name of *bloom* has been somewhat inappropriately applied. It is common on cabbage-leaves, grapes, plums, etc.

The epidermis is pierced by many openings—the breathing pores or *stomates*—through which the interchange of gases takes place. See STOMATES.

The epidermis commonly develops hairs upon its surface as extensions of some of its cells. See HAIRS (of plants).

After considering the fibro-vascular bundles and the epidermal (boundary) portion of the plant-body, there is left a mass of tissues as yet poorly classified, which Sachs called the "fundamental" tissue-mass, or system of tissues. In many plants the belt of tissues lying immediately beneath the epidermis shows much similarity, and is called the *cortical zone*. In it the columns of thick-angled tissue lie next to the epidermis, while between and below these is a mass of chlorophyll-bearing parenchyma; beneath this again is often a belt of large-celled parenchyma, sometimes underlaid with a layer of elongated thick-walled cells (fibers). In dicotyledonous stems the mass of cells lying within the ring of fibro-vascular bundles (the pith) is mostly soft tissue, occa-

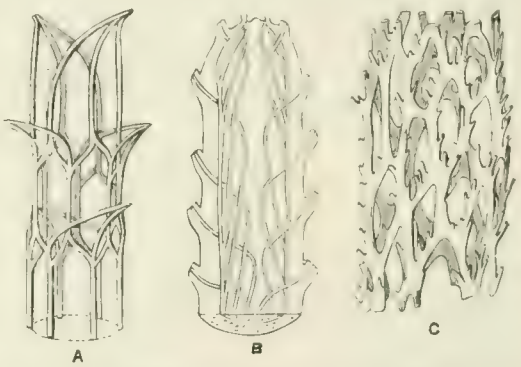


FIG. 15.—Fibro-vascular stem skeletons: A, of a dicotyledon (*Clematis*); B, of a monocotyledon (*Aspidistra*); C, of a fern (*Aspidium*).

sionally with intermingled stony cells. Between the pith and the cortical zone are radiating medullary plates ("medullary rays") of tissue originally of parenchymatous cells, but later, especially in woody plants, of thick-walled, stony cells, these constituting the "silver grain" of wood. In all parts of the fundamental system milk tissue may be present. Likewise cork may develop in any part, although in uninjured organs more commonly immediately beneath the epidermis.

LITERATURE.—The following titles are selected from a multitude of works bearing upon plant histology: Arthur, Barnes, and Coulter's *Handbook of Plant Dissection* (1886); Behrens's *Guide for the Microscopical Investigation of Vegetable Substances* (translated by A. B. Hervey, 1885); Bower's *Course of Practical Instruction in Botany* (1888); de Bary's *Comparative Anatomy of the Vegetative Organs of the Phanerogams and Ferns* (English translation 1884); Poulson's *Botanical Microchemistry* (translated by William Trelease, 1884); Strasburger's *Das botanische Practicum* (1887); Zimmermann's *Botanische Mikrotechnik* (1892; translated by J. E. Humphrey, 1893). CHARLES E. BESSEY.

Historical Theology: See CHURCH HISTORY.

Historic Geology: See GEOLOGY.

History [from Lat. *historia* = Gr. *ἱστορία*, a learning or knowing by inquiry, deriv. of *ἵστωρ*, learned, knowing, wise man (for **Fἰδτωρ*), deriv. of *εἰδέναι*, know]: in its most ordinary sense, a narrative of transactions in the order of time, with or without critical and philosophical commentary.

In its origin, history, considered as a method of recording events, is indistinguishable from oral tradition, which seldom preserves the memory of any but the most remarkable occurrences beyond three or four generations. A considerable advance was made when traditions assumed the form of ballads, easily remembered and repeated, but no really authentic record could exist previous to the invention of writing. The first application of this art was to monumental purposes, and along with the invocation of deities, chronicles of the actions of kings began to figure upon Egyptian and Babylonian temples. The invention of papyrus as a writing material was a further step in advance, and from this period (possibly about 4000 B. C.) the Egyptians may be said to have possessed an historical literature. The practice of recording events in writing spread in due time to the Hebrews, the Phœnicians, the Chaldæans, and the Assyrians, but the pursuit of history as a branch of literary art, and the study of it as a department of intellectual culture, were reserved for the Greeks. About the middle of the fifth century B. C. Herodotus of Halicarnassus composed the first work answering to our present idea of history, presenting the results of his own inquiries into a series of previous transactions in a thoroughly artistic form. As mere narrative the work of Herodotus has never been surpassed to this day, and, notwithstanding his extraordinary credulity, his work still possesses unmistakable value. It is, however, to be regarded as literature, rather than as an authentic record of facts. A great step in advance was taken by the next great historian, Thucydides, who, not content with relating the actions of men, endeavors to penetrate into their motives, and to investigate not merely the accompanying incidents, but the determining causes of changes in human affairs. As Herodotus is the first great narrator, so is Thucydides the first great philosophical historian. In the opinion of Macaulay (see his remarkable essay on history), Thucydides has never been excelled, even if he has been equaled, as an historical writer. The next distinguished philosophical historian, Polybius, though living in the age when all other states were succumbing to the power of Rome, was enabled to investigate the causes of national greatness and decay on a much larger scale than his predecessor. Xenophon's *Anabasis* and Cæsar's *Commentaries* are remarkable examples of pure narrative unaccompanied by reflection. Of the two great Roman historians, Livy, like Herodotus, aims principally at narrative, but aims at another purpose alien to the simplicity of his model—the glorification of his own people, whose prose epic, in fact, he has written. He also follows the example of Thucydides in interspersing his own reflections, frequently in the form of speeches composed by himself, but placed in the mouths of historical personages; his work may be considered as the finest ancient example of the eclectic or composite style. Tacitus imitates Thucydides, but with the addition of an element distinctively his own—an intense moral purpose. Escaped from an era of tyranny, the subject of his history, he aims at painting it in the blackest colors to prevent any subsequent relapse into it. He has thus become the typical representative of an important department of history. He was essentially an advocate. Many valuable historians flourished during the decline of the Roman empire, but we meet with none of special mark before Eusebius (A. D. 330), the first great ecclesiastical historian, and Procopius (A. D. 550), neither philosophical nor eloquent, but the model of the dry, impartial, business-like historian.

During the Middle Ages history was entirely eclipsed, except among the Saracens. Ignorance, superstition, the slow circulation of intelligence, the barbarism of language, and the total loss of the critical spirit conspired to reduce historians for several centuries to mere annalists. The intellectual revival of the twelfth century produced a marked improvement, but History was not replaced upon her old footing until the resurrection of classical literature had brought good models to light, and the invention of printing rendered them generally accessible. Two great Italian historians, Macchiavelli and Guicciardini, kindred spirits to Thucydides and Tacitus, traced, the former the mediæval, the latter the contemporary, history of his country, with a mastery that fixed the standard of historical composition for the language. Their example, though not their style, was emulated by de Thou, the French, and Davila, the Italian, historian of the wars of religion in France; by Mariana, the historian of Spain, and Strada, the elegant but inaccurate narrator of the revolt of the Low Countries; Raleigh, the first Englishman to attempt a history of the world, and Clarendon, whose account of the Rebellion is perhaps the best example of a partisan history. These remain the only eminent English historians until Hume, the magic of whose style and the symmetry of whose narrative atone in some degree for his negligence and prejudice. Robertson gave the first example of a high-class English historian devoting himself to the transactions of foreign nations. His knowledge of the world ensured him a full measure of success as a political historian, though his *History of America* has been superseded by Prescott, and his *History of Charles V.* is limited and marred by his ignorance of German. A far greater name is that of his contemporary, Gibbon, whose *Decline and Fall of the Roman Empire* is perhaps the greatest historical work ever produced—a wonderful example of diligence in the accumulation of enormous materials and of mastery in their control. Gibbon's judgment is almost infallible, and his historical portraits are as accurate as they are brilliant. His principal defect is his insensibility to the spiritual side of man's nature.

Since the eighteenth century history has claimed more and more the attention of superior minds, and we must be content with a bare enumeration of some of the principal works. Early English history has been treated by Freeman, that of the Tudor dynasty by Froude, the Commonwealth by Guizot and Gardiner, the Revolution by the dazzling but too rhetorical Macaulay, Scottish history by Tytler and Burton. Green's *History of the English People* is a work of the first importance. France boasts a constellation of the brightest historical names, including Michelet, her general historian; Thierry, the investigator of her early history; Thiers, the least scrupulous, but the most genuinely national of all her writers; Guizot, Barante, Lamartine, Louis Blanc, Henri Martin, de Tocqueville, Taine, and Lanfrey. The subordinate historical branch of memoir-writing has also flourished more among the French than among any other nation. In virtue of its subject, Carlyle's *French Revolution* may be included among French histories. This extraordinary work, a poem rather than a narrative, is the only modern book that has added an entirely new type to history.

Some of the most valuable contributions to Italian history have been made by foreigners, Sismondi, Roscoe, Gregorovius, Voigt, Burchardt, Giesebrecht, and Symonds, but Italy also boasts her Botta, Cantù, and Colletta. Germany has produced a national historian in Johannes Müller, and the greatest of political historians in Ranke; her mediæval history is recounted by von Raumer, Giesebrecht, Dahn, and Droysen. Schlosser's general history of the eighteenth century and Heeren's *History of Commerce* are additional instances of first-class German histories; the number of the simply meritorious is legion. The American Motley has immortalized himself as the historian of the revolt of the Netherlands. The history of Bohemia has been classically written by Palacky, of Russia by Karamsin and Rambaud, of Sweden by Geijer, and of Portugal by Hercolano. The story of the Greek war of independence has been told by Tricoupi. Bancroft is still a standard historian of the U. S., though it is unlikely that he will remain so. As historians of limited periods in American history, or limited subjects, Parkman, Henry Adams, Fiske, Schouler, Holst, MacMaster, and Rhodes are important. The best histories of the Spanish conquest of South America are by Prescott and Arthur Helps. Very great ability has been displayed in technical military histories, of which we can only mention that of the Peninsular war by Gen. W. F. P. Napier and that of the Crimean war by Kinglake.

The reconstruction of philology and archæology has directed attention to classical history, which, with the exception of the era comprehended in Gibbon's work, may be said to have been completely rewritten during the present century. Niebuhr, though sometimes unduly skeptical, effectually disentangled the legendary from the authentic portions of early Roman history. The work thus begun has been carried on with even greater success by Schwegler and Mommsen. The history of the republic has been written on a grand scale by Mommsen, and the interval between him and Gibbon has been ably bridged by Dean

Merivale. Grote has produced what will long remain the standard history of the Greek republics, although its animation is by no means equal to its erudition and sagacity. The *Histories of Greece* by Curtius and Duruy are also worthy of note. The history of the Christian Church has been admirably told by Milman, Stanley, Neander, and Schaff. Duncker's *History of the Aryan Race* gives a brilliant and comprehensive view of the early historical period of this section of mankind. The history (as yet so obscure) of Egypt is told by Brugsch, Marriette, and Rawlinson, and that of Assyria by Rawlinson and Lenormant. India has found eminent historians in Mill and Orme, and its ancient annals have been critically investigated by Lassen and his coadjutors. The rise of Mohammedanism has employed the pens of Muir, Sprenger, and others. Among the native Oriental historians may particularly be named Mirkhond, the historian of Persia.

Finally, an important class of history, much cultivated in modern times, may be described as collateral or auxiliary to history proper. Its office is to treat of the origin and progress of human pursuits or institutions, such as commerce or law, which involves a chronological arrangement, though the mention of persons or events is only subsidiary to the main design. The Germans and the French have excelled in this kind of history. Hallam's *Constitutional History* is a good example in English.

The spirit of modern times has modified the study of history in four principal ways: (1) By the resort, as a main source of information, to archives, including statutes, charters, public documents of all kinds, diplomatic and even private correspondence. (2) By the endeavor to reconstruct the private as well as the public life of nations, involving an intimate knowledge of the minutiæ of their daily existence. (3) By the application of the mythical theory to fabulous, sometimes even to extraordinary, narratives. (4) By the attempt to frame a philosophy of history—i. e. to discover the general laws on which particular events depend.

Archives, Statutes, &c.—It was long before it was recognized that the history of every civilized people was in some sort written in its public institutions, and that the essential principles underlying great struggles were displayed in such manifestoes as the Solemn League and Covenant or the Declaration of Independence. Such were comparatively rare in antiquity, during which period the value of documentary evidence as an aid to history was very imperfectly recognized. Nor was it sufficiently attended to among the moderns until the obscurity and imperfection of the annalists of the Middle Ages led historians to resort to the contemporary archives as a supplementary source of information. It was soon discovered that laws and charters not only filled up the outlines of historians, but corrected their errors; and it is now universally admitted that an authentic history of any period must be based upon documentary testimony where such is procurable. The principle is of course liable to exceptions from the occasional deliberate falsification of such testimony, the preambles of laws frequently stating considerations notoriously at variance with truth, and letters expressing the wishes and designs, rather than the convictions, of the writer. It is nevertheless certain that this self-delineation presents, on the whole, both a truer and livelier picture of an age than any formal narrative; and no history would now be considered adequate where every possible use had not been made of documentary materials. The researches of palæographical scholars and the disclosure of state archives long jealously secluded have immensely increased the resources of this nature at the disposal of historical scholars. The valuable histories of Ranke are based almost entirely upon the examination of confidential state papers. Much has been done in Great Britain, Germany, France, Italy, and Switzerland by the official publication of original documents and papers, and of abstracts of the correspondence preserved in the record offices.

History in its Relation to Private Life.—It was natural that in its infancy the attention of history should be principally fixed upon great public events and picturesque occurrences. "To rescue from oblivion the memory of former incidents, and to render a just tribute of renown to the many great and wonderful actions both of Greeks and barbarians, Herodotus of Halicarnassus produces this historical essay." The same principle actuated all ancient historians, and their references to the state of manners or the social condition of the people are in general merely incidental. The conviction that the intrigues of cabinets and the shocks of armies are only important in so far as they affect the general well-being originated with the humane philosophy of the eighteenth century. It has now thoroughly leavened every branch of historical research. External incidents, so far from being considered as the sole objects of historical inquiry, are now chiefly valued for the light they afford to the primal causes on which the march of history depends, and, unless in the case of professedly military or political histories, no historian is satisfied unless he can exhibit the moral and social condition of a nation at a given period with the same vividness as that with which he would detail a public occurrence or depict a political character. Macaulay's view of the social state of England at the Revolution and Mill's picture of the condition of India at the British conquest are famous examples. This expansion of the scope of history has necessarily introduced the most important modifications into historical composition, and greatly extended the range of accomplishments requisite for the historian. The Germans excel in that kind of historical composition which they term *Kulturgeschichte*.

The Mythical Theory.—In the earliest ages of historical authorship stories of the supernatural, even if referring to contemporaries, were accepted as intrinsically credible, and all the early history of nations was enveloped in a cloud of legend. The existence of a critical spirit, however, soon made itself manifest, but the legendary element was scrutinized on no satisfactory principle. According to the theory of Euhemerus, improbable stories were regarded as distortions of actual prosaic occurrences; thus when Hercules is said to have slain the Lernæan hydra, it is to be understood that he drained the Lernæan marsh. Another theory, prevalent in the Middle Ages, and of which Bryant is the most characteristic modern representative, regards all legendary fables as perversions of a really veracious archetype; thus Hercules is to be identified with Samson. Both these views are now exploded, and legends are regarded either as "the natural effusions of the unlettered, imaginative, and believing man" (*Grote*), or as anthropomorphic representations of natural phenomena, whose original signification has been forgotten. (*Cox, Max Müller*, etc.) Whether their origin be referred to nature or imagination, they are equally regarded as poetry, only available in small measure and with the utmost caution for the ascertainment of authentic history. The first application of this principle on a large scale was made by Niebuhr in his Roman history, and the result has been to clear our histories of innumerable popular legends, and to free ancient history in particular from formidable chronological difficulties, besides destroying one great source of error in the construction of theories to account for what never took place. The study of folk-lore has also discredited many occurrences not intrinsically incredible; the story of Tell and the apple, for instance, loses its claims to credence as soon as it is shown to be an ordinary incident in popular mythology. It can scarcely be disputed, on the other hand, that the interpretation of tradition has frequently afforded pretexts for the most extravagant theories, such as the resolution of the heroes of the *Iliad*, *Ramayana*, and other epics into mere celestial and atmospheric phenomena. It might be safe to admit, as a general principle, that where gods alone are introduced in a legend the deification of Nature may be suspected, but that there is room for the supposition of actual event where mortals are also concerned.

Philosophy of History.—The idea of a philosophy of history could not arise until after the conception of a universal history had been formed; and this was scarcely possible until after the realization of a universal empire. The Roman empire, however, was hardly established ere it began to decline, and the accompanying decadence of intellectual power prevented any attempt at a general philosophy of history until the days of St. Augustine, who was led to undertake it by the necessity of exonerating his religion, to whose prevalence the downfall of the empire was naturally attributed by its adversaries, from responsibility for the political disasters of the time. From this point of view his *De Civitate Dei* is a masterly performance, but its inadequacy to afford a theory of the course of historical development may be inferred from its regarding the whole course of occurrences merely in their relation to the Christian Church, and its consequent restriction to the records of the Old and New Testaments, and of the heathen nations affected by the promulgation of Christianity. Its limitations, however, were unnoticed by the incurious spirit of the Middle Ages; and no progress toward historical philosophy was discernible until (in 1567) Jean Bodin enunciated the proposition that the course of

events is controlled by definite laws admitting of investigation by the human intellect. The next great writer who took up the subject was Bossuet, but his *Discourse on Universal History*, often cited as the foundation of the science, is little more than an improved republication of Augustine. The true founder of historical philosophy was the Italian Vico, whose *New Science* (1725) first attempted that scientific explanation of the course of events whose possibility had been asserted by Bodin. The author, who had reflected profoundly on the phenomena attending revolutions in human history, deduces from them the principles which regulate the origin and development of society. The germ of his political speculations exists in a memorable passage in Plato's *Republic*, but what with Plato is mere assertion is with Vico corroborated by a command over the vast mass of experience which had accumulated since Plato's age. His great problem is to reconcile the existence of a divine plan of history with the freedom of human agency, in which he has perhaps been as successful as any of his successors. The idea of a deduction of all human events from first principles being once admitted, various attempts to ascertain these principles began to be made, leading to the establishment of rival historical schools. The great maxim, that the grand determining causes of history are general laws which even the most distinguished individuals obey while they seem to control, was placed in the clearest light by Montesquieu (1745). The chief merit of his contemporary, Voltaire, is not the application of any principle, but the fearless and independent spirit which cleared history of everything intrinsically insignificant or dependent upon mere traditional sanction. With all his brilliancy of detail, his general view of history is discouraging and ignoble. Condorcet (1793) arrived at the opposite conclusion, and first laid it down distinctly that the operation of the laws recognized by Vico leads definitely and inevitably to the elevation of humanity as a whole. This generalization would now hardly be disputed by any philosophical writer, but great differences still exist as to what tendencies should be allowed to rank as laws, and as to the best method of expressing and classifying them. The grandest attempt ever made to sum up all historical principles under a single formula is, so far, that of Hegel (1837). Hegel conceives the development of history to represent the progress of the principle of the universe itself from a condition of chaos to one of self-consciousness. Every important stage in history is identified with some ruling idea which it has been its mission to express and exhaust, that humanity may proceed to develop the next. Friedrich von Schlegel, on the contrary, explains history as the striving back of mankind to a lost condition of original blessedness. It is the great merit of Herder (1791) to have pointed out the vast influence of external nature on mankind, and of Saint-Simon (1813) to have shown the connection of history with the physical sciences. Saint-Simon, borrowing perhaps a hint from Turgot, also enunciated the principle of two necessary stages of human thought—the theological and the physical—subsequently expanded by Comte into his famous doctrine of the three stages—the theological, the metaphysical, and the positive. The significance of this pregnant suggestion is evinced by the debate which it has excited; but it certainly can not be allowed to rank as a demonstrated law so long as all three of these hypothetically successive stages continue to coexist in all civilized nations. Michelet and Pierre Leroux have contributed valuable principles to historical philosophy by insisting on the fundamental unity of all peoples in spite of national distinctions, and de Tocqueville by his recognition of the fact that real progress inevitably tends to democracy. Bonald, on the contrary, has revived the theocratic conception of Augustine. To Bunsen we are indebted for the proof of the degree to which history has inscribed itself upon language; to Buckle, for a demonstration of the paramount importance of intellectual progress as an instrument of national development. Lecky has exhibited in a most striking manner the sudden and, as it almost appears, spontaneous disappearance of accredited beliefs, whose hold upon men's minds has long been imperceptibly loosening. The principal danger of such speculations is their tendency to subordinate individual action altogether to general laws, and to overlook the diversities of human character as agencies in shaping the destinies of nations. The revolutions in North America and France were perhaps equally inevitable, but in the present state of our knowledge no satisfactory reason can be given why one might not as well as the other have brought forth a Washington. Russia owes her present position to Peter, Prussia to Frederick, but no rule can be deduced from historical science to show that either of these sovereigns must necessarily have been a man of genius. Carlyle, on the other hand, greatly exaggerates the hero's independence of circumstances.

The Study of History.—As there is no study more delightful than that of history, so is there none more vitally necessary to the citizen of a free state. The constitution of a democratic republic especially, assuming as an indispensable condition of its working that every citizen shall take an intelligent interest in public affairs, imposes the study of history as a duty incumbent upon all. It is impossible to form a correct judgment of present circumstances without the means of comparison with the past supplied by a knowledge of history. The student must bear in mind, however, that all such knowledge is not equally useful. The annals of great military monarchies supply comparatively little that the citizen of a free state can turn to account, and some of the most attractive chapters of human history—that of Egypt, for instance—are chiefly important to the cultivators of special studies. The citizen of the U. S. should especially familiarize himself with the history of free states, his own country before all others; then the great and free country from which it sprang, and from whose institutions its own are derived; then the prototypes of freedom in ancient Greece and Rome. If possible, he should also familiarize himself with the slow development of Roman institutions into the feudalism of the Middle Ages, and the continous transformation undergone by the latter. To state the conclusions which he might probably deduce from such an inquiry would involve trespass on the ground of contemporary politics; nor need we do more than allude to the splendid examples of excellence with which history abounds, and their obvious tendency to encourage a high standard of public and private virtue. The best method of study is that which commences with an outline or skeleton of the subject, serviceable even if the student proceeds no further, but capable of being filled up indefinitely. Commencing with simple and condensed narratives, such as the excellent series published under the editorship of Mr. Freeman, let the student proceed to comprehensive histories like Grote's or Gibbon's, filling up, as it were, the interstices of his knowledge by a resort to memoirs and detached narratives of particular transactions, and crowning his labors by the endeavor to comprehend and apply some system of the philosophy of history. Such general conspectuses of a subject as Voltaire's *Essai sur les Mœurs* will save him much toilsome research; but with these, even more than with regular historical narratives, he will need to be on his guard against the idiosyncrasies of his author, no matter of what school. In conclusion, it may be confidently affirmed that the more progress he is able to make toward recognizing all history as one great whole pervaded by an absolute unity of plan, the more reason will he have to congratulate himself on genuine progress in his historical studies.

See Hegel, *Philosophy of History* (1839); Adams, *Manual of Historical Literature* (3d ed. 1889); Droysen, *Principles of History* (1893). See also the article CHURCH HISTORY.

Revised by C. K. ADAMS.

Hit (anc. *Is*): town of Asiatic Turkey; on the west bank of the Euphrates; 90 miles W. N. W. of Bagdad (see map of Turkey, ref. 7–J). The existence of the town has from the earliest times to this day depended on the immense pits of bitumen and naphtha found in the immediate vicinity. These materials were taken hence for the building of Babylon, and even as far as Egypt. The modern town, mean and dirty, has a population of about 2,000.

EDWIN A. GROSVENOR.

Hita, ARCHPRIEST OF: See RUIZ, JUAN, Archpriest of Hita.

Hitchcock, CHARLES HENRY, A. M., Ph. D.: geologist; b. at Amherst, Mass., Aug. 23, 1836; son of Edward Hitchcock, geologist; graduated at Amherst College, Massachusetts; instructor in Geology in that institution and at Lafayette College; Professor of Geology at Dartmouth College, New Hampshire, since 1869; assistant geologist of Vermont 1857–61; State geologist of Maine 1861–62, and of New Hampshire 1868–72. He was vice-president of the American Association for the Advancement of Science in 1883. His most important writings are contained in the *Final Report on the Geology of New Hampshire*, vols. i.–iii., 1874–78: his minor contributions, which are numerous, treat more especially of New England geology, the crystalline schists, and local ore deposits.

Revised by G. K. GILBERT.

Hitchcock, Edward, D. D., LL. D.: geologist; b. in Deerfield, Franklin co., Mass., May 24, 1793. Interrupted in his preparation for Harvard College by sickness and weakness of the eyes, he educated himself while following the plow. From 1815 to 1818 he was principal of Deerfield Academy. His first publication was *The Downfall of Bonaparte*, a dramatic poem of 500 lines; this appeared in 1815. From that date till 1818, while principal of the academy, he furnished the calculations for *The Farmer's Almanac* and frequent corrections to *The Nautical Almanac*. From 1821 to 1825 he was pastor of the Congregational church in Conway, and meanwhile made a geological survey of Western Massachusetts. From 1825 to 1844 he was Professor of Chemistry and Natural History in Amherst College. In 1830 he was appointed State geologist of Massachusetts, having suggested the survey which he was appointed to make. In 1836 he was commissioned to do the same work in the first district of New York, but resigned the office on account of ill health. From 1844 to 1854 he was president of Amherst College and Professor of Natural Theology and Geology. Under his administration the college greatly flourished. When he resigned the presidency, he retained the professorship, and devoted the remainder of his life to his favorite science of geology, but always in its connection with religion. His earliest publications in geology and natural history were *Geology of the Connecticut Valley* (1823) and *Catalogue of Plants within Twenty Miles of Amherst* (1829; new ed., revised by Prof. Tuckerman, 1874). In 1832 appeared *First Report on the Economic Geology of Massachusetts*, and in 1835 the full report on the geology, zoölogy, and botany of the State, which have given Massachusetts the honor of being the first in Europe or America to provide at public expense for the survey of an entire State. The final report on the geology of Massachusetts was made in 1841 in 2 vols. quarto of 831 pages, with 55 plates. *The Religion of Geology and its Connected Sciences* (1851) and *Religious Truths Illustrated from Science* (1857) were the works to which he gave the most thought and study. Among the most popular of his books have been *History of a Zoölogical Temperance Convention in Central Africa* (1850); *A Wreath for the Tomb* (1838); and *Religious Lectures on the Peculiar Phenomena of the Four Seasons* (1850).

President Hitchcock was one of the originators and founders of Mt. Holyoke Seminary and of the Massachusetts Agricultural College. In connection with these may be mentioned his *Memoir of Mary Lyon* and his *Report to the Massachusetts Legislature on the Agricultural Schools of Europe*, which he visited and examined by appointment of the Government in 1850. The last book which he published was the *Reminiscences of Amherst College* (1863). His most unique and enduring monument is the Hitchcock Ichnological Museum of Amherst College, created by his genius, science, and industry. The American Geological Society owes its existence to his suggestion, and he was its first president. He died in Amherst, Feb. 27, 1864.

Revised by George P. Fisher.

Hitchcock, Edward, A. M., M. D.: specialist in physical culture; b. at Amherst, Mass., May 23, 1828; graduated at Amherst College 1849; Harvard Medical School 1852; after teaching in the Williston Seminary, Easthampton, Mass., was appointed (1861) Professor of Hygiene and Physical Education in Amherst College, a position he still (1894) holds. The chair of physical culture at Amherst was the first of the kind established in the country. He has been for many years a member of the board of health, lunacy, and charity of Massachusetts, and is a director of Mt. Holyoke College and of Clark Institute for the Blind, and was for three years president of the American Association for the Advancement of Physical Culture. Author of *Anatomy and Physiology* (New York, 1852), and a long series of pamphlets on anthropometry and physical culture. C. H. T.

Hitchcock, Ethan Allen: soldier and author; grandson of Ethan Allen; b. at Vergennes, Vt., May 18, 1798; graduated from the U. S. Military Academy, and entered the army as third lieutenant of artillery July, 1817. Till 1829, except for three years as assistant instructor of infantry tactics at West Point, he served on garrison and recruiting duty, after which he became commandant of cadets at the Military Academy. He served in the Florida war as acting inspector-general in Gaines's campaign of 1836. Promoted major Eighth Infantry in 1838, he was placed on garrison duty from 1839 until called to Washington in 1841, and placed in charge of the Indian bureau. In the Mexican war he was inspector-general of Gen. Scott's army, and received the brevets of colonel and brigadier-general. From 1851 till 1854 he commanded the military division of the Pacific till 1854. In consequence of personal differences with the Secretary of War, he resigned Oct. 18, 1855, and made his home at St. Louis. In Feb., 1862, the civil war having broken out, he was appointed major-general of volunteers, was placed on duty in the War Department, and in November was appointed commissioner for exchange of prisoners of war and commissary-general of prisoners. He remained in service till Oct., 1867. He published *The Doctrines of Swedenborg and Spinoza Identified* (1846); *Remarks upon Alchemy and the Alchemists* (1857); *Swedenborg a Hermetic Philosopher* (1858); *Christ the Spirit, being an Attempt to State the Primitive View of Christianity* (1861); *Remarks on the Sonnets of Shakspeare*, and *Colin Clout Explained* (1865); *Notes on the Vita Nuova of Dante* (1866). D. at Sparta, Ga., Aug. 5, 1870.

Hitchcock, Roswell Dwight, D. D., LL.D.: educator; b. at East Machias, Me., Aug. 15, 1817; joined the sophomore class in Amherst College in 1833; graduated in 1836; was principal of an academy in Jaffrey, N. H., 1836–37; pursued biblical and other studies under private tuition 1837–38; entered Andover Theological Seminary in 1838; was assistant teacher in Phillips Academy, Andover, for one term; was tutor at Amherst 1839–42; and in 1869 was elected one of the trustees of the college. From 1842 to 1844 he was a resident licentiate at Andover; then preached for a year in Waterville, Me.; and was ordained and installed over the First Congregational church in Exeter, N. H., Nov. 19, 1845. One year (1847–48) was spent in Germany at the Universities of Halle and Berlin. In 1852 he resigned his pastorate to accept the Collins professorship of Natural and Revealed Religion in Bowdoin College; and in 1855 he was chosen Washburn Professor of Church History in Union Theological Seminary, New York city. In 1871 he was made president of the American Palestine Exploration Society. He received the degree of D. D. from Bowdoin College in 1855, and from Edinburgh University 1885, and of LL. D. from Williams College in 1873, and from Harvard University 1886. From 1863 to 1870 he was one of the assistant editors of *The American Theological Review*, for which, as previously for *The Presbyterian Quarterly*, he wrote many articles, mostly relating to Church history. Besides numerous essays, orations, addresses, and sermons, he published *The Life, Character, and Writings of Edward Robinson* (1863); *A Complete Analysis of the Bible* (1869); *Socialism* (1878); and edited (with Dr. Eddy and Dr. Schaff) *Hymns and Songs of Praise* (1874); alone, *Hymns and Songs for Social and Sabbath Worship* (1875); *Carmina Sanctorum* (1885). He was joint editor with Prof. Francis Brown of *The Teaching of the Twelve Apostles* (1884; 2d ed. 1885). After his death, *Eternal Atonement*, a collection of sermons from his pen, was published (1888). He was elected president of the Union Theological Seminary, New York city, in 1880. D. at Somerset, Mass., June 16, 1887.

Revised by George P. Fisher.

Hitchin: town of Hertfordshire, England, on the Ivel; 32 miles N. N. W. of London (see map of England, ref. 12–J). It has breweries, manufactures of straw-plaiting, and a trade in corn, malt, and flour. Pop. (1891) 8,860.

Hit'tites [Heb. *Chittī, Chittīm*, sons of *Chēt*, Heth]: a Canaanitish tribe, mentioned in Scripture first in connection with Abraham at Hebron (Gen. xv. 20, xxiii. 3–18); next as the people from whom Esau took his first two wives (Gen. xxvi. 34); later among the other tribes in the Promised Land (e. g. Ex. xxiii. 28; Josh. ix. 1, xi. 3). Uriah the Hittite was one of David's chief officers (2 Sam. xxiii. 39). Numbers of them remained with the Jews even as late as the time of Ezra and Nehemiah (Ezra ix. 1). They are mentioned upon the Egyptian and cuneiform inscriptions, but nothing like a full or accurate account can be given of them. They left numerous inscriptions, which are undecipherable. It is the common opinion that they were a far greater people than the incidental biblical allusions would lead one to expect. Cf. A. H. Sayce, *The Hittites* (London, 1888). See Hieroglyphics.

Revised by S. M. Jackson.

Hit'torff, Jacques Ignace: architect; b. at Cologne, Germany, Aug. 20, 1793; studied in Paris; traveled through England, Germany, and Italy; spent two years in archæological studies in Sicily; and in 1824 returned to Paris, where he was kept busy as the architect of important public works until his death. He was made a member of the

Institute of France in 1853. Died in Paris, Mar. 27, 1867. The most prominent of his works as a practical architect are the Cirque de l'Impératrice, Hôtel du Louvre, and different embellishments of the Place de la Concorde and Bois de Boulogne. The most remarkable of his writings are *Architecture antique de la Sicile* and *Architecture moderne de la Sicile*, but especially his *Architecture polychrome chez les Grecs*, which was one of the earliest and remains one of the most important works on the Greek custom of painting buildings and their sculptured decoration. Revised by RUSSELL STURGIS.

Hitzig, FERDINAND: biblical scholar; b. at Haningen, Baden, June 23, 1807; studied after 1824 at the Universities of Heidelberg, Halle, and Göttingen, and was in 1833 appointed professor at the University of Zurich, whence in 1861 he removed to that of Heidelberg. In Halle he heard Gesenius, and from that time he concentrated his studies principally on the exegesis of the Old Testament; and by his freedom from dogmatic prejudices, by his comprehensive learning and acuteness, he contributed much to the true understanding especially of the prophets and Psalms, on which he published large exegetical works. His best work is his *Commentary on Isaiah* (Heidelberg, 1833). He also wrote *Urgeschichte und Mythologie der Philistäer* (Leipzig, 1845), etc., and *Geschichte des Volkes Israel* (1869, only first part published). D. in Heidelberg, Jan. 22, 1875.
Revised by S. M. JACKSON.

Hiuen-tsang (also written *Hiouen Thsang*, *Hwen Tsang*, *Hsüen-chwang*, *Yuen Tswang*, etc.): a Chinese Buddhist monk who set out in the year 629 on a journey to India in search of Buddhist scriptures, and who returned in 644 after having visited 110 countries and places, with 657 different works in Sanskrit (requiring twenty-two pack-horses) and many Buddhist relics and images. The remainder of his life (nineteen years) was spent in translating, with the assistance of twelve other monks, into Chinese the works he had brought with him. By command of the emperor an account of his travels was prepared under the title *Ta T'ang Si-yu-ki*, or Record of Western Rambles in the Time of the T'ang Dynasty. See Julien's translation *Mémoires sur les Contrées Occidentales, par Hiouen Thsang* (2 vols., Paris, 1857–58), and Beal's *Si-yu-ki: Buddhistic Records of the Western World* (2 vols., London, 1884). See also Julien's *Histoire de la Vie de Hiouen Thsang* (Paris, 1853).
R. LILLEY.

Hives: See NETTLE-RASH.

Hi'vites [Heb. *Chivvī*, midlanders, villagers]: a Canaanitish race conquered by the Hebrews (Josh. ix. 7, xi. 19); part of them escaped total destruction by a successful fraud (Josh. ix. 26). The great mass of them, living in the region of Tyre (Judges iii. 3), seem to have been unconquered. Solomon exacted tribute of the Hivites living in his kingdom (1 Kings ix. 20, 21).
Revised by S. M. JACKSON.

Hiwassee College: an institution in Monroe co., Tenn.; organized in 1849 with the design to secure thorough instruction at minimum cost and under conditions most favorable to physical, mental, and moral development. A new edifice, the Edwin W. Marsh, Jr., building, was opened to public use in 1887, and the doors were opened to young ladies and girls Jan., 1894. The college is in a prosperous condition, and bids fair to continue its sphere of operations in the Southern States, from which it draws its patronage.
S. G. GILBREATH.

Hoactzin, hō-akt'zin, or **Hoatzin**: native name of a bird found in Northern South America; the only member of the order OPISTHOCOMI (*q. v.*). It is about 2 feet in length, with slender body and long tail. The rounded wings are ample in size, but owing to the peculiar structure of the breastbone the bird flies poorly. The head bears a long, flaring crest. The general color of the upper parts is brown, with, in places, a greenish gloss. The belly, rump, primaries, and part of secondaries are rusty red. The wings have narrow, whitish bars, and the crest is yellowish, with many feathers tipped with black. The hoactzin is partial to thickets near the water, nesting in low bushes. It feeds largely on the wild arum (*Caladium arborescens*), whose leaves impart an extremely disagreeable, musky flavor to the flesh. The young are peculiar for the great development of the thumb, and are said to scramble about, using their wings like legs. As the birds grow the thumb is gradually absorbed, and in the adult this part of the wing is even less prominent than in most birds.
F. A. LUCAS.

Hoadley, BENJAMIN: prelate; b. at Westerham, Kent, England, Nov. 14, 1676; was educated at Catharine Hall, Cambridge, of which he became a fellow in 1697: took holy orders 1701; became rector of St. Peter-le-poor, London, 1704; rector of Streatham, Surrey, 1710; was distinguished by his advocacy of Low Church views in a famous controversy ("the convocation controversy") with Atterbury and others, Burnet and Wake being on Hoadley's side. In 1715 he was made Bishop of Bangor, and in 1717 a sermon preached before the king on the words, "My kingdom is not of this world," led to the famous Bangorian controversy, in which he was assailed by the non-jurors and the High Church party, headed by William Law, Archdeacon Warren, and Canon Snape, because he advocated the withdrawal of temporal jurisdiction from the clergy. This controversy led to the prorogation of the convocations and the almost complete extinction of their powers. In 1721 he was translated to the see of Hereford; to that of Salisbury 1723; and of Winchester 1734. D. at Chelsea, Apr. 17, 1761. Among his works are *Letters on Miracles* (London, 1702); *Reasonableness of Conformity* (1703); *Brief Defense of Episcopal Ordination* (1707); *A Preservation against the Principles of Non-jurors* (1716); *Nature and End of the Lord's Supper* (1735); and *Sermons* (1754–55).—His two sons, BENJAMIN and JOHN, also distinguished themselves. The former was born in London, Feb. 10, 1706; studied at Cambridge; took his degree as doctor of medicine in 1728: settled in London; was appointed physician to the royal household in 1742; and died at Chelsea, Aug. 10, 1757. He wrote in 1747 the comedy *The Suspicious Husband*; assisted Hogarth in his *Analysis of Beauty*; and published in 1756 *Observations on a Series of Electrical Experiments*. The younger brother, John, was born in London, Oct. 8, 1711; studied first law and then theology; took orders, and became chaplain to the Prince of Wales 1735, and held various rectorates and vicarages. D. in Winchester, Mar. 16, 1776. He wrote several comedies—*The Contrast* (1731) and *Love's Revenge* (1737)—several oratorios and pastorales, and edited his father's works (1773, 3 vols.).

Hoang-Hai: See YELLOW SEA.

Hoang-Ho: same as HWANG-HO.

Hoar, EBENEZER ROCKWOOD, LL. D.: jurist; b. at Concord, Mass., Feb. 21, 1816; a son of Samuel Hoar (1778–1856). He graduated at Harvard in 1835, and was admitted to the bar in 1840; was a judge in the court of common pleas 1849–55; a judge of the supreme judicial court 1859–69; U. S. Attorney-General 1869–70; joint high commissioner on the Washington treaty of 1871; M. C. from Massachusetts 1873–75. D. at Concord, Mass., Jan. 31, 1895.

Hoar, GEORGE FRISBIE, LL. D.: U. S. Senator; a son of Hon. Samuel Hoar; b. at Concord, Mass., Aug. 29, 1826; graduated at Harvard in 1846; admitted to the bar in 1849; settled at Worcester, Mass. He was elected to the 41st Congress, and re-elected to the 42d, 43d, and 44th. In 1877 he was elected to the U. S. Senate from Massachusetts; re-elected in 1883, and again in 1889 and 1895.

Hobart: formerly Hobart Town; capital of Tasmania, formerly Van Diemen's Land; on the navigable Derwent, which at its entrance into Storm Bay forms an excellent harbor for the largest vessels (see map of Australia, ref. 9–I). Hobart was founded in 1804. It is beautifully situated at the foot of Wellington Mountain, and well built with straight and broad streets and many handsome buildings, among which there are several Episcopalian, Roman Catholic, and Presbyterian churches and a Jewish synagogue. It has also a fine Government house, 4 banks, and 3 public libraries. It has good public schools, and gas and water works. It is connected with Launceston on the north side of the island by rail and with Melbourne by steamer, and carries on quite a lively trade. It has an Anglican and a Roman Catholic bishop. Pop. (1891) 24,905; (1896) with suburbs, 36,300. Revised by M. W. HARRINGTON.

Hobart, AUGUSTUS CHARLES (*Hobart Pasha*): naval officer, who served as admiral of the Turkish fleet; b. in England, Apr. 1, 1822; entered the British navy in 1836; served with distinction in the Crimean war, rising to the rank of captain; became the commander of a blockade-runner during the U. S. civil war, and in 1867 entered the service of the Ottoman Government, which gave him the title of pasha. He was placed in command of the fleet operating against Crete, and took energetic measures to prevent the Greeks bringing aid to the islanders. He was afterward raised to

the rank of grand admiral, with the command of the Turkish squadron in the Mediterranean. On the outbreak of the war between Russia and Turkey, the latter appointed him to the command of the Black Sea fleet. On Jan. 8, 1881, the sultan raised him to the rank of marshal of the empire. D. at Milan, June 19, 1886. F. M. COLBY.

Hobart, GARRET A.: Vice-President of the U. S.; b. at Long Branch, N. J., 1844; educated at Rutgers College; studied law at Paterson, N. J., with Socrates Tuttle, whose daughter he afterward married; admitted to the bar in 1866; became city counsel in 1871, and counsel to the board of chosen freeholders in the following year; was in the Legislature in 1873–74; was sent to the State Senate in 1877, and was its president in 1881–82; defeated for the U. S. Senate 1884; elected to the vice-presidency in 1896. He is interested in many of the banking and business enterprises of his State.

Hobart, JOHN HENRY, S. T. D.: bishop and author; b. in Philadelphia, Pa., Sept. 14, 1775; graduated with honors at Princeton in 1793; was tutor there 1796–98; ordained deacon of the Protestant Episcopal Church in 1798, and priest in 1800. In 1799 he became rector of Christ church, New Brunswick, N. J.; in 1800 was for a short time rector of St. George's, Hempstead, L. I., and in the same year assistant minister of Trinity church, New York, of which in 1812 he became assistant rector, and in 1816 rector. He was made assistant Bishop of New York in 1811, and bishop in 1816. In 1821 he became Professor of Pastoral Theology and Pulpit Eloquence in the General Theological Seminary, New York, of which he was one of the founders. Among his published works are *Companion for the Altar* (1804); *Apology for Apostolic Order* (1807). See *Memoir* by William Berrian (1833); *The Early Years of Bishop Hobart* (1834); and *The Professional Years of Bishop Hobart*, by J. McVickar (1836). D. at Auburn, N. Y., Sept. 12, 1830. W. S. P.

Hobart, JOHN HENRY, D. D.: son of Bishop John Henry Hobart; b. in New York city, Oct. 1, 1817; graduated at Columbia College (1836) and at General Theological Seminary; ordered deacon 1841; some time rector of Grace church, Baltimore, and an assistant minister of Trinity, New York, 1848–63. For a number of years Dr. Hobart was registrar of the House of Bishops. Author of *Instruction and Encouragement for Lent* (New York, 1859); *Church Reform in Mexico* (1877); *Mediæval, Papal, and Ritual Principles Stated and Contrasted* (1877); sermons, etc. D. Aug. 31, 1889. WILLIAM STEVENS PERRY.

Hobart College: a general Church institution of the Protestant Episcopal Church at Geneva, N. Y. All bishops of dioceses in the U. S. are regents *ex officio*; the bishop of the diocese in which the college may at any time stand is a member of the board of trustees *ex officio*, as is the president of the college. The bishops of the dioceses of the State of New York are visitors. The institution was projected 1812; founded for academic work 1822 by a provisional charter; chartered as Geneva College 1825; named Hobart Free College 1852; Hobart College 1860, being largely indebted to Bishop Hobart and to an early endowment from Trinity church, New York. There are three courses leading respectively to the degrees A. B., B. S., B. L. The equipment includes valuable scholarships and prizes, a chemical and a physical laboratory, a cabinet and museum, a gymnasium, and a library of 30,000 volumes in a fire-proof building. The college site is noted for its beauty and salubrity. Its alumni number over 1,300. CHARLES D. VAIL.

Hob'bema, MEINDERT: painter; b. in Holland in 1638. Little is known of his life, for he seems to have been neglected by his contemporaries. He lived and died poor, and it was not till fifty years after his death that his pictures began to be considered. Hence they are not common in the older public galleries, and are little known in Europe. But they have always been sought by private buyers, and a great many were taken to Great Britain during the eighteenth century. The newly formed public galleries of London, Edinburgh, and Glasgow, and the large private collections of Great Britain are especially rich in Hobbemas. He is of not so poetical a nature as Ruysdael or Cuyp, but still he is ranked by many as dividing with them the supremacy of the great Dutch school of landscape. His execution is extremely firm, even and solid, his perception of natural forms exceptionally clear, his composition simple, so that his pictures look like close copies of natural scenes chosen for their gracefulness and quiet beauty. His most prominent fault is a mechanical way of painting foliage, tending to spotty and twinkling light. Hobbema died Dec. 7, 1709.

In the National Gallery in London are *The Avenue of Middelharnis*, *Showery Weather*, *Watermills and Bleacheries*, the *Ruins of Brederode Castle*, and several more; in the Bridgewater Gallery, a *Watermill* and two other valuable landscapes; in the Dulwich Gallery and in Buckingham Palace, several; and landscapes whose names are hardly important as being so similar are in the galleries of the Hermitage, near St. Petersburg, and at Munich, Vienna, Bordeaux, and especially Amsterdam and Rotterdam.
RUSSELL STURGIS.

Hobbes, THOMAS: one of the most distinguished thinkers of the period of English emancipation from scholasticism; b. Apr. 5, 1588, at Malmesbury, in Wiltshire. His father was a country clergyman. After a thorough preparation, he was sent to Oxford at about the age of fifteen, and there studied Aristotle and scholastic philosophy for five years, acquiring certain nominalistic principles which marked all his subsequent thinking, although he early assumed a hostile attitude toward scholasticism. He became tutor to the future Earl of Devonshire, and in 1610 traveled with his charge through France, Italy, and Savoy. On his return, and on subsequent visits to the Continent, he met the foremost thinkers of the time, and became more or less intimate with Lord Bacon, Ben Jonson, Lord Edward Herbert of Cherbury, Descartes, Gassendi, Galileo; later in life with Selden, Cowley, and Dr. Harvey. In 1628 he translated and published *Thucydides*, with the express purpose of showing his countrymen a warning example of the "fatal consequences of intestine troubles." Just at this time the foundations of civil order were shaken by the struggle between the House of Stuart and the supporters of individual liberty and the rights of conscience. Of an unusually timid disposition, Hobbes felt very keenly the lack of security which the state should afford, and this subject (the state) occupied his chief thoughts for the rest of his life. Retiring to Paris with the royalists in 1640, he published a small edition of his *Elementa Philosophica de Cive* in 1642, the work being reprinted, much enlarged, in 1647 at Amsterdam by the famous Elzevirs. In 1647 he became mathematical instructor to Charles, Prince of Wales, a relation which was broken the next year by the removal of the prince to Holland. His connection with the exiled royalist party was severed by the publication of his views on political, moral, and theological subjects in the treatises (1) *Treatise on Human Nature* in 1650, (2) *De Corpore Politico* (London, 1650), and (3) his collected views in the *Leviathan, or the Matter, Power, and Form of a Commonwealth, Ecclesiastical and Civil*, in 1651. He escaped persecution from exiled English royalists, as well as from French authorities, by fleeing secretly from Paris and taking refuge in England, where Cromwell's absolute power in 1653 furnished a government much in accordance with Hobbes's doctrines. He published a remarkable *Letter upon Liberty and Necessity* in 1654, and the first and second divisions of his great work, *Philosophical Rudiments*, in 1655–58; the first division treating of *Body*, the second division of *Human Nature*, the third of *The State*. His *Leviathan* and *De Cive* were censured in Parliament in 1666, and very many works were written to refute them, the most able of these being Cudworth's *Intellectual System*. After the Restoration, Hobbes received a pension of £100 from Charles II., his former pupil. In 1675 he published a translation of Homer's *Iliad* and *Odyssey*. He wrote his autobiography in Latin verse, and his *Behemoth*, a dialogue on the civil wars between 1640 and 1660, was written somewhere about 1670. He died Dec. 4, 1679, at the seat of the Earl of Devonshire, his constant friend and supporter.

The literary style of Hobbes is pronounced admirable, being always clear and never tedious. His system of philosophy was a materialistic scaffolding built for the purpose of supporting and complementing his philosophy of the state, which is his only valuable contribution to human thought, besides certain negative or skeptical principles afterward elaborated by Locke and Hume. He held sensation to be the basis of all knowledge; matter to be the only reality; philosophy to be the knowledge of effects in their causes and of causes in their effects; scientific method, consequently, to be twofold (*a*) inductive or analytical, and (*b*) deductive or synthetical. In his *Prima Philosophia* he defines the ideas of space, time, thing, cause, etc., somewhat after the manner of the schoolmen. But the subject of philosophy is the two kinds of bodies, natural and artificial, the latter including human organizations, of which the state is the

highest example. He held mind to be material; thought to be a process of adding and subtracting representations produced by physical impressions; language to be the most essential instrumentality to human life, rendering possible the existence of civil society and the state and the development of science and reason itself; ideas of good and evil to have their origin in the sensations of pleasure and pain; the human will to be under the control of circumstances and necessity. The state of nature is not the ideal state of man, but a state of war on the part of each against all—*bellum omnium in omnes*—and its result a condition of complete misery. Self-interest impels man to combine with his fellows and institute government, a "leviathan power" which adjusts and subordinates individual selfishness and produces the maximum of happiness. Outside the state are found constant war, fear, poverty, filth, ignorance, and wretchedness; within the state dwell peace, security, riches, science, and happiness. Coercion is essential, and absolute monarchy is the most perfect form of government. Individual conviction should not be considered. The state is the Grand Man which makes possible the rational development of the individual man, like a mortal god subduing his caprice and passion, and compelling obedience to law, developing the ideas of justice, virtue, and religion, creating property and ownership, nurture and education. It is surprising that his tendencies toward nominalism in philosophy should have yielded to so realistic a doctrine in his science of politics, for he makes not the individual man (as Rousseau does a century later), but the state, the true reality. The social or political process is the real one, the individual is only a vanishing or transitory point in the social whole. Hobbes was so much impressed with the importance of the authority of the state that he could not appreciate the necessity of mediation by which the individual will shall be adjusted and reconciled to the universal will (of the state) through the principle of popular representation. Complete *Works*, edited by Molesworth, 16 vols. (5 vols. Lat., 11 vols. Eng.), London, 1839–45. W. T. Harris.

Hobby [M. Eng. *hobie*, from O. Fr. *hobe*, *hobier*, deriv. of *hober*, move, stir]: in Great Britain, either of certain small falcons, especially the *Falco subbuteo*, a bird about a foot in length and of very elegant shape. It was once much employed in hawking.

Hobhouse, John Cam (*Lord Broughton*): b. June 27, 1786; graduated at Cambridge in 1808; in 1820 was elected to Parliament by the Liberals of Westminster, and later represented both Nottingham and Warwick; entered the cabinet of Earl Grey as Secretary of War in 1831; was made Secretary of State for Ireland in 1833, and president of the board of control from 1835 to 1841 and from 1846 to 1852; was created a baron in 1851, and died June 3, 1869. His *Journey through Albania and other Provinces of Turkey with Lord Byron* (1813), *Illustrations of the Fourth Canto of Childe Harold* (1818), and *Italy* (1859), attracted much attention.

Hoboken: city (incorporated 1855); Hudson co., N. J. (for location, see map of New Jersey, ref. 2–E); on the Hudson river, and the Del., Lack. and W. Railroad; adjoining Jersey City and directly opposite New York city, with which it is connected by several lines of steam-ferries. It is an important commercial center, having a large trade with the principal domestic and foreign ports, supplying New York city and its shipping with the greater part of their coal, and being the terminus of the Netherlands-American, Hamburg-American, North German Lloyd, and Thingvalla steamship lines. It has also become an important manufacturing center, and is widely known for its production of lead-pencils, caskets, leather, leather goods, and foundry and machine-shop products. The manufacture of lead-pencils has become an important industry. The city is connected with Jersey City and suburban villages by horse and electric street railways, and in 1893 had nearly 25 miles of water-mains, more than 12 miles of sewers, and electric street lighting. The assessed valuation was: personal, $1,989,395; real, $20,905,800—total, $22,895,195, and the tax-rate $2.08 per $100. There were 21 churches, high school and 6 grammar schools, free public library, 2 convents, monastery of the Passionate Fathers, St. Mary's Hospital, 7 U. S. bonded and 7 free warehouses, Institute of Technology (founded by Edwin A. Stevens, and opened in 1871), and 1 daily, 4 weekly, 2 monthly, and 2 other periodicals. Pop. (1880) 30,999; (1890) 43,648; (1895) 54,083.

Revised by Edwin A. Stevens.

Hobson's Choice: a nominal choice with no real alternative; a familiar term which owes its origin to the practice of Tobias Hobson, university carrier at Cambridge, England, in Milton's time. He was the subject of two poems by Milton. It is related in *The Spectator* (509) that Hobson was the first person in England who kept a hackney-stable. He always politely asked his customers to take their choice of his forty horses; but no matter which horse was chosen, Hobson always managed to put off the traveler with the horse which stood nearest the door.

Hoche, ōsh, Lazare: general; b. at Montreuil, France, June 25, 1768; son of a poor workman, who could give him no education. In 1784 he enlisted in the army; in 1791 he fought as sergeant in the regiment of Gardes Françaises with the rabble before the door of Marie Antoinette; in 1792 he became lieutenant in the regiment of Rouergue; and in 1793 he distinguished himself in the siege of Thionville and in the battle of Neerwinden. Having been imprisoned on some suspicion, he sent a plan of a campaign to the committee of public safety, and he was immediately liberated, made a brigadier-general, and sent to serve in the army of Houchard. He soon received an independent command, and in 1793 he defeated the Austrians at Weissenburg, and compelled them to withdraw from Alsace. In 1795 he foiled the invasion of the royalists and the English, attempted from the peninsula of Quiberon. In 1796 he pacified the Vendée, while his expedition to Ireland failed, as stormy weather scattered his ships. In Apr., 1797, he again commanded against the Austrians, and defeated them in three battles: he was at Wetzlar when the armistice of Lisbon ended the war. In the fall of that year he was suddenly taken ill, and died Sept. 18; a post-mortem examination showed that he had been poisoned.

Hochelaga, hŏk-*e*-laa'ga: the county-seat of Hochelaga County, Quebec, Canada; a beautiful suburb of Montreal, with which it is connected by a street railway (see map of Quebec, ref. 5–B). Its convent of the Holy Name is the largest nunnery in the province. Pop. of village about 1,600.

Hoch'kirch: a village of Saxony; 7 miles S. E. of Bautzen (see map of German Empire, ref. 5–G). Here Frederick the Great was completely defeated by the Austrians under Daun Oct. 14, 1758. He had taken up a very unfavorable position, and had only 30,000 men. At five o'clock in the morning he was attacked by Marshal Daun with 50,000 men. The attack was half a surprise, a dense fog covering the whole landscape, and with great loss the king was compelled to retire to the heights of Drehsa. There he was again attacked, by the Duke of Aremberg, and the retreat became a rout.

Höchst, höchst: town in the province of Hesse-Nassau, Prussia; at the influx of the Nidda into the Main: 6 miles W. of Frankfort (see map of German Empire, ref. 5–D). It is noted for the battles fought here—June 20, 1622, in which Tilly defeated Duke Christian of Brunswick, and Oct. 11, 1795, in which the Austrians defeated the French under Jourdan. Pop. (1890) 8,455.

Hoch'städt: See Blenheim.

Hocking, or **Hockhocking**: a river of Ohio; rises in Fairfield County, flows S. E. through Hocking County, and joins the Ohio in Athens County, after a course of 80 miles. For nearly 70 miles it is navigable for boats.

Hock-tide [O. Eng. *hōcor*, scorn + *tīd*, time], or **Hoke Days**: the Monday and Tuesday occurring two weeks after Easter, a former English festival in memory of Ethelred's great victory over the Danes in 1002. Tolls were taken at the town-gates and money was collected throughout the parish for the priest. Traces of the old customs existed in some places in the eighteenth century.

Hodell, Frans Oscar Leonard: Swedish dramatist; b. in 1840; was in early youth apprenticed to a druggist: in 1860 he entered the stage; and from 1870 up to the time of his death was editor, and from 1881 proprietor, of *Söndags-Nisse* (The Sunday Puck), a comical paper. He was one of the most fertile of Swedish dramatic authors, and wrote or adapted for the comic stage more than 100 plays. The most popular of all of them is *Andersson, Petersson, and Lundström* (1866), acted more than 300 times in Stockholm. Among his other plays may be noticed *En Söndag i det grōna* (A Sunday à la champêtre, 1861): *Fabriksflickan* (The Factory Girl, 1868); *Herr Larssons Pariserfärd* (Mr. Larsson's Trip to Paris, 1868); *Syfrōknarna* (The

Seamstresses, 1868); *Tre par skor* (Three Pairs of Shoes, 1881). He also proved himself to be an excellent author of songs and ballads by his *Visor och kupletter* (Songs and Stanzas, 1873). D. May 25, 1890. P. Groth.

Hodge, Archibald Alexander, D. D., LL. D.: son of Dr. Charles Hodge (1797–1878); b. in Princeton, N. J., July 18, 1823; graduated at the College of New Jersey in 1841; was tutor 1844–46; graduated at Princeton Theological Seminary in 1847; went the same year as a missionary to Allahabad, India; returned in 1850 on account of the impaired health of his wife; was settled as a pastor in Lower West Nottingham, Md., 1851–55; at Fredericksburg, Va., 1855–61; and at Wilkesbarre, Pa., 1861–64. In 1864 he was elected by the General Assembly of the Presbyterian Church to the chair of Didactic, Historical, and Polemic Theology in the Western Theological Seminary, Allegheny, Pa. In connection with the professorship, he became in 1866 pastor of the North Presbyterian church of the same city. He was chosen Associate Professor of Didactic and Polemic Theology at Princeton 1877, and succeeded his father in 1878. He published *Outlines of Theology* (New York, 1860; enlarged ed. 1878); *The Atonement* (1867); *Commentary on the Confession of Faith* (1869); *Life* of his father (1880); *Popular Lectures on Theological Themes* (1887). D. at Princeton, N. J., Nov. 11, 1886.

Revised by S. M. Jackson.

Hodge, Charles, D. D., LL. D.: of Scotch-Irish descent; b. in Philadelphia, Pa., Dec. 28, 1797. In 1812 he entered the sophomore class in the College of New Jersey, and graduated with the highest honors in 1815. From 1816 to 1819 he was a student in the Theological Seminary at Princeton. In 1820 he became assistant teacher of the original languages of Scripture in the seminary, and in 1822 was elected by the General Assembly Professor of Oriental and Biblical Literature. In 1828 he returned to his chair, after three years' study at the Universities of Paris, Halle, and Berlin. In 1840 he was transferred to the chair of Exegetical and Didactic Theology, to which, in 1852, Polemic Theology was added. He was moderator of the General Assembly (Old School) at Philadelphia in 1846, and 1858 one of a committee to revise the *Book of Discipline*. The celebration at Princeton, Apr. 24, 1872, of the semi-centennial anniversary of his professorship was the first of its kind in the U. S. His contributions to sacred literature were of the most scholarly and solid character. In 1825 he founded *The Biblical Repertory*, the scope of which was enlarged and *Princeton Review* added to its title in 1829. In 1872 it was united with *The Presbyterian Quarterly and American Theological Review*, the organ of the New School branch. Till then, for nearly forty years, he had been not only editor-in-chief of *The Princeton Review*, but also chief contributor, more than one-fifth of all that was written for it coming from his pen. He also published *A Commentary on the Epistle to the Romans* (Philadelphia, 1835; abridged 1836; rewritten and enlarged 1866); *Constitutional History of the Presbyterian Church in the United States* (2 vols., 1840–41); *The Way of Life* (1842); commentary on *Ephesians* (1856); *First Corinthians* (1857); *Second Corinthians* (1860); *What is Darwinism?* (1874). But the great work of his life was *Systematic Theology* (3 vols., 1871–72), which is regarded as one of the ablest expositions of Calvinism ever made. See *Semi-Centennial Commemoration of the Professorship of Charles Hodge, D. D., LL. D., Sept. 24, 1872* (1872), and his *Life* by A. A. Hodge (New York, 1880). D. in Princeton, N. J., June 19, 1878. Revised by S. M. Jackson.

Hodge, Frederick Webb: ethnologist; b. in Plymouth, England, Oct. 28, 1864; was taken to the U. S. when seven years of age; was educated in Washington, D. C.; appointed to the U. S. Geological Survey in Aug., 1884, devoting such of his time as was not occupied by official duties as a student in the Corcoran Scientific School until Dec., 1886, when he resigned from the Geological Survey and became secretary of the Hemenway Southwestern archæological expedition. During his connection with this expedition Mr. Hodge made detailed surveys and maps on a large scale of the ruins of Los Muertos, and their accompanying irrigation *acéquias* and reservoirs, descriptions of which have been embodied in papers on the *Architecture of the Prehistoric Pueblos of Southern Arizona* and *Methods of Irrigation of the Ancient Inhabitants of the Salado Valley*. At the close of the field-work of the Hemenway expedition in July, 1889, Mr. Hodge returned to Washington and was appointed to the bureau of ethnology, Smithsonian Institution, for duty in connection with the preparation of a *Synonymy of Indian Tribes*, under the direction of Mr. H. W. Henshaw. J. W. Powell.

Hodge, Hugh Lenox, M. D., LL. D.: b. in Philadelphia, June 27, 1796; brother of Prof. Charles Hodge; graduated at Princeton with honors 1814; took the medical degree in 1817 at the University of Pennsylvania; was Professor of Obstetrics in that institution 1835–63, when he became emeritus professor. Author of a *System of Obstetrics* (1864) and a work on *Diseases Peculiar to Women* (Philadelphia, 1859), standard treatises of the first authority; wrote much and ably for the professional journals, and had a wide fame as a practitioner and instructor. D. at Philadelphia, Feb. 23, 1873.

Hodge, Hugh Lenox, M. A., M. D.: surgeon; b. in Philadelphia, Pa., July 30, 1836; studied at the University of Pennsylvania, and received the degrees of B. A. 1855, M. A. 1858, and M. D. 1858; was resident physician in the Pennsylvania Hospital 1858–60; in 1861 was appointed demonstrator of surgery and chief of the surgical dispensary of the University of Pennsylvania, and in 1870 demonstrator of anatomy. During the civil war he was one of the surgeons attached to the U. S. Satterlee Hospital, belonged to the Pennsylvania reserve corps of surgeons, and was pension examining surgeon to the U. S. sanitary commission; has been attending surgeon to the Children's Hospital since 1864, and attending surgeon to the Presbyterian Hospital since its opening in 1872. He has written and published a number of articles in medical journals.

Hodge, John Aspinwall, D. D.: minister; b. in Philadelphia, Pa., Aug. 12, 1831; graduated at the University of Pennsylvania 1851, and at Princeton Theological Seminary 1856; was pastor of the First Presbyterian church at Mauch Chunk, Pa., 1857–65, and of the Presbyterian church in Hartford, Conn., 1866–92. He published *What is Presbyterian Law?* (Philadelphia, 1882; 6th ed. 1892); *Theology of the Shorter Catechism*, second part, the first part being by the Rev. A. A. Hodge, D. D. (New York, 1888); *Recognition after Death* (New York, 1889); and the tracts *Why I am a Presbyterian* and *Form for Organizing a Church*. He resides at Lincoln University, Pennsylvania.

Willis J. Beecher.

Hodges, Edward, Mus. Doc.: organist and composer; b. at Bristol, England, July 20, 1796, and educated there; organist successively of several Bristol churches, and early a composer of sacred music of the old English cathedral school of the severest kind; received his doctor's degree from Cambridge in 1825; in 1838 settled in New York and became successively organist of St. John's chapel and (1846) of Trinity church; returned to England in 1863, and died at Clifton, Sept. 1, 1867. D. E. Hervey.

Hodgins, John George, LL. D., F. R. G. S.: Canadian educator; b. in Dublin, Ireland, Aug. 12, 1821; removed to Canada in 1833, and graduated at Victoria College in 1856. Since 1876 he has been deputy minister of education of Ontario, and has had much to do with perfecting its school system. From 1855 till 1879 he edited *The Journal of Education*, and is author of *School History of Canada* (Montreal, 1862); *Sketches and Anecdotes of the Queen* (1870); *The School-house and its Architecture* (Toronto, 1872); *School Manual* (1870); *Lectures on School Law* (1870).

Neil Macdonald.

Hodgson, Shadworth Hollway, M. A. (Oxford), LL. D. (Hon. Edinburgh): b. at Boston, Lincolnshire, England, Dec. 25, 1832. He was educated at Rugby and Oxford; honorary fellow of Corpus Christi College, Oxford; president of the Aristotelian Society for the Systematic Study of Philosophy, London, since 1880. His principal works are *Time and Space: a Metaphysical Essay* (London, 1865); *Principles of Reform in the Suffrage* (London, 1866); *The Theory of Practice* (2 vols., London, 1870); *The Philosophy of Reflection* (2 vols., London, 1878); *Outcast Essays and Verse Translations* (London, 1881). He has also contributed articles to *Mind* (London), the *Proceedings of the Aristotelian Society*, etc. J. Mark Baldwin.

Hodgson, Telfair, D. D., LL. D.: clergyman; b. at Columbia, Va., Mar. 14, 1840; educated in Philadelphia and at Princeton, where he graduated in 1859. He was one of the few clergymen ordained in the Church of the Confederate States of America, and was a chaplain in the Confederate army. In 1872 he became Professor of Philosophy in the University of Alabama; later was appointed vice-chancellor

of the University of the South at Sewanee, Tenn., and dean of its theological department. He published some sermons and pamphlets. D. at Sewanee, Sept. 11, 1893.

WILLIAM STEVENS PERRY.

Hod-Mezö-Vasarhely: See VASARHELY.

Hod'ograph [Gr. *ὁδός*, way, path + *γράφειν*, write, describe]: the locus of the extremities of lines drawn from a fixed point to represent in magnitude and direction the velocity of a moving point. The invention of this construction is due to Sir W. R. Hamilton, and the most beautiful of the many remarkable theorems to which it leads is this: *The hodograph for the motion of a planet or comet is always a circle, whatever be the form and dimensions of the orbit.* Since the radius-vector of the hodograph represents the velocity at each instant, it is evident that an elementary arc represents the acceleration or change of velocity in the direction of any co-ordinate, and thus a finite arc represents the whole acceleration of the moving point during the corresponding time; and it is evident also that the tangent to the hodograph is parallel to the direction of the acceleration of the moving point in the corresponding position of its orbit. The intensity of heat and light emanating from a point, or from a uniformly radiating spherical surface, diminishes with increasing distance according to the same law as gravitation. Hence the amount of heat and light which a planet receives from the sun during any interval is proportional to the whole acceleration during that interval—i. e. to the corresponding arc of the hodograph.

Revised by S. NEWCOMB.

Hodom'eter [from Gr. *ὁδός*, road, way + *μέτρον*, measure]: a more correct form of ODOMETER (*q. v.*).

Hoe [M. Eng. *howe*, from O. Fr. *hoe* > Fr. *houe*, from O. H. Germ. *houwa* (> Mod. Germ. *haue*, hoe), deriv. of *houwan*, cut, hew: Eng. *hew*]: an instrument of farm-husbandry of various forms. The best known is a plate of steel attached to a handle at somewhat less than a right angle, and is used for cutting and drawing the earth. The shuffle-hoe is drawn and thrust backward and forward for the purpose of cutting off weeds. Various forms of horse-hoe are used for cultivating those crops which are planted in rows and drills.

Hoe, RICHARD MARCH: inventor; b. in New York, Sept. 12, 1812; the son of Robert Hoe (1784–1833), an ingenious English mechanician who became a manufacturer of printing-presses in New York. Richard Hoe became after his father's death a partner in the business, to which was added the manufacture of saws, in which Mr. Hoe made important improvements. In 1841 Richard Hoe, with his brothers, Robert Hoe and Peter Smith Hoe, assumed the whole business, the former partners retiring. In 1846 he brought out "Hoe's lightning press," extensively employed for newspaper-work. It has been much improved. He also made many less celebrated inventions. D. in Florence, Italy, June 7, 1886.

Hoefer, hö'fer, JOHANN CHRISTIAN FERDINAND: scientist and author; b. at Döschnitz, in the principality of Schwarzburg-Rudolstadt, Apr. 21, 1811; educated at gymnasium of Rudolstadt. In 1830 he went from Bremen to Lille, where he enlisted in the foreign legion as a soldier, and from Lille to Marseilles, whence he was sent to Navarino, the station of his regiment; returned in 1831 to France and taught foreign languages at the Colleges of Lyons, St.-Étienne, and Roanne; co-operated with Cousin in translating Kant's *Kritik der reinen Vernunft* in 1834, and removed to Paris, where he began to study natural science and medicine, while he made his living by writing and translating for different periodicals. In 1840 he received the degree of doctor, and in 1848 he was naturalized as a French citizen. The most prominent of his writings are *Histoire de la Chimie* (1842), the first complete history of the science of chemistry; *Dictionnaire de Physique et de Chimie* (1846); *de Médecine pratique* (1847); *de Botanique* (1850); *d'Agriculture et d'Horticulture* (1855); *Histoires du Café, du Chocolat, de la Pomme de Terre, du Lotus, du Poivrier, etc.* (1850–51); *Histoire du Maroc* (1848); besides a great number of articles in the *Biographie Générale*, of which he was editor-in-chief. D. at Brunoy in May, 1878.

Hof: town; in Upper Franconia, Bavaria; on the Saale; 103 miles by rail S. S. W. of Leipzig (see map of German Empire, ref. 5–F). It has a fine church, built in 1299 and thoroughly restored in 1884, and extensive manufactures of cotton, woolen, linen, leather, and colors. Pop. (1890) 24,455.

Hofdijk, WILLEM JACOBSZOON: poet and writer; b. in Alkmaar, Holland, June 27, 1816. He was early powerfully influenced by the Romantic movement, and in 1839 had already completed a romantic poem, *Rosamunde*. This attracted some attention from literary people, especially from van Lennep, who subsequently befriended the young poet. In 1841 he obtained a clerk's position under the city government at Alkmaar, which he held till 1851, when, through van Lennep's offices, he was made instructor in Dutch History and Literature in the gymnasium at Amsterdam. Throughout his life he was a prolific writer both in verse and prose. Of longer poems we have from him *De Bruidsdans* (1842); *De Jonker van Brederode* (1849); *Een Kunstenaars-idylle* (1849); *Aeddon* (1852); *Helene* (1854); *Zuid en Noord* (1861); *In't harte van Java* (1881); *In het gebergte Di-Eng* (1884); *Dajang Soembi* (1886). Collections of shorter pieces and ballads are *Kennemerland. Balladen* (1850–52); *Verspreide Gedichten* (1860); *Romantische Poëzy* (1867); *Malven en asters* (1880). With less success Hofdijk essayed dramas, or dramatic poems: *Griffo de Salier* (1852); *Theda* (1854); *De bloem der waereld* (1854); *Vondel gekroond* (1858); *Een bouze eed* (1868); and others. The more important among Hofdijk's prose-works are *Geschiedenis der Nederlandsche Letterkunde* (1856); *Historische Landschappen* (1856); *De Kloosterorden in Nederland* (1862); *Geschiedenis des Nederlandschen Volks* (3 vols., 1865–72); *Voor 300 jaren* (1865–71); *Willem Frederik Hendrik, Prins der Nederlanden* (1880). D. at Arnhem, Aug., 1888.

A. R. MARSH.

Ho'fer, ANDREAS: soldier and patriot; b. at St. Leonard, in the Tyrol, Nov. 22, 1767; became a vintner and horse-merchant; took command of a party of riflemen serving against the French 1796; took a prominent part (1803–09) in the public affairs of the Tyrol; led in the uprising of the people against the French and Bavarians 1809; gained the important battles of Sterzing and Innspruck; defeated Lefebvre and drove him out of the province, and was declared ruler of the Tyrol. Soon after, Austria having been reduced to submission by Napoleon, Hofer, who having renewed hostilities was excluded from the amnesty, was betrayed for money by one of his most trusted followers, and was taken prisoner and shot by order of Napoleon at Mantua. Feb. 20, 1810. Revised by F. M. COLBY.

Höfer, EDMUND: novelist; b. in Greifswald, Germany, Oct. 15, 1819; studied philology and history in Greifswald, Berlin, and Heidelberg; in 1842 returned home and devoted himself to writing; ten years later he published a collection of stories under the title *Aus dem Volk*. In 1854 he removed to Stuttgart and founded the *Hausblätter* in company with Hackländer. His observation was keen and his perception fine, and his best work is of a high order of artistic realism; but he wrote too much to write always well, and only a few of his works have permanent value. Among them are *Gedichte* (1853; 2d ed. 1856); *Schwanwiek* (1856); *Bewegtes Leben* (1856); *Wie das Volk spricht* (8th ed. 1876); *Norien, Erinnerungen einer alten Frau* (1858); *Die Honoratiorentochter* (1861); *Altermann Ryke* (1865); *Ein Findling* (1868); *Der Demagoge* (1872); *Zur linken Hand* (1874); *Der Junker* (1878); *In der letzten Stunde* (1881). See *Ausgewählte Schriften* (14 vols., 1882). D. at Cannstatt, May 23, 1882.

Höffding, HARALD, Ph. D.: b. in Copenhagen, Denmark, Mar. 11, 1843; educated in college and university at Copenhagen; has been in turn school-teacher, privat docent, public docent, and, since 1883, Professor of Philosophy in the University of Copenhagen. In 1881 he was made a member of the Royal Danish Society for Science. He has published, in Danish, *The Conception of Will in the Greek Philosophy* (1870); *Philosophy in Germany since Hegel* (1872); *Contemporary English Philosophy* (1877; German trans. 1889); *Life and Philosophy of Spinoza* (1877); *Outlines of Psychology* (1882; German trans. 1887, and 2d ed. 1892; English trans., London and New York, 1891, from the German of 3d ed.); *Psychological Researches* (1889; German trans. as articles in the *Vierteljahrschrift für wissenschaftliche Philosophie*, vols. xiii. and xiv.); *Human Ethics* (German trans.) and *Ethical Researches* (1891; partly translated as articles in *The International Journal of Ethics* and *The Monist*). Prof. Höffding describes himself as a "critical Positivist," influenced much by the English psychologists. He emphasizes the principle of association as the law of an inner synthesis or activity of mind. In ethics he is a Utilitarian as far as the ethical criterion is concerned, but does

not follow the English in making personal welfare the ethical motive or end. J. Mark Baldwin.

Hoffman, Charles Fenno, M. A.: author; b. in New York in 1806. He was educated at Columbia College. In 1827 he was admitted to the bar, and was afterward (1833–47) editorially connected with the New York *American*, *The Knickerbocker Magazine*, the New York *Mirror*, etc. He published *A Winter in the West* (1835); *Wild Scenes in the Forest and Prairie* (1837); *Greyslaer*, a novel (1840); *The Vigil of Faith and other Poems* (1842); *The Echo*, poems (1844); *Love's Calendar* (1848); and an edition of his poetical works, edited by E. F. Hoffman, appeared in 1874. He was in 1846–47 editor of *The Literary World*, and soon after was attacked by a mental disease, in consequence of which he lived in retirement. He was a half-brother of Murray Hoffman. D. in Harrisburg, Pa., June 7, 1884.

Hoffman, David, LL. D. (Oxon.), J. U. D. (Göttingen): lawyer and author; b. in Baltimore, Dec. 25, 1784; Professor of Law in the University of Maryland 1817–36; traveled in Europe for two years, after which he practiced law in Philadelphia till 1847; then went to Europe to gather materials for a history of the world, two volumes of which (completing the history to the year 573), entitled *Chronicles Selected from the Originals of Cartaphilus, the Wandering Jew*, were published in London in 1853. In 1853 he returned to the U. S. He published also *A Course of Legal Study* (1836; 2d ed.); *Legal Outlines* (1836); *Miscellaneous Thoughts*, etc., by Anthony Grumbler (1837); *Viator, or a Peep into my Note-book* (1841); *Legal Hints* (1846), etc. D. in New York city, Nov. 11, 1854.

Revised by F. Sturges Allen.

Hoffman, Eugene Augustus, D. D., D. C. L., LL. D.: clergyman; b. in New York city, Mar. 21, 1829; educated at Harvard College (graduated 1848) and at the General Theological Seminary (graduated 1851); rector of Grace church, Elizabeth, N. J., 1853–63; of St. Mary's church, Burlington, N. J., 1863–64; of Grace church, Brooklyn Heights, N. Y., 1864–69; of St. Mark's church, Philadelphia, Pa., 1869–79; appointed dean of the General Theological Seminary, New York, in 1879. He has published numerous pamphlets, tracts, sermons, and historical papers. Dean Hoffman and members of his family have munificently endowed the institution of which he is the head.

Revised by W. S. Perry.

Hoffman, Murray: jurist; b. in New York, Sept. 29, 1791; graduated in 1809 at Columbia College; was admitted to the bar, and was assistant vice-chancellor (1839–43) and judge of the superior court of New York (1853–61). He published *Office and Duties of Masters in Chancery and Practice in the Master's Office* (1824); *A Treatise on the Practice in the Court of Chancery* (1834–40, 3 vols.); *Treatise upon the Estate and Rights of the Corporation of New York as Proprietors* (1853); *Reports of Cases, Court of Chancery* (1839–40; 3d ed. 1874); *On the Law of the Protestant Episcopal Church in the United States* (1850); *Ecclesiastical Law in the State of New York*; *The Ritual Law of the Church* (1872); *Law and Practice as to References, and the Powers and Duties of Referees* (1875), etc. D. in Flushing, L. I., May 7, 1878. Revised by F. Sturges Allen.

Hoffman, Richard: pianist; b. in Manchester, England, May 24, 1831; removed to the U. S. in 1847, where he has since resided. He made an early appearance as a pianist, and for many years maintained a reputation as one of the best resident pianists in New York. He was associated with Julius Benedict in the tour with Jenny Lind in 1850, and frequently played with Benedict, Gottschalk, and others in concert tours. He has all his life been engaged in teaching in New York city, and his compositions, with few exceptions, are for the piano. D. E. Hervey.

Hoffman, Walter James, M. D.: ethnologist; b. at Weidasville, Pa., May 30, 1846. He graduated from Jefferson Medical College, Philadelphia, Pa., in 1866, and practiced his profession in Reading, Pa., until the outbreak of the Franco-German war, when he was commissioned as surgeon in the Prussian army. Upon returning home he was appointed acting assistant surgeon, U. S. army, and was attached as naturalist to the expedition for the exploration of Nevada and Arizona, Lieut. Wheeler, U. S. Engineer Corps, commanding; was ordered to the military post at Grand River agency, North Dakota, in 1872, and detailed as surgeon to the expedition commanded by Gen. Stanley for the selection along the Yellowstone river of a route for the Northern Pacific Railroad. He was detailed in charge of the ethnological and mineralogical material of the U. S. Geological Survey, under Dr. Hayden, in 1877, and at the organization of the bureau of ethnology, in 1879, was appointed assistant ethnologist. Dr. Hoffman is author of numerous contributions relating to ethnology, biology, and folk-lore. For services in medicine and science he has been ten times decorated by foreign powers. J. W. Powell.

Hoffmann, Ernst Theodor Wilhelm: writer; b. at Königsberg, Prussia, Jan. 24, 1776. He studied law, and held various judicial offices in Posen and Warsaw for some years. In 1816 he was appointed councilor of the court of judicature in Berlin, where he died July 24, 1822. His life was full of troubles and very unhappy. In his early manhood he was thrown out of his position by Napoleon's invasion, and for several years he was compelled to earn an uncertain livelihood by giving lessons in music and drawing, two arts of which he was a perfect master. He composed several operas. When he was once more reinstated in his judicial office he evinced an irritability of mind and had contracted habits which made him unfit for society. He retired from the drawing-room to the tavern, where his sparkling wit and brilliant imagination soon gathered a circle of revelers around him, and where the last of his fine gifts were as rapidly destroyed. His first book, *Phantasiestücke in Callots Manier* (1814), is a collection of essays or papers chiefly on music, and in spite of a somewhat willful singularity, both in style and ideas, they are worthy of being read. His next great work, *Elexire des Teufels* (1816), is also brilliant and powerful, though it is still more wild, weird, and eccentric. His last effort was *Lebensansichten des Katers Murr* (1821–22); but although this book is considered his chief work by many, it is really only the ruin of his mind. Among his minor novels there are many which may be considered as very good, such as *Meister Martin und seine Gesellen*, *Das Fraülein von Scudery*, *Doge und Dogaresse*, etc. Greatly overestimated at his time, he is a typical representative of the vagaries and eccentricities of the earlier Romantic school, and it is quite significant that he should have been imitated by the same school in France. See Hitzig, *Hoffmanns Leben und Nachlass*; Z. Funk, *Aus dem Leben zweier Dichter* (1836). Revised by Julius Goebel.

Hoffmann, Hans: poet and novelist; b. in Stettin, Germany, July 27, 1848; studied philology and history at Bonn, Berlin, and Halle; traveled in Italy and Greece, and became a teacher in Stettin, his native city. Since 1879 he has devoted all of his time to literature, and has produced a number of stories and novels which, by their humor and their refined artistic form, rank among the very best of contemporary German fiction. His collection of poems, *Am Wege gepflückt* (1893), also contains many gems of lyric verse. Among his novels may be mentioned *Unterm blauen Himmel*, *Von Frühling zu Frühling*, *Iman der Schreckliche und sein Hund*, *Der eiserne Rittmeister*, *Ruhm*, *Landsturm*.

Julius Goebel.

Hoffmann, Friedrich, M. D., F. R. S.: b. at Halle, Germany, Feb. 19, 1660; graduated M. D. at Jena 1681; practiced medicine with great renown at Minden and Halberstadt; became physician to the King of Prussia 1708; was Professor of Medicine at Halle 1693–1742. Hoffmann is memorable as one of the first to introduce the modern or scientific spirit into the Galenic or regular medical system of his time. His special medical theories, however, were of only temporary value, and have been long forgotten. His greatest work was *Systema Medicinæ Rationalis* (9 vols., 1718–40). Others were *Medicina Consultatoria* (12 vols., 1721–39) and other works, including five volumes of posthumous *Opuscula*. His name is perpetuated by Hoffmann's Anodyne (*q. v.*). D. at Halle, Nov. 12, 1742.

Hoffmann von Fallersleben, -fŏn-faal-ers-lā'ben, August Heinrich: poet and scholar; b. at Fallersleben, in Hanover, Apr. 2, 1798; studied at Göttingen and Bonn; became librarian in 1823, and Professor of German Language and Literature in 1830 at the University of Breslau, but was dismissed in 1842 on account of his *Unpolitische Lieder* (1840–41, 2 vols.) and banished from Prussia. For several years he led a wandering life, but settled in 1845 in Mecklenburg; was rehabilitated in Prussia in 1848 and received a pension; edited 1854–57 the *Weimarisches Jahrbuch*, and became in 1860 librarian at the Castle of Corvey. The most prominent of his linguistic and historical writings are *Horæ Belgicæ* (1830–62); *Fundgruben für Geschichte deutscher Sprache*

und Literatur (2 vols., 1830–37); *Geschichte des deutschen Kirchenliedes bis auf Luther* (1832; 2d ed. 1854); *Altdeutsche Blätter* (1835–40); *Spenden zur deutschen Literaturgeschichte* (1844); *Die deutschen Gesellschaftslieder des 16. und 17. Jahrhunderts* (2d edit. 1860); autobiography, *Mein Leben* (1868); of his poems, besides above mentioned, *Unpolitische Lieder* (1841); *Allemannische Lieder* (1843); *Soldatenlieder* (1851); *Kinderlieder* (1845); *Ausgewählte Gedichte* (8th ed. 1875). D. at the Castle of Corvey, Jan. 19, 1874. Revised by Benj. Ide Wheeler.

Hoffmann's Anodyne (*Spiritus ætheris compositus*): a valuable anodyne mixture of common ether, ethylic alcohol, and the heavy oil of wine. It overcomes spasm, pain, and nausea, and is useful to expel flatus and stop hiccough. It was named from its inventor, Friedrich Hoffmann (1660–1742).

Hö'fler, Karl Adolph Konstantin Ritter, von: historian; b. Mar. 26, 1811, at Memmingen, Bavaria; studied at Munich and Göttingen; visited Italy; became Professor of History at Munich in 1840, but was removed in 1847 on account of his *Concordat und Constitutionseid der Katholiken in Bayern*, and accepted in 1851 a chair of History at Prague. He has been a champion of the Germans as opposed to the Czechs. The most prominent of his writings are *Die deutschen Päpste* (1839); *Fränkische Studien* (1853); *Die Geschichtsschreiber der hussitischen Bewegung* (1856–65); *Papst Adrian VI.* (1880); *Abhandlungen aus dem Gebiet der slawischen Geschichte* (5 vols., 1879–83).

Hofmann, August Wilhelm: chemist: b. at Giessen, Germany, Apr. 8, 1818; studied law, and afterward chemistry under Liebig. In 1845 he became a teacher of chemistry in the University of Bonn. From Bonn he went to England to take charge of the new Royal College of Chemistry, an institution modeled after the laboratory of Liebig in Giessen. In 1853 he became Professor of Chemistry in the Royal School of Mines, still remaining at the head of the College of Chemistry; in 1864 was invited to Bonn to build a university laboratory, and became its director. In 1865 he was called to Berlin, where he remained until his death, May 5, 1892. His researches on aniline and similar bases were extraordinarily fruitful from the point of view both of pure science and of chemical industry. They led to the present conception of the constitution of aniline, so far as its relation to ammonia is concerned, and formed an important part of the foundation of what is called "modern chemistry." In 1858 he obtained fuchsine by treating aniline with carbon tetrachloride, and to the investigation of this compound he devoted many years. Founded the *Deutsche chemische Gesellschaft*. Author of *Einleitung in die moderne Chemie*.
Ira Remsen.

Hofmann-Peerlkamp, Peter: See Peerlkamp.

Hofwyl: See Fellenberg.

Hog: See Swine.

Hogarth, George: journalist and music critic; b. in England, 1783. He was educated for the legal profession; studied music as an amateur; in 1834 settled in London; became sub-editor and music critic of *The Morning Chronicle*, and in 1846 took a similar position on *The Daily News*. In 1850 he became secretary to the Philharmonic Society, and in 1862 published a history of that society from its foundation in 1813. He wrote a *History of the Opera* in two volumes (1838), and also a volume of *Musical History, Biography and Criticism* (1835). His eldest daughter, Catherine, was married to Charles Dickens, Apr. 2, 1836. Hogarth died Feb. 12, 1870. His history of the opera is entertainingly written, but not entirely to be depended upon.
D. E. Hervey.

Hogarth, William: painter and engraver; b. in London, Nov. 10, 1697, and at first apprentice to Ellis Gamble, a silver-plate engraver. While still an apprentice he engraved his first plate for printing, a business card for his master; and he was hardly out of his time and a free man before his own business card, "W. Hogarth Engraver," in a very well-designed frame in the taste of the time, and dated "Aprill ye 23, 1720," showed that he intended at first to follow the trade he had learned, and engrave ornamental designs on silver vessels and the like. But he had a chance to engrave illustrations for one or two books, and then in 1724 appeared the first of his many satirical prints, *Masquerades and Operas*. In this are shown crowds at the gate of the opera-house, of the pantomime, of a juggler, and another crowd helped by the devil in person into the building where a masquerade is to be held, while a wheelbarrow full of books, lettered with the names of the great English dramatists, is being trundled away for sale to the shops as waste-paper. Beyond is the gate of Burlington House, lettered "Accademy of Arts," and upon its summit is a statue entitled "W. Kent," the name of a not wholly despicable painter, gardener, architect, and general utility man in high favor just then, while seated statues of Raphael and Michelangelo serve as pendants. It is an awkward design, but Hogarth had already learned to draw men and women in movement, and to compose a crowd, which not every painter can do. About 1726 he began to paint seriously in oil, giving the reason for this in his remarks about the stealing of his designs by publishers, who copied his prints with but slight changes, and sold these copies instead of his own works. His early paintings were nearly all groups and scenes of several persons in each. Before 1731 he had completed the six important pictures of *The Harlot's Progress*, and in that year he exhibited them, issued his engraved ticket to subscribers for the prints, received nearly 1,200 names, and began the engraving, which he did entirely with his own hand, as it appears. The invasion of his rights as designer was in great part remedied by a bill which passed Parliament in 1735, and which was in a great measure obtained by Hogarth's efforts. Meantime the eight pictures of *The Rake's Progress* had been painted, exhibited, and engraved; his subscription ticket this time was the well-known *Laughing Audience*; there were many subscribers, and the prints were ready in the summer of 1735. About the same time his father-in-law, Sir James Thornhill, having died, the art school of that painter came into Hogarth's hands; out of it there grew a society for art study with classes for study of the living model, and this flourished and was useful until made unnecessary in 1762 by the newly established schools of the Royal Academy.

Hogarth painted some religious pictures and some portraits about this time; in 1740 the admirable portrait of Capt. Coram, chief organizer of the London Foundling Hospital, in which institution that fine head, with the immortal *March to Finchley*, and two large paintings of biblical subjects are still to be seen. The set of *Morning*, *Night*, *Noon*, and *Evening*, with admirable studies of out-of-door life in London, the *Strolling Actresses Dressing in a Barn*, the *Enraged Musician*, and the *Distressed Poet* belong to this time, and then followed what is often called his masterpiece, the set of the *Marriage à la Mode*. All the original pictures are preserved, except the *Actresses*, which was burned many years ago; the six pictures of the *Marriage* are in the National Gallery in London, together with a portrait of Hogarth by himself, with a dog beside him, a portrait of Simon Fraser, Lord Lovat, and one of Mary Hogarth—all these being works of this his best time. All these pictures were engraved, and the prints sold readily. He was fifty years old, and in comfort as a worthy citizen of London, but his diligence and vigor never flagged, and he produced in rapid succession *Calais Gate* (1749); the *March to Finchley*, in which he made admirable fun of the confusion attending the breaking up of a camp, as he had seen it when the Guards began their march toward Scotland at the coming of the Young Pretender in 1745; and *The Election*, four pictures of the abuses and oddities of a parliamentary election contest. All these were engraved, and some large satirical prints were issued of which no paintings are known; moreover, a great number of small studies, subscription tickets, book-plates, and the like were published.

There are two points of view from which Hogarth should be especially studied—(1) as an original engraver (see Engraving), à *peintre-graveur*, if there ever was one; and (2) as one of the first of those men who have been at once artists in the technical sense, careful of and successful in the use of color, and historians or chroniclers, great at the telling of a tale. His methods as a painter were excellent, his work has endured the test of time, and is generally well preserved; and it is most worthy, sound, and meritorious. His power of story-telling, his handling of a busy and moving crowd, his gift at telling and appropriate detail, his satiric and humorous insight are all unsurpassed. The prints are of endless interest from their subject, and those of them which are from his own engravings show a strong and capable touch as an engraver; but to study his work in the original paintings is to gain a lesson in the combination of fine art with description, narrative, and satire hardly to be matched elsewhere.

Hogarth died Oct. 25, 1764. His most important works

have been named above. Small engraved copies of the greater number of his compositions have been made, and have been republished frequently. Nichols & Stevens's *The Genuine Works of William Hogarth* (3 vols., 1808–17) contains 240 of these octavo-size prints. Mr. Austin Dobson, who wrote the article *Hogarth* in the *Encyclopædia Britannica* and that in the *Dictionary of National Biography*, has expanded the latter article into a volume, *William Hogarth* (1891), containing eleven photogravures and about forty other illustrations. RUSSELL STURGIS.

Hoge, hōg, MOSES DRURY, D. D., LL. D.: a minister of the Presbyterian Church South; b. in Hampden-Sidney, Va., Sept. 17, 1819; educated in the College and Union Theological Seminary of Hampden-Sidney; was assistant pastor of the First Presbyterian church of Richmond 1843–45, and has since, from its organization, been the pastor of the Second Presbyterian church of the same city. In 1864 he ran the blockade from Charleston, and procured from the British Bible Society a grant of some 300,000 copies of the Scriptures for the Confederate soldiers. He was moderator of the General Assembly (South) at St. Louis in 1875; a delegate to the international meetings of the Evangelical Alliance in New York (1873) and Copenhagen (1884); to the national meeting in Boston (1889); and to the councils of the Reformed Churches (Pan-Presbyterian) in Edinburgh (1877) and in London (1888). In 1890 services were held commemorating his forty-five years of service, and a commemorative volume published.
CHARLES KIMBALL HOYT.

Hogg, JAMES: "the Ettrick Shepherd"; poet; b. in Ettrick parish, Selkirkshire, Scotland, Jan. 25, 1772; followed his ancestral occupation of shepherd, and several times attempted, with poor success, to gain a living as a farmer on his own account. His school education was very slight, but he was a great reader, and when twenty-four years old began to compose songs, some of which attracted much attention and gave him a local fame. In 1801 he published *Scottish Pastorals, Poems and Songs*, followed by *The Mountain Bard* (1803); became in 1810 editor of *The Spy*, a journal in Edinburgh. Here he was the associate of Scott, Wilson, and the other Tory men of letters, and a frequent contributor to *Blackwood*. His figure in the *Noctes Ambrosianæ* did not please him, but it added to his fame. In 1817 the Duke of Buccleugh settled him upon the farm of Altrive, where his unlucky business ventures brought him many troubles; but here he lived for the greater part of his remaining years, engaged mainly in literary work, varied by field-sports, of which he was very fond; and here he died Nov. 21, 1835. His best work, *The Queen's Wake* (1813), was followed by a large number of volumes of prose and verse of very unequal merit. Revised by H. A. BEERS.

Hogg, QUINTIN: English philanthropist; son of Sir James Weir Hogg, Bart.; b. Feb., 1845; educated at Eton. On leaving school he became interested in homeless boys in London, and began with humble apartments in the Strand, which he shared with six or eight lads. He greatly increased his work, and built up the Youths' Christian Institute, which, on the purchase of the old Polytechnic in Regent Street, 1880, became known as the Polytechnic, and had in 1891 a membership of 12,000. Mr. Hogg has expended over $500,000 in his work. C. H. T.

Hogg, WILSON THOMAS: a minister and officer of the Free Methodist Church; b. at Lyndon, Cattaraugus co., N. Y., Mar. 6, 1852; educated at Franklinville, N. Y., and Ten Broeck Free Academy; joined the Genesee conference 1873, and served several pastorates in Buffalo and other leading churches of Western New York till 1893; elected president Greenville College, Greenville, Ill., 1893. Was elected general superintendent Apr. 4, 1893. Has published *Handbook of Homiletics and Pastoral Theology* (1887) and *Revivals and Revival Work* (1890). ALBERT OSBORN.

Hog-gum, or **Gum Hog**: a variety of Bassora gum, used in preparing paper for the marbling process. The hog-gum of the West Indies, used in medicine and for paying boats, is furnished by various trees of the genera *Clusia* and *Moronobea*, and perhaps by *Rhus metopium* and *Helwigia balsamifera*.

Hog-plum: the fruit of *Spondias lutea, tuberosa, purpurea*, and *Mombia* of Brazil and the West Indies, so called because hogs are fed upon the abundant and rather agreeable fruits. The fruit of *S. birrea* of Senegal and Abyssinia yields an intoxicating drink. That of *S. dulcis* or *Poupartia*, which grows in the Society islands, is very delicious. Several of the above and other species have medicinal qualities. They belong to the family *Anacardiaceæ*.

Hogshead [M. Eng. *hoggeshed*, orig. meaning, however, *ox-head*; cf. Low Germ. *okshoofd*, Swed. *oxhufvud*]: in wine-measure half a pipe, or 63 wine-gallons. In beer-measure a hogshead contains 54 beer-gallons. The first kind contains 52½ imperial gal., nearly; the second about 55 imperial gal. Any large cask is in popular language called a hogshead. In the U. S. a hogshead of tobacco weighs from 750 to 1,200 lb., varying in the different States.

Hohenlohe, hō'en-lō-*e* [Germ., cf. M. H. Germ. *hôch*, high + *lôh*, thicket, brush]: name of a princely family of Germany, sprung from Franconia, where the Castle of Holloch was the family seat; since the twelfth century the possessors of this castle have called themselves lords of Holloch. They acquired much landed property, became counts, and branched off into various lines. In 1776 the Counts of Hohenlohe were created princes of the empire. The family comprises two principal lines—Hohenlohe-Neuenstein and Hohenlohe-Waldenburg, of which the former is subdivided into the lines of Hohenlohe-Langenburg and Hohenlohe-Oehringen, the latter into those of Hohenlohe-Bartenstein and Hohenlohe-Schillingsfürst; these lines consist furthermore of many branches. The following members of the family are known to history: (1) FRIEDRICH LUDWIG, Prince of Hohenlohe-Ingelfingen, Prussian general, b. 1746; d. 1818. He is famous for the capitulation at Preuzlau, Oct. 28, 1806, where, having received the command of the Prussian army after the Duke of Brunswick, who was wounded in the battle of Jena, he made 17,000 men lay down their arms. (2) LUDWIG ALOYSIUS, Prince of Hohenlohe-Waldenburg-Bartenstein, b. 1765; d. 1829. He distinguished himself in the French, Dutch, and Austrian services as an able officer, fighting on the side of the allies against the revolutionary government of France and Napoleon, but after the restoration entered the service of Louis XVIII. and became marshal and peer of France. (3) ALEXANDER LEOPOLD FRANZ EMMERICH, Prince of Hohenlohe-Waldenburg-Schillingsfürst, b. 1794; d. 1849. He was educated by the Jesuits, became a priest, wrote mystical books, attracted swarms of believing patients, and had great fame as a healer of the sick by miraculous power. At the time of his death he was Bishop of Sardica *in partibus*. (4) CHLODWIG KARL VICTOR, Prince of Hohenlohe-Waldenburg-Schillingsfürst, ambassador of the German emperor to France; b. Mar. 31, 1819. He entered the Bavarian service, pursued a national policy, worked with success for a good understanding between Prussia and Bavaria, and became president of the Bavarian ministry in 1866. He did much for the unity of Germany, especially as vice-president of the German Zoll-Parliament of 1868 and 1869. But the anti-union party in Bavaria became so hostile that he resigned his office a short time before the Franco-German war broke out. After the war he voted for the incorporation of Bavaria in the empire, and in general was a supporter of Bismarck's policy. In 1874 the German emperor appointed him ambassador to the French Government. In 1883 he was appointed governor of Alsace, where he exerted himself to hasten the Germanization of the country.
Revised by F. M. COLBY.

Hohenstaufen, hō'en-stow-*fen* [Germ., cf. M. H Germ. *hôch*, high + *stouf*, cliff, rock; cf. Eng. *steep*]: the name of a princely family in Germany which arose in the middle of the eleventh century, bore the imperial crown from 1138 to 1254, and died out in the latter part of the thirteenth century. The founder of the family was Friedrich von Büren, who in the middle of the eleventh century moved his residence from Büren, a place in the valley, on the bank of the Danube, in the present kingdom of Würtemberg, to the Castle of Hohenstaufen, situated on the brow of the hill. With the change of residence changed also the name of the family. Friedrich von Büren's son, FRIEDRICH VON STAUFEN or HOHENSTAUFEN, followed Henry IV. as his true knight, and distinguished himself so much by valor and military talents, especially in the battle of Merseburg (1080), that the king made him Duke of Suabia, gave him his daughter Agnes in marriage, and appointed him regent in Germany during his absence in Italy. By this rapid rise the family of Hohenstaufen (also called by the Italians *Ghibellines*, from another of their possessions, the Castle of Weiblingen) could not help coming into collision with the powerful family of the Welfs or Guelphs, which in Germany held the dukedom of Bavaria, besides large possessions in Italy. On the death of Frederick

in 1105 he left two sons, of whom the elder, Frederick II., was confirmed as Duke of Suabia by Henry V., and the younger created Duke of Franconia in 1112. Both the brothers adhered with great fidelity to the emperor, and when, in 1125, the Franconian dynasty died out with Henry V., the family of Hohenstaufen inherited a large part of the emperor's private fortune, which greatly increased its wealth and power. Frederick II. even attempted to obtain the imperial dignity, but failed. Lothair the Saxon, an enemy to him and his family, was chosen emperor, and at one time the Hohenstaufens were pressed so hard that they had to sue for peace at the diet of Mühlhausen in 1135. Nevertheless, on the death of Lothair in 1138, Frederick II.'s brother, Conrad, Duke of Franconia, succeeded in being elected emperor, and the family held the dignity for more than a century in the persons of Conrad III., 1138–52; Frederick I. Barbarossa, 1152–90; Henry VI., 1190–97; Philip, 1197–1203; Frederick II., 1212–50; Conrad IV., 1250–52. The characters of these men, whose biographies are in this cyclopædia, were conspicuous for vigor and energy, tending toward despotism, but generally allied with magnanimity and many brilliant qualities. The most prominent feature of their reign was their perpetual contest with the Guelphs and the popes, during which, however, the poetry and art of German chivalry reached their highest perfection. See Raumer, *Geschichte der Hohenstaufen* (5th ed. 1878).

Revised by C. K. Adams.

Hohenzollern, hō'en-tsōl-ern: a small territory of Germany, entirely inclosed by Würtemberg and Baden, but belonging to Prussia. Its area is 453 sq. miles; it is mountainous, but fertile, drained by the Neckar and the Danube. Until 1849 it formed two independent principalities, Hechingen and Sigmaringen, which represent the elder line of the house of Hohenzollern, while the younger line is represented by the reigning dynasty of Prussia. In 1849 the King of Prussia bought the sovereignty of the country by paying the two princes an annual pension. Pop. (1890) 66,085.

Revised by C. K. Adams.

Hohenzollern: name of a princely family of Germany, from which the present imperial dynasty is descended. It traces its origin back to one Thassilo of Burchardinger, who is thought to have built the Castle of Zollern near Hechingen about the beginning of the ninth century. The early history of the line is obscure, but in the latter part of the twelfth century Count Frederick III. brought the family into notice by the prominent part that he took in the councils of the court. By marrying the heiress of the Burgrave of Nuremberg he secured the inheritance to the burgravate. His sons, Conrad III. and Frederick IV., succeeded to the joint possession of his titles and estates, and founded respectively the Franconian and the Suabian lines. The Suabian line separated in 1576 into two branches—Hohenzollern-Hechingen and Hohenzollern-Sigmaringen. The former was raised to the princely rank in 1623 by the Emperor Ferdinand II. In 1695 a covenant of inheritance was concluded between the two branches of the Suabian line and the younger or Frankish line, which had assumed the name of Brandenburg. Hermann Friedrich Otto, sovereign Prince of Hohenzollern-Hechingen, joined in 1806 the Rhenish confederation. Prince Frederick William Constantine, on failing to suppress the political disturbances of 1848–49, concluded a treaty with Prussia by which he transferred his sovereignty to the Prussian crown. On his death in 1869 the male line of Hohenzollern-Hechingen became extinct. The branch of Hohenzollern-Sigmaringen obtained the princely dignity in 1638, joined the Rhenish confederation in 1806, became allied to the imperial house of Napoleon by the marriage of Prince Carl with the daughter of Murat, King of Naples, and ceded its sovereignty to Prussia in consequence of the revolution of 1849. The princes of this branch, however, have since been prominent in European politics. Leopold, through his claim on the Spanish throne, became the occasion of the Franco-German war. His brother Karl was chosen King of Roumania in 1881. The younger line, the Franconian, generally named after its chief possession, the burgravate of Nuremberg, obtained the princely dignity in 1273 from the Emperor Rudolf. Frederick VI., Burgrave of Nuremberg, bought the margravate of Brandenburg from the Emperor Sigismund in 1415, and was created Elector of Brandenburg. In 1511 Albert of Brandenburg was chosen grand master of the Teutonic Knights, and in 1525 was acknowledged Duke of Prussia. Frederick William, the Great Elector (1640–88), gave the country political influence, acquired new provinces, and left at his death a state with 1,500,000 inhabitants. His son, Frederick III., attained the royal dignity, and was crowned Jan. 18, 1701, in Königsberg as Frederick I., King of Prussia. He was followed by the thrifty Frederick William I.; then Frederick II., the Great, who left his state with 6,000,000 inhabitants; then Frederick William II.; then Frederick William III., who was defeated by Napoleon, but regained his country; then his son, Frederick William IV.; then his younger son, William, who became William I., Emperor of Germany, Jan. 18, 1871. He was succeeded by his son (Frederick III.) Mar. 9, 1888, and the latter by his son (William II.) June 15, 1888.

F. M. Colby.

Hoihow (the Cantonese pronunciation of Chinese *Hai-K'ow*, seaport): the principal port of Hainan (*q. v.*), situated in the northeast part of the island at the head of a shallow bay which extends inland about 3 miles. It is the port of K'iung-chow-foo, the capital of Hainan, opened to foreign trade in 1876. The trade is chiefly with Hongkong and the southern ports of China. The exports amounted in 1892 to 1,002,304 taels, or about $1,052,104 U. S. gold, and the imports (cotton and woolen goods, opium, metals, medicines, etc.), mostly from Hongkong, to 861,773 taels, or about $904,861 U. S. gold. Indian yarn constitutes nearly 39 per cent. of the total value of imports.

R. L.

Ho'jo: name of the most powerful family in Japan during the century 1490–1590. Succeeding to the power of the Ashikaga dynasty, which had ruled at Kamakura, the Hojo family established themselves at Odawara, 24 miles to the W. The capture of this castle by Hideyoshi in 1590 overthrew their power, and Yedo (Tokio) became the new military capital.

J. M. D.

Hok-chiu: See Fuh-chow.

Hok'usai, Katsushika (1760–1849): a famous Japanese painter and draughtsman, held in particularly high esteem by foreign artists.

J. M. D.

Hol'bach, Paul Henri Thiry, Baron d': b. at Heidelsheim, in the Palatinate, in 1723. He went at an early age to Paris, where he married and spent his whole life. D. Jan. 21, 1789. His father had left him a large fortune, and in his rich and elegant house he gathered, with the greatest hospitality, a large circle of literary men, chiefly of the group of Diderot and the Encyclopædists. The baron himself was a man both of knowledge and talent, and a very prolific author. His first original works (he had already translated into French several German scientific books and written many scientific articles for the *Encyclopédie* of Diderot), *Le Christianisme dévoilé* (Amsterdam, 1767), *Esprit du Clergé* (London, 1767), and *De l'imposture sacerdotale* (Amsterdam, 1767), made an attack on Christianity more open, direct, and vehement, and also more skillful, than any to which it hitherto had been exposed. In a second series of writings, *Le système de la nature* (London, 1770), *Le bon sens, ou idées naturelles opposées aux idées surnaturelles* (Amsterdam, 1772), and *Le système social* (Amsterdam, 1773), he gives the positive, systematic development of those materialistic and atheistic views which in the first series are given under the form of criticism only. His style is dry or sentimental, affected or trivial. But his influence was great. He reached layers of society to which philosophy never before had penetrated, and his cynical ideas are often recognizable during the first years of the Revolution. He wrote his books under different pseudonyms, and for a long time even his most intimate friends knew nothing of his authorship. See Avezac-Lavigne, *Diderot et la société du Baron Holbach* (Paris, 1875).

Revised by A. R. Marsh.

Holbein, hōl'bīn, Hans, called The Younger: painter; b. at Augsburg, Bavaria, in 1497, or perhaps even a few years earlier; received his first instruction from his father, a painter of some note. The days of his youth were spent in Basel, and as early as 1512 his brilliant talent had attracted great attention, and he received large orders both for private houses and public buildings. Erasmus admired his work, and with a letter of introduction from him to Sir Thomas More he went to England in 1526. After living three years in More's house, he was introduced to the king, and Henry VIII. was so charmed by his pictures that he made him court painter and heaped both honors and money on him. D. in London, Nov., 1543, of the plague. In accuracy of drawing, in truth and richness of coloring, Holbein surpassed all contemporary painters in Germany, and stands, indeed, among the greatest painters of the world.

His portraits especially are excellent, and he produced a great number, which are scattered among all the larger European galleries. He painted a portrait of Erasmus which the latter preferred to the one engraved by Dürer. One of his finest pictures is the portrait of his friend and patron, Boniface Amerbach, who made the collection of Holbein's drawings and paintings now at Basel. While in England, Holbein painted or drew not only the king, but his queens, Jane Seymour and Anne of Cleves, Prince Edward, and nearly every distinguished nobleman and noblewoman of his court, besides distinguished commoners. These pictures and drawings are a splendid possession alike for art and for history; a collection of about ninety drawings is in Windsor Castle. Holbein worked for the engravers, but to what extent is not precisely known. Two important series of wood-cuts—*The Dance of Death* (see DANCE OF DEATH) and *Pictures from the Old Testament*—are ascribed to Holbein. One of the most famous pictures by Holbein is the *Madonna of the Meyer Family*, in the gallery of Dresden. This is, however, believed to be a copy, probably by Holbein's own hand, of the original in the palace of the Dukes of Darmstadt. Many of Holbein's best pictures have been engraved, and nearly all his finest drawings photographed, the last chiefly by Braun. See *Hans Holbein der jüngere*, by Ulrich Hegner (Berlin, 1827), a well-executed, useful work, which only needs revision to take its place among the standard books on the subject; *Holbein und seine Zeit*, by Alfred Woltmann (Leipzig, 1867, 2 vols. and appendix; 2d ed. 1 vol., 1874), a book absolutely necessary to the student for its facts, but ill-arranged, and, critically, little to be depended on—the second edition is full of contradictions of the first; a translation of Woltman's book by Cundall (London, 1879); *Life and Works of Holbein*, by R. N. Wornum (1 vol., London, 1867), almost useless from its want of arrangement, its slipshod style, and its want of the critical spirit.

Revised by RUSSELL STURGIS.

Holberg, LUDVIG: dramatist; b. in Bergen, Norway, Dec. 3, 1684; studied at the University of Copenhagen, traveled extensively in Holland, France, Germany, Italy, and stayed for nearly two years in England, most of the time studying at the University of Oxford; was in 1717 appointed professor at the University of Copenhagen; accumulated considerable wealth, which he bequeathed to an educational institution, the Academy of Sorö; was created a baron in 1747. His sound, practical ideas, and clear, solid reasoning, sustained by learning and seasoned by humor, made his works on history, *Danmarks Riges Historie* (History of Denmark, i.–iii., 1732–35); *Almindelig Kirkehistorie* (Ecclesiastical History, 1738); *Store Heltes og berömmelige Mœnds sammenlignede Historier* (Lives of Great Men and Heroes Compared, 1739); *Heltinders og navnkundige Damers sammenlignede Historier* (Lives of Great and Famous Women Compared, 1745); *Jödefolkets Historie* (The History of the Jewish People, 1742); and on philosophy, *Epistler* (Epistles) and *Moralske Tanker* (Moral Meditations, 1744), a most influential agent in Danish civilization. The greatest influence, however, on Danish literature was exerted by his comic writings. In 1719 his *Peder Paars*, a comic epopee, celebrating the adventures of Peder Paars, the shopkeeper, on his voyage from Kallundborg to Aars, appeared. With cutting satire Holberg in this poem, in stately alexandrines, derided the snobbishness and ignoble ambitions that ruled supreme almost everywhere in Denmark in those days. The poem caused a great sensation, and made him a great many enemies in influential quarters. It is still read, and is considered a classical work in Danish literature. The first of Holberg's comedies, *Den politiske Kandestöber* (The Political Pewterer), appeared in 1722, shortly after the opening of the Danish theater in Copenhagen. That very year he produced four new comedies, the following year ten more, and before the end of 1725 he had written some twenty odd plays. Among these comedies may be mentioned, as having more than the others retained their popularity up to the present time, *Jeppe paa Bjerget*, *Erasmus Montanus*, *Jakob v. Thyboe* (compare Miles Gloriosus), *Den Stundeslöse* (The Busy Trifler), *Barselstuen* (The Lying-in Room). Holberg's comedies are the chief products of his genius, and have had an influence on Danish and Norwegian civilization as hardly any other man's writings. He made use of many characters and subjects borrowed from Molière, Plautus, Terence, and Aristophanes, but he nationalized them all, so the Danish public in his characters found themselves as in a mirror, with all their more or less amiable follies. Holberg's comedies are still regularly acted on the Danish and the Norwegian stage. The satire has lost its sting, but the humor acts with still undiminished force on the mind of young and old. An intermediate position between Holberg's comical productions and his moralizing writings is held by his "moral novel," *Nicolai Klimii iter subterraneum* (1741), written in Latin, describing the adventures of a young student from Holberg's native city, Bergen, on a trip through the interior of the earth. Holberg in this book discusses, with thoroughness and good sense, a great many questions of social, religious, and ethical interest. D. Jan. 28, 1754.

P. GROTH.

Holcombe, JAMES PHILEMON: lawyer and author; b. in Lynchburg, Va., in 1820; was educated at Yale College and the University of Virginia; Professor of Law in University of Virginia 1852–60; was member of the Confederate Congress 1861–63; was principal of a high school from 1868–73. Besides many magazine articles, he was the author of *Introduction to Equity Jurisprudence* (1846); *Leading Cases upon Commercial Law* (1847); *Digest of Decisions of the United States Supreme Court* (1848); *Merchants' Book of Reference* (1848); *Law of Debtor and Creditor in the United States and Canada* (1848); *Literature and Letters* (1868). D. in Capon Springs, Va., Aug. 26, 1873.

Revised by F. STURGES ALLEN.

Holcroft, hōl'krŏft, THOMAS: dramatist; b. in London, Dec. 10, 1745; a shoemaker's son; served for a time as a stable-groom at Newmarket; became an actor, and then an author; was arrested for high treason in 1794, being a member of the Society for Constitutional Information, but was released without trial. Author of thirty plays, besides novels, poems, translations, etc., some of which are of an irreligious tendency. His noteworthy works are *The Road to Ruin*, a comedy (1792), still popular; *The Life of Trenck* (1788), from the German; *Hermann and Dorothea* (1801), translated from the German of Goethe; *Memoirs* by himself, finished by Hazlitt (3 vols., 1816). D. Mar. 23, 1809.

Hold: a musical character 𝄐, placed over a note, signifying a pause, or the holding of the note longer than its proper time. The hold may also be placed over a rest or a double bar, or as an indication of the end of a canon or other piece.

Holden, hōl'den: city; Johnson co., Mo. (for location of county, see map of Missouri, ref. 4–E); on the Mo. Pac. Railway; 40 miles W. of Sedalia, 50 miles S. E. of Kansas City. It is in an agricultural and stock-raising region, and contains 10 churches, 2 public schools, water-works, 2 hotels, 2 elevators, a flour and 2 grist mills, fair-grounds of 40 acres with race-track, St. Cecilia's Seminary, several manufactures, and a weekly newspaper. Pop. (1880) 2,014; (1890) 2,520.

EDITOR OF "ENTERPRISE."

Holden, EDWARD SINGLETON, B. S., A. M., LL. D.: astronomer; b. in St. Louis, Mo., Nov. 5, 1846; educated at Washington University, St. Louis, where he was a pupil of Prof. Chauvinet (graduated 1866), and at West Point, where he graduated in 1870. He was appointed lieutenant in the Corps of Engineers. In 1873 he was appointed Professor of Mathematics in the navy, and assigned to duty at the naval observatory as assistant to Prof. Newcomb with the 26-inch telescope, which had just been mounted. In 1878 he had charge of the U. S. eclipse expeditions to Colorado. In 1881 he resigned his naval position to become director of the Washburn observatory, and Professor of Astronomy in the University of Wisconsin. In 1883 he had charge of the U. S. eclipse expedition to the South Pacific Ocean. In 1886 he was appointed president of the University of California, and in 1888 became director of the Lick observatory. In 1877 he took an active part in interpreting the famous cipher dispatches in the presidential campaign of the preceding year. He has published *Astronomy for Students*, with Prof. Simon Newcomb (New York, 1880); *Sir William Herschel; his Life and Works* (New York and London, 1881); *Handbook of Lick Observatory*; publications of the Washburn observatory (5 vols.); of the Lick observatory (1 vol.); and numerous memoirs on astronomical subjects.

S. NEWCOMB.

Holden, HUBERT ASHTON, M. A., LL. D.: clergyman and classical commentator; b. in Staffordshire, England, in 1822; educated at King Edward's School, Birmingham, and at Trinity College, Cambridge; tutor from 1848–53; head master of Ipswich School from 1858–83; fellow of the University of London, in which he had been classical examiner, 1869–

74 and 1886–90. He is especially noted as the editor of excellent exegetical commentaries to Cicero's *de officiis*; *Pro Plancio*; *Pro Sestio*; Xenophon's *Cyropædia* and *Œconomicus*; *Octavius* of Minucius Felix, and to a number of Plutarch's *Lives*—viz., the *Gracchi*, *Sulla*, *Timoleon*, *Themistocles* (2d ed. 1884); *Nicias*, and *Demosthenes* (1893).

ALFRED GUDEMAN.

Hölderlin, JOHANN CHRISTIAN FRIEDRICH: poet; b. at Lauffen on the Neckar, Germany, Mar. 20, 1770; studied at Nürtingen, where he became intimate with Schelling; continued his studies at Denkendorf and Maulbroun; was sent to the University of Tübingen in 1788 to study theology, but devoted himself to philosophy and poetry, and made the acquaintance of Schiller, who found him congenial and published some of his poems in *Thalia*. In 1796 he obtained a position as tutor in the family of a banker in Frankfort, and in the course of two years wrote two volumes of *Hyperion, oder der Eremit in Griechenland* (1797–99), in which he extolled the beautiful and accomplished wife of his employer in the heroine "Diotima." Resigning his tutorship he lived for a while with his devoted friend Sinclair, and wrote the fragments *Agis* and *Empedocles*. Meanwhile the burden of life grew too heavy for the sensitive poet to bear and he became insane. See Kelchner, *Friedrich Hölderlin und seine Beziehungen zu Homburg v. d. Höhe* (1883). D. in Tübingen, June 7, 1843.

Holding-note: in musical compositions of two or more parts, a note sustained or prolonged in one of the parts while the others are in motion. In fugues, and in adagio, andante, and legato movements, holding-notes are of constant occurrence, and give unity, compactness, and a binding effect to the general texture of the harmony.

Holdredge: city (founded in 1883); capital of Phelps co., Neb. (for location of county, see map of Nebraska, ref. 11–E); on the Burl. and Mo. River Railroad; 150 miles W. of Lincoln, 300 miles E. of Denver. It contains 7 churches, 2 public schools, water-works, electric lights, 3 national banks, 5 hotels, board of trade, shops of the Burl. and Mo. River Railroad, and 1 semi-weekly and 3 weekly newspapers. Pop. (1890) 2,601; (1893) estimated, 3,400.

EDITOR OF "NEBRASKA NUGGET."

Holguin: a city in the eastern part of Cuba; about 62 miles N. N. W. of Santiago, and 20 miles S. S. W. of the port of Jibaro (see map of West Indies, ref. 4–E). It is built on a fertile plain by a small river, and is the center of a rich agricultural district, exporting tobacco, maize, cattle, and timber. Holguin was settled in 1720, and received a city charter in 1751. Pop. (1893) about 9,000. H. H. S.

Holiday: literally, a holy day; that is, a day set apart to holy or religious uses and observances (see FEASTS), and hence any day set apart for relaxation or exemption from the ordinary cares and toil of life, either in commemoration of some event or for pleasure and rejoicing; and hence, in law, any day on which one or more legal obligations, as attendance upon court, service of notices, protesting of notes, etc., are remitted. Holidays being designated in old calendars by red letters are often called red-letter days. For the sake of distinction these days are often called *legal holidays* or *public holidays*.

Legal Holidays.—In the wide sense of the term Sunday is a legal holiday, but the law with regard to contracts and the performance of judicial and ministerial duties upon Sunday is so different from that of other legal holidays as to necessitate a separate treatment.

Sunday.—One or two laws forbidding secular pursuits on Sunday were passed in England before it became Protestant, but the principal statute regulating the matter in England is that of 29 Charles II., c. 7, in which it was enacted that "no tradesmen, artificers, workmen, laborers, or other person whatsoever shall do or exercise any worldly labor, business, or work of their ordinary callings upon the Lord's day or any part thereof (works of necessity and charity only excepted)."

At the common law, no judicial act performed on Sunday was valid, but all contracts and all other acts not of a judicial nature were of the same effect as if performed on any other day. The statute above mentioned makes all acts performed contrary to it by the persons mentioned in it illegal, but the courts of England have held that the words "any other person whatsoever" were not intended to extend its application to any others than those mentioned, and that any contract made by a person *out* of his ordinary calling is valid. What is a work of necessity or charity (mercy) must be decided according to the circumstances of each case. Most of the U. S. have Sunday laws which forbid the doing of any but works of "necessity and mercy" upon Sunday, and under them *all* acts are void which are not works of necessity or mercy. When a note falls due upon Sunday, it is payable upon the following Monday, and this rule applies to all analogous cases of contract both in the U. S. and in Great Britain.

Other Holidays.—Holidays other than Sunday are entirely statutory, and all acts are valid, whether judicial or otherwise, unless expressly or by necessary implication declared invalid in the creating statute. The purpose for which they are usually created are to give exemption from the obligation to perform certain acts, such as the protesting and giving notice of dishonor of notes (*bank holidays*), attendance upon court (*court holidays*), etc. In the case of these holidays a note falling due upon them is payable upon the day previous unless otherwise provided in the statute, either expressly or by necessary implication.

Persons can not be compelled to attend to legal business upon a legal holiday, as, for example, at court, at a sheriff's sale, etc. An employee who is hired by the week, month, or year who works on a general legal holiday at his employer's request can recover extra remuneration; but a day declared a legal holiday for banking purposes, or the like, is not thereby made a general legal holiday. The legal holidays besides Sundays in the U. S. are the Fourth of July (observed in all the States), and generally Christmas, Thanksgiving Day (appointed by the President and the Governors), New Year's Day, Washington's birthday, Decoration Day, Labor Day, and the general election days. Besides these special days or parts of days may be made holidays; thus in New York Saturday is a bank half-holiday.

In England the office holidays of the Supreme Court are Good Friday, Monday and Tuesday in Easter week, Whit-Monday, Christmas Day and the next following working day, and days appointed by proclamation for fasting, thanksgiving, and humiliation. The *bank holidays* are in England and Ireland Easter Monday, the Monday in Whitsun-week, the first Monday in August, and Dec. 26 (or, if this be a Sunday, the day following); in Scotland, New Year's Day, Christmas Day (or, if either be a Sunday, the day following), Good Friday, the first Monday of May, and the first Monday of August. F. STURGES ALLEN.

Hol'inshed, RAPHAEL, or RALPH, M. A.: an English chronicler who died between 1580 and 1584. Almost nothing is known of his life, but his fame is perpetuated by the *Chronicles of England, Scotland, and Ireland* (2 vols. fol., 1577). Of this he was not the sole author, for Harrison, Stow, Fleming, and others prepared large portions.

Hol'kar: the name of a family of Mahratta chieftains who have played a conspicuous part in the history of India during the last two centuries, and often proved themselves formidable enemies of the British empire in Hindustan. Mulhar Rao Holkar was the founder of the family. He was born in 1693; received in 1736 the western part of Malwah, with Indor for its capital; and died 1765. But the most remarkable member of the family was Jeswunt Rao Holkar, a natural son of Tokhagi Holkar, who reigned from 1801–11. Although he was defeated at Indor (Oct. 14, 1801) by Dowlat Rao Sindia, his reputation for valor and energy was so great that a part of the victorious army went over to his side, and next year (Oct. 25, 1802) he entirely routed Sindia at Poona. Sindia took refuge with the British, and now a war began between Holkar and the British which was carried on with various success to Dec. 24, 1805, when peace was concluded and Holkar compelled to give up some maritime districts, and bind himself to take no Europeans into his service. He died insane, and was succeeded by his son, Mulhar Rao Holkar, who reigned from 1811 to 1833. He began war against the British in 1817, but was defeated, and under the peace of Jan. 6, 1818, a British residency was established at Indor. The present ruler of INDOR (*q. v.*), Mulkerji Rao Holkar, who came into power in 1852 and remained true to the British in 1857, is not of the Holkar family, though he bears the name; with Kumdi Rao Holkar the family died out in 1852.

Holl, FRANK: portrait and genre painter; b. in London, July 4, 1845; pupil of his father, F. Holl, engraver, and of the Royal Academy; won a gold medal there in 1869 for his *Sacrifice of Abraham*, and a traveling scholarship in 1871 for his picture called *The Lord Giveth and the Lord hath*

Taken Away; Royal Academician 1883. He was an excellent portrait-painter, and was the most successful man in England in this branch of art at the time of his death, with the single exception of Sir John Millais. D. in London, July 31, 1888. WILLIAM A. COFFIN.

Holland [:Germ., Dan. *Holland*, from Dutch *Holland*, for older *Holtland*, liter., *woodland*; *holt*, wood, woods + *land*, land], **North** and **South**: two provinces forming the northwestern part of the Netherlands, adjacent and similar in natural and social relations. The ground is very low, and must be protected against inundations of the North Sea and the Zuyder Zee by artificial dams and dikes. It is everywhere intersected by rivers, the Rhine, Yssel, Lek, Maas, and Mervede, and canals. But the soil is very fertile, and marvelously well cultivated. The rearing of cattle and the production of butter and cheese are the main pursuits of the inhabitants, but many other kinds of industry are carried on with success. North Holland has an area of 1,070 sq. miles, with (1891) 860,742 inhabitants; the area of South Holland is 1,166 sq. miles, with 987,342 inhabitants. The principal towns of North Holland are Amsterdam, Haarlem, and Alkmaar; of South Holland, The Hague, Leyden, Rotterdam, and Gouda. See NORTH HOLLAND CANAL and NORTH SEA CANAL OF HOLLAND. For the nation, see NETHERLANDS.

Holland: city; Ottawa co., Mich. (for location of county, see map of Michigan, ref. 7–H); on the Black river, and the Chi. and W. Mich. Railway; 4 miles E. of Lake Michigan, 25 miles S. W. of Grand Rapids. It is in an agricultural, lumber, and fruit region; is a popular summer resort; has a monthly and six weekly periodicals, and is principally engaged in tanning, iron-ore smelting, and milling. It is the seat of Hope College (Reformed Church, opened in 1862), which in 1890 had 13 professors and instructors, 293 students, of whom 128 were women, 5,000 volumes in its library, $45,000 invested in grounds and buildings, and $128,000 in productive funds. Pop. (1880) 2,620; (1890) 3,945; (1894) 6,307.

Holland, Sir HENRY, Bart., M. D., D. C. L., F. R. S: physician and author; b. at Knutsford, Cheshire, England, Oct. 27, 1788; graduated M. D. at Edinburgh 1811; was for many years a physician in ordinary to Queen Victoria, and one of the most popular men, professionally and socially, in London. He several times visited the U. S., and traveled extensively in Europe and Asia. His second wife, a writer of ability, and a daughter of Sydney Smith, died Nov. 2, 1866. Sir Henry was the author of several books on various subjects; the most important are *Medical Notes and Reflections* (1839) and *Recollections of Past Life* (1871). D. in London, Oct. 27, 1873.

Holland, HENRY RICHARD VASSALL-HOLLAND, Lord: b. in Wiltshire, Nov. 21, 1773; succeeded in 1774 to the peerage as the third Lord Holland of the Fox family. His patronymic was changed from Fox to Vassall in 1797, the latter being the family name of his wife, the divorced Lady Webster, by whom he had had a son, Charles R. Fox, born before the divorce. Holland was a man of fine manners and most amiable character. His uncle, Charles James Fox, trained him up to liberal political principles, and he was educated at Eton and Christ Church, Oxford; he was (1806) made a commissioner and plenipotentiary for settling disputes with the U. S.; was Lord Privy Seal 1806–07; Chancellor of the Duchy of Lancaster 1830–40. Lord Holland was a most brilliant debater and parliamentary tactician, the steady friend of every political reform, and had a large personal following of strongly attached social and political friends. He did much to develop a taste for Spanish literature. Author of *Life and Writings of Lope de Vega Carpio* (1806); *Three Comedies from the Spanish* (1807); *Foreign Reminiscences* (1850); *Memoirs of the Whig Party* (1852); and other works. D. at Kensington, Oct. 22, 1840.

Holland, JOSIAH GILBERT, M. D.: author and journalist; b. at Belchertown, Mass., July 24, 1819; graduated at Berkshire Medical College, Pittsfield, and practiced medicine three years. He became a contributor to *The Knickerbocker Magazine*, and was for one year superintendent of schools at Vicksburg, Miss. From 1849 to 1866 he was one of the editors of the Springfield (Mass.) *Republican*, which became under his management one of the most influential and widely circulated newspapers in New England. In 1866 he sold his interest in the *Republican*, and traveled for some time in Europe. In 1870, in connection with Roswell Smith and Messrs. Scribner, Armstrong & Co., he established *Scribner's Magazine*, of which, and of its successor, *The Century Magazine*, he remained editor until his death. He was very popular as a lyceum lecturer, was president of the New York city board of education, and chairman of the trustees of the College of New York. His works, some of them published under the name of *Timothy Titcomb*, are a *History of Western Massachusetts* (1855); *The Bay Path*, a novel (1857); *Letters to the Young* (1858); *Bitter Sweet*, a poem (1858); *Gold Foil* (1859); *Miss Gilbert's Career*, a novel (1860); *Lessons in Life* (1861); *Letters to the Joneses* (1863); *Plain Talk on Familiar Subjects* (1865); *Life of Lincoln* (1868); *Kathrina*, a poem (1867); *The Marble Prophecy* (1872); *Arthur Bonnicastle* (1873); *Garnered Sheaves*, poems (1873); *The Mistress of the Manse* (1874); *The Story of Seven Oaks* (1875); *Nicholas Minturn* (1876). D. in New York, Oct. 12, 1881. His poems and novels were widely popular and distinctly moral in purpose. His poetry is pure and sweet in feeling, and his fiction appealed to a large class of readers by its earnestness and good sense. Revised by H. A. BEERS.

Holland, ROBERT AFTON, A. B., S. T. D.: clergyman and author; b. at Nashville, Tenn., June 1, 1844; educated at Louisville College; at the age of seventeen became a Methodist preacher; at the age of eighteen became chaplain of a cavalry brigade in the Confederate army; after the war ended became pastor of Trinity Methodist church, Baltimore, and editor of *The Christian Advocate*, published in that city. In 1872 he took orders in the Protestant Episcopal Church, and from 1872 till 1880 was rector of St. George's church, St. Louis, Mo. From 1880 till 1884 he was rector of Trinity church, Chicago; then went to New Orleans, and after a brief rectorship in that city returned to St. George's, St. Louis. For eight years he was one of the faculty of the Concord Summer School of Philosophy. For many years he has been a vice-president of the American Social Science Association, and is also a vice-president of the American branch of the Christian Social Union. He has published *The Philosophy of the Real Presence*; *The Relations of Philosophy to Agnosticism and to Religion*; *The Proof of Immortality*; *Midsummer Night's Dream—an Interpretation*; *Democracy in the Church*; *What's the Use of Going to Church?*; *Annunciation Lilies* (a sermon).

Hollandish: See DUTCH LANGUAGE.

Hollar, WENCESLAUS: engraver; b. at Prague, in Bohemia, July 13, 1607. It is said that he was taught by Matthew Merian. He went to Cologne and Antwerp, and his print of the city of Prague pleased Thomas Howard, Earl of Arundel, English ambassador to the emperor, who took Hollar to England with him in 1635 or soon after. He was made drawing-master to Prince Charles, afterward Charles II. During the civil war he served in the royal army, but fell into great poverty during the Commonwealth, and resided much on the Continent. Even after the Restoration he was poor and little appreciated. The great merit of his engraved work has received abundant recognition in later times. Nearly all of it is engraved from his own designs, and he is one of the greatest of the painter-engravers. D. in London, Mar. 28, 1677. Of his 2,700 prints the following may be named: Large topographical views of Strassburg, Lucerne, Oxford, and many other places; delicate architectural drawings of *Antwerp Cathedral*, *St. George's Chapel at Windsor*, *The Royal Exchange*, *London*, *Portraits of Charles I.*, *Charles II.*, *Rubens*, *Bishop Malder*, *Oliver Cromwell*; studies of costume and detail, as the four prints of the *Dress of English Women in the Four Seasons of the Year*, *Muffs and Masks*, *Shells*, the *Hanging Hare*.

RUSSELL STURGIS.

Holley: village; Orleans co., N. Y. (for location of county, see map of New York, ref. 4–D); on the N. Y. Cent. and Hudson Riv. Railroad and the Erie Canal; 22 miles W. of Rochester. It is in an agricultural and fruit-growing region, has extensive Medina sandstone quarries, and contains five churches, union school, academy, water-works, electric light, weekly newspaper, and a cider, vinegar, and evaporated apple manufactury, said to be the largest in the U. S. Pop. (1880) 1,018; (1890) 1,381; (1893) estimated, with suburbs, 2,000. EDITOR OF "STANDARD."

Holley, ALEXANDER LYMAN, LL. D.: engineer; son of Alexander H. Holley, Governor of Connecticut 1857–58; b. at Lakeville, Conn., July 20, 1832; graduated at Brown University 1853; was technically educated at the Corliss Steam-engine Works. Between 1856 and 1863 he contrib-

HOLLAND
&
BELGIUM
NORTH
SEA
ZEELAND
GELDERLAND
BRABANT
LIMBURG
A B C D E F G H I J
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uted to and edited various engineering periodicals, and published (in connection with Zerah Colburn) his *Railway Economy, a Report on European Railways* (New York, 1858). In 1879 he was appointed lecturer on Iron and Steel Metallurgy in the Columbia College School of Mines. Of no less importance were his practical services. In 1865 he introduced the Bessemer process of steel-making into the U. S., built steel-works and rolling-mills at Harrisburg, Troy, Chicago, Joliet, and Pittsburg, and a number of mechanical improvements in the process are due to him. In the same year he published *A Treatise on Ordnance and Armor* (New York and London). He was consulting engineer to many iron and steel works, president of the American Institute of Mining Engineers in 1875, vice-president of the American Society of Civil Engineers in 1876, one of the founders of the American Society of Mechanical Engineers, and achieved the rare distinction of being a leading authority and the advocate of fundamental improvements in three separate lines: railways, ordnance, and steel manufacture. D. in Brooklyn, N. Y., Jan. 29, 1882. In 1883 the American Institute of Mining Engineers published a memorial volume prepared by a special committee in honor of Holley, and in 1890 a bronze bust of him by J. Q. A. Ward was placed by American and foreign engineers in Washington Square, New York.

Hollidaysburg: borough; capital of Blair co., Pa. (for location of county, see map of Pennsylvania, ref. 5–D); on the Juniata river and the Penn. Railroad and canal; 7 miles S. of Altoona. It is the seat of a prosperous female seminary with 4 instructors, 75 students, and a library of 3,000 volumes. Pop. (1880) 3,150; (1890) 2,975.

Hollis: town; Hillsborough co., N. H. (for location of county, see map of New Hampshire, ref. 10–E); on the Boston and Maine Railroad; 7 miles S. W. of Nashua, 15 miles N. W. of Lowell, Mass. It is in an agricultural region; contains a high school, public library, and weekly newspaper, and manufactures large quantities of lumber and casks. Pop. (1880) 1,077; (1890) 1,000.

EDITOR OF "TIMES AND BROOKLINE REPORTER."

Hollister: town (founded in 1868); capital of San Benito co., Cal. (for location of county, see map of California, ref. 10–C); on the S. Pac. Railroad; 94 miles S. of San Francisco. It contains a seminary, complete system of public schools, and two weekly newspapers, and is principally engaged in agriculture, stock-raising, and quicksilver-mining. The completion of extensive irrigation-works has led to much attention being paid to horticulture. Near the town are the richest tobacco plantations in the State. Pop. (1880) 1,034; (1890) 1,234; (1893) estimated with suburbs, 2,800. EDITOR OF "SAN BENITO ADVANCE."

Holliston: town; Middlesex co., Mass. (for location of county, see map of Massachusetts, ref. 2–H); on the Boston and Albany Railroad; 26 miles S. W. of Boston. It is in an agricultural region; has manufactures of boots and shoes, straw and woolen goods, nails, pumps, etc.; and contains a public library, high school, and two weekly newspapers. Pop. (1880) 3,098; (1890) 2,619; (1895) 2,718.

EDITOR OF "TRANSCRIPT."

Holly [O. Eng. *holen, holegn*: O. H. Germ. *huls* > Mod. Germ. *hulst*; borrowed into Fr. *houx*]: species of various shrubs and small trees, chiefly of the genus *Ilex* and family *Ilicineæ*. They are mostly evergreens, with rich green leaves and red berries. The typical species is *I. aquifolium*, the European holly, whose leaves are so highly prized for Christmas decorations. Its bark yields bird-lime, and has medicinal powers. The finest American species is the *I. opaca*, a small tree, used also in Christmas decorations, but its appearance is far inferior to that of the former species. The wood of both the above species is very hard and white, and is used by turners, inlayers, and carvers. *I. cassine* and other species yield the "yaupon tea" of the Carolinas and the "black drink" of the Creek Indians. Paraguay tea (see MATÉ) is produced by certain South American hollies. The U. S. have fourteen species of *Ilex*, mostly unimportant shrubs, some with deciduous leaves, besides one, the mountain holly, *Nemopanthes canadensis*, of another genus closely allied. The sea-holly or sea-holm of Europe is the *Eryngium maritimum*, a very different plant of the Umbellifer family. Revised by CHARLES E. BESSEY.

Holly: village; Oakland co., Mich. (for location of county, see map of Michigan, ref. 7–K); on the Shiawassee river, and the Det., Gr. Hav. and Mil., and the Flint and Père Marq. railways; 47 miles N. W. of Detroit. It is in one of the most fertile and attractive regions in the State; has flour and planing mills, furniture and box factories, foundry, and pickle and vinegar works, and contains a high-school building (cost $50,000), hotel (cost $20,000), and a weekly newspaper. Pop. (1880) 1,443; (1890) 1,266; (1894) 1,231. EDITOR OF "OAKLAND COUNTY ADVERTISER."

Holly Family: the *Ilicineæ*, a family of trees and shrubs with simple, mostly alternate leaves, and small, axillary, 4–8-merous choripetalous flowers. Ovary free, compound, four to eight celled, forming a berry-like drupe, containing four to eight seeds. There are about 180 species, which are included in four genera, viz., *Ilex* (world wide), *Byronia* and *Sphenostemon* (Australian and Pacific), and *Nemopanthes* (North American). CHARLES E. BESSEY.

Hollyhocks [M. Eng. *holihoc*, liter., holy hock or mallow, so called because said to have been imported from the Holy Land]: certain biennial plants of the genus *Althæa* (*A. rosea, ficifolia, chinensis*), tall Old World herbs, much cultivated in gardens for their flowers, of which there are many varieties, single and double. The culture of these plants for forage purposes has been proposed. The stalks abound in a fiber which may be utilized as paper-stock.

Holly Springs: city; capital of Marshall co., Miss. (for location of county, see map of Mississippi, ref. 3–G); on the Ill. Cent. and the Kan. C., Mem. and Birm. Railroad; 43 miles S. E. of Memphis, Tenn. It is the seat of Rust University (Methodist Episcopal, opened 1868), which in 1890 had fifteen professors and instructors and 314 students; of the State Normal School (founded 1870); of the Franklin Female College (non-sectarian, opened 1878); of the Bethlehem Academy (Roman Catholic); and of the Maury Institute (non-sectarian). It has a cotton compress, stoneware-factory, and a monthly and two weekly periodicals, and the principal business is handling cotton. Pop. (1880) 2,370; (1890) 2,246.

Holm'boe, CHRISTOPHER ANDREAS: Orientalist; b. at Vang, Norway, Mar. 19, 1796; studied Oriental languages in Christiania and Paris, and became in 1822 lector and in 1825 Professor of Oriental Languages at the University of Christiania. The most prominent of his writings are *De prisca re monetaria Norvegia* (1841); *Sanskrit og Oldnorsk* (1846); *Det Oldnorske Verbum* (1848); *Det Oldnorske Sprogs väsentligste Ordforraad, sammenlignet med Sanskrit* (1852); *Norsk og Keltisk* (1854). As a member of various commissions he exercised a great and beneficial influence on educational affairs in Norway. He resigned his position in 1876, and died Apr. 2, 1882.

Revised by R. B. ANDERSON.

Holmes, ABIEL, D. D., LL. D.: b. at Woodstock, Conn., Dec. 24, 1763; graduated at Yale in 1783, and was a tutor there 1783–85; held Congregational pastorates at Midway, Ga., 1785–91, and at Cambridge, Mass., 1792–1832. He married in 1790 a daughter of President Stiles (d. 1795); in 1800 he married a daughter of Hon. Oliver Wendell. He published *Annals of America*, a work of permanent value (2 vols., Cambridge, Mass., 1805; enlarged ed. bringing it down to 1826, 1829); *Life of President Stiles* (Boston, 1798); papers on Stephen Pannenius; on the Mohegan Indians; biography of John Lothrop, and many others. He received the degree of D. D. from Edinburgh University. D. at Cambridge, Mass., June 4, 1837. See his biography by W. Jenks.

Holmes, AUGUSTA MARY ANNE: composer; b. in Paris, France, Dec. 16, 1847, of Irish parents; received her entire education, musical and otherwise, in Paris. Her compositions are generally in the large forms. They include an opera, *Hero and Leander*: a psalm, *In Exitu Israel*; a symphony, *Orlando Furioso*; a symphony, *Lutece*, which gained a prize at a municipal competition; a symphony, *Les Argonauts*, performed by Pasdeloup, Apr. 24, 1881; a symphonic poem, *Irlande*; another, *Pologne*; and a symphonic ode with choruses, *Ludus pro Patria*, performed Mar. 4, 1888. She writes the text of her vocal compositions. D. E. HERVEY.

Holmes, GEORGE FREDERICK: educator; b. in British Guiana in 1820; educated in England at Durham University. When eighteen years old he settled in the U. S.; was a teacher in Virginia, Georgia, and South Carolina, and in 1842 was admitted to the bar of South Carolina by the Legislature, although not naturalized. He was for a time assistant editor of *The Southern Quarterly Review*, and in

1845 accepted a professorship in Richmond College, Virginia. In 1846 he was chosen professor of the University of Mississippi, in 1847 Professor of History, Political Economy, and International Law in William and Mary College, and in 1857 Professor of History and Literature in the University of Virginia. He is the author of a series of school-books especially designed for the Southern States.

Holmes, Mary Jane (*Hawes*): novelist; b. in Brookfield, Mass. She was married to Daniel Holmes, a lawyer, of Richmond, Ontario co., N. Y., and has since then resided in Versailles, Ky., and Brockport, N. Y. She has written a large number of very popular novels, including *Lena Rivers* and *Tempest and Sunshine*, mostly of an unambitious or domestic character, and of excellent moral tendency.

Holmes, Nathaniel: jurist and Shakspeare scholar; b. at Peterborough, N. H., in 1814; graduated at Harvard in 1837; was admitted to the bar in Boston 1839; was judge of the Supreme Court of Missouri from 1865 to 1868; and Professor of Law in Harvard University from 1868 to 1872. Judge Holmes was an ardent believer in the so-called "Baconian" theory of the authorship of Shakspeare's plays, and published in 1866 *The Authorship of Shakspeare* in support of his belief. Henry A. Beers.

Holmes, Oliver Wendell: author and physician; a son of Dr. Abiel Holmes; b. at Cambridge, Mass., Aug. 29, 1809; graduated at Harvard in 1829; studied law, and afterward medicine, receiving his doctor's degree in 1836, after several years' attendance in the European hospitals. In 1838 he became Professor of Anatomy and Physiology in Dartmouth, and in 1847 was called to the same chair in the Massachusetts Medical School, Boston, from which he retired in 1882. He was distinguished as an accurate anatomist, a skillful microscopist and auscultator, and an amateur photographer, but his widest fame is as a poet, wit, and man of letters. The first collected edition of his poems appeared in 1836. His Phi Beta Kappa poems, *Poetry* (1836), *Terpsichore* (1843), *Urania* (1846), and *Astræa* (1850), gave him fresh laurels; and his *Autocrat of the Breakfast Table*, *Professor at the Breakfast Table*, and *Poet at the Breakfast Table*, all originally published in *The Atlantic Monthly*, were a series of brilliant prose papers, with occasional poems, nearly all in his happiest vein of mingled humor, pathos, healthy sentiment, and practical wisdom. His after-dinner poems and other short lyrics are among the best of their kind in the language. He wrote also various medical addresses, papers, and pamphlets, and *Currents and Counter-currents in Medical Science* (1861); *Elsie Venner*, a romance (1861); *Borderlands in some Provinces of Medical Science* (1862); *Songs in Many Keys* (1864); *Soundings from the Atlantic* (1864); *Humorous Poems* (1865); *The Guardian Angel* (1868); *Mechanism in Thought and Morals* (1870); *Songs of Many Seasons* (1874); *John L. Motley, a Memoir* (1878); *The Iron Gate and other Poems* (1880); *Ralph Waldo Emerson* (1885); *A Mortal Antipathy* (1885); *Our Hundred Days in Europe* (1887); *Before the Curfew* (1888); *Over the Teacups* (1890). He visited England again in 1886, and received many honors. D. in Boston, Mass., Oct. 7, 1894. See his *Life and Letters*, by John T. Morse, Jr. (1896). Henry A. Beers.

Holmes, William Henry: archæologist; b. near Cadiz, O., Dec. 1, 1846. After completing a scientific course in the McNeely Normal College in 1870, he was appointed to the professorship of Physical Geography and Natural History in that institution. In 1871 he removed to Washington, D. C., and became attached as a draughtsman to the Smithsonian Institution. In 1872 he was appointed artist to the Hayden exploring expedition, and in 1874 was transferred to the geologic corps and placed in charge of the survey of the San Juan country, including Southwest Colorado and parts of the adjoining territories. He held this position until the reorganization of the survey in 1879. The atlas of Colorado and several of the later volumes issued by the Hayden survey were edited by Mr. Holmes, and the work of that survey was brought to a close under his superintendence. In 1881 he was appointed geologist under Director J. W. Powell of the reorganized survey; in 1882 was made honorary curator of aboriginal pottery in the National Museum, and in 1889 was placed in charge of the archæological explorations of the bureau of ethnology. In Sept., 1892, he was elected Professor of Archæologic Geology in the University of Chicago. His publications in archæology include reports on the cliff ruins of the San Juan country, papers on aboriginal art, and on the evolution of ornament. J. W. Powell.

Holm-oak [liter., holly-oak, evergreen oak; *holm*, holly < M. Eng. *holme* < O. Eng. *holen*]: popular name of *Quercus ilex* (the *ilex* of Roman authors), a beautiful evergreen oak of Southern Europe and Northern Africa, prized for its beauty, as well as for the great excellence and durability of its timber.

Holoceph'ali [Gr. ὅλος, whole + κεφαλή, head]: one of the great divisions of cartilaginous fishes containing but two genera, Chimæra (*q. v.*) from the northern hemisphere and *Callorhynchus* from Antarctic waters. These forms differ from all other shark-like forms in several structural features, which make them of extreme interest to naturalists. Among these may be mentioned the firm union of the upper jaw with the skull (as in higher vertebrates), whence the name of the group, four internal gills communicating with the exterior by a single opening on either side of the neck (as in the ordinary fishes). There is no spiracular opening, and the jaws are covered with horny plates, four above, two below. The eggs of *Chimæra* are unknown, those of *Callorhynchus* are inclosed in a broad and curiously fringed horny shell. J. S. Kingsley.

Holofernes: See Judith.

Holos'tomi [Mod. Lat., from Gr. ὅλος, whole + στόμα, mouth]: a group and probably an order of eels, thus distinguished by Prof. Cope: "Epiclavicle suspended to fourth vertebra, post-temporal wanting. Parietals in contact. Mouth bounded by the premaxillaries, which are in contact medially, and bounded behind by maxillary. Symplectic present; vertebræ unaltered; no pectoral fin. Third superior pharyngeal not smaller than fourth." In addition to these characters, the pectoral fins are absent, and the vertical fins quite rudimentary and reduced to mere folds of the integument; the anus is situated very far backward; the gill-openings are confluent in a single outlet under or near the throat; and the ovaries have oviducts. This group has been formed for the reception of two families of eel-like fishes confined to the tropical regions—viz., (1) *Symbranchidæ*, represented in both the East Indies and America, and (2) *Amphipnoidæ*, confined to Bengal.

Theodore Gill.

Holothurians, or **Holothuroidea**: a group of Echinoderms (*q. v.*) commonly known as "sea-cucumbers," in allusion to the cucumber-shaped body. They form the class Holothuroidea and are characterized by having the body drawn out in a worm-like manner, the mouth and vent being at opposite ends. In most forms the skin is leathery, and the calcareous plates, so characteristic of other Echinoderms, are entirely concealed in the integument. Only in a few cases (e. g. *Psolus*) do they form conspicuous plates on the outside. In many these plates are microscopic, and sometimes they are strangely regular and beautiful, forming favorite objects for microscopists. Thus in *Myriotrochus* they take the shape of wheels; in *Synapta* of anchors and plates. The Holothurians are without teeth, and the mud or coral sand on which they feed is forced into the mouth by means of the tentacles which surround that opening. The intestine is either straight or curiously looped within the body, in some cases measuring forty times the length of the animal. In the circulatory, "water vascular," and nervous systems the radial arrangement of parts so characteristic of all Echinoderms is easily traced, but in most forms the "madreporic body" is internal. In most forms the sexes are separate; the development in a few is "direct," but in most there is a distinct metamorphosis, though the changes of forms are less marked than in other Echinoderms. Few species have any economic importance. In the Eastern seas certain

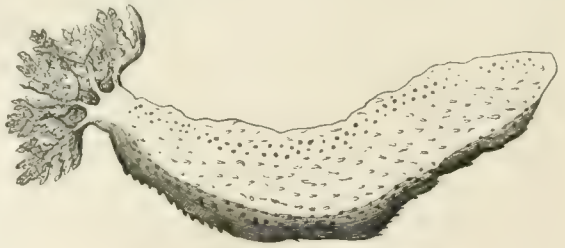

Fig. 1.—The common sea-cucumber.

species are taken in large quantities, dried in the sun, and sent to China, where, under the name trepang, they are used for soup. Three orders of Holothurians are recog-

nized: (1) *Pedata*, in which the tube feet are developed, the madreporic body is internal, and there is an enormous branching development of the hinder end of the digestive tract of unknown functions, but known as the "respiratory tree." Here belong the majority of the species. (2) *Elasi-*

FIG. 2. A Holothurian, *Cladodactylus*.

poda, in which the body is bilaterally symmetrical, the tube feet being restricted to the lower surface, the upper surface being ornamented with strange outgrowths, and the stone canal opening direct to the exterior, there being no madreporic body. The respiratory tree also is lacking. These forms are all inhabitants of the deep seas. (3) *Apoda*, without tube feet, usually without respiratory tree, madreporic body internal, and the body wall frequently transparent. Near these forms should be placed the curious *Rhopalodina* from Africa, in which the pear-shaped body is so folded as to bring mouth and vent in close proximity. Most important in the literature is Semper's *Monograph of the Holothurians* (Leipzig, 1868). Reference should also be made to the papers of Ludwig, Teuscher, and Semon. J. S. KINGSLEY.

Holothuridæ: a family of HOLOTHURIANS (*q. v.*) of which the trepang (*Holothuria*) is the typical member.

Holst, HANS PETER: poet and novelist; b. in Copenhagen, Denmark, Oct. 23, 1811. His earliest volume of poems (1832) shows the influence of Oehlenschlager. He was made famous by his *Mindedigt over Frederik VI.* (Memorial Poem on Frederick VI.), a simple but affecting poem of twelve verses. Published a volume of poems in 1840; *Ude og Hjemme* (At Home and Abroad), prose and verse, in 1843; *Den lille Hornblæser* (The Little Bugler), 1849. A collection of war poems added greatly to his popularity; wrote several comedies, vaudevilles, novels, and poems. In 1880 he translated *Much Ado About Nothing*. As a lyric poet his work displays delicate fancy, combined often with considerable depth of feeling. D. June 2, 1893. D. K. DODGE.

Holst, HERMANN EDUARD, von: historian; b. at Fellin, Livonia, June 19, 1841; studied at Dorpat and Heidelberg: in 1866 settled in St. Petersburg, but having, while traveling in Germany, published a pamphlet displeasing to the Russian Government, he was forbidden to return and soon afterward emigrated to the U. S., where he was engaged in literary work for several years. He was appointed professor at Strassburg university in 1872, and two years later was called to the chair of Modern History at Freiburg. Afterward revisiting the U. S. he lectured at Johns Hopkins University, and in 1892 was called from Freiburg to the chair of History at the University of Chicago. His chief work, *Verfassung und Demokratie der vereinigten Staaten von Amerika*, translated by J. J. Lalor and A. B. Mason under the title *The Constitutional and Political History of the United States* (5 vols., Chicago, 1876–85), presents a strongly anti-slavery view of the politics of the U. S. Among his other works are a *Life* of John C. Calhoun, a *Life* of John Brown, and *The Constitutional Law of the United States of America* (Chicago, 1887).

Hol'stein: a duchy which forms part of the Prussian province of SCHLESWIG-HOLSTEIN (*q. v.*). It is situated between the Baltic and the German Ocean, and between the Elbe and the Eider, which separate it respectively from Hanover and Schleswig. Its western part is marshy, and so low that it must be protected from inundation by dikes, but it is very fertile and presents excellent grazing-grounds; the central part is heathful and sandy; the eastern part has fine soil fitted for agriculture. The rearing of cattle and the production of butter and cheese, together with agriculture, are the main branches of industry. Pop. 600,000.

Revised by R. B. ANDERSON.

Holston River: a stream which rises in Smyth co., Va., by two heads, the North and South Forks, which after a course of about 54 miles unite at Holston boat-yard, near Kingsport, in Sullivan co., Tenn., to form the Tennessee river as determined by the Legislature of Tennessee in 1889, the South being regarded by the Legislature as the Holston proper. Prior to this enactment the Holston was conceived by some to extend as far as the French Broad river at Knoxville, and by others to the mouth of the Clinch at Kingston, Tenn.

Holt, JOSEPH: lawyer; b. in Breckenridge co., Ky., Jan. 6, 1807; educated at St. Joseph's College, Bardstown, and at Center College, Danville; in 1828 he entered upon the practice of law at Elizabethtown, Ky., removing to Louisville in 1832, and the following year was attorney for Jefferson circuit. In 1835 he removed to Port Gibson, Miss., but in 1842 returned to Louisville. In 1857 President Buchanan appointed him commissioner of patents, and in 1859 to a seat in his cabinet as Postmaster-General. Upon the resignation of John B. Floyd (Dec., 1860), Gen. Holt succeeded him as Secretary of War. He subsequently made a report detailing the facts of the intended seizure of the capital. He was a member of the commission appointed to investigate the military claims against the department of the West. In Sept., 1862, President Lincoln selected him as judge-advocate-general of the army, with the rank of colonel, and upon the establishment of the bureau of military justice in June, 1864, he was retained at its head with the same title, but with the rank of brigadier-general; brevet major-general 1865. He bore a conspicuous part in important courts martial, courts of inquiry, and military commissions—notably that before which the assassins of Lincoln were arraigned. Retired Nov., 1875. D. in Washington, D. C., Aug. 1, 1894.

Holtei, KARL, von: poet and novelist; b. in Breslau, Germany, Jan. 24, 1798; studied at the Magdalenen Gymnasium; chose a dramatic career and appeared in Breslau in 1819 as Mortimer in Schiller's *Maria Stuart*; spent his life in theatrical pursuits as theater secretary, manager, etc. His numerous works are widely read, but are light and sketchy. Among them are the plays *Die Wiener in Berlin*, *Die Berliner in Wien*, *Der alte Feldherr*, and *Lenore*; the collections *Gedichte* (1826; 5th ed. 1861); *Schlesische Gedichte* (1830; 19th ed. 1888); *Deutsche Lieder* (1834; 2d ed. 1836); *Königslieder* (3d ed. 1878); and the novels *Die Vagabunden* (1851; 7th ed. 1886); *Christian Lammfell* (1853; 4th ed. 1878); *Ein Schneider* (1854; 2d ed. 1858). See his autobiography, *Vierzig Jahre* (2d ed. 1859), and Kurnich, *Karl von Holtei, ein Lebensbild* (1880). D. in Breslau, Feb. 12, 1880.

Holton: city; capital of Jackson co., Kan. (for location of county, see map of Kansas, ref. 4–L); on the Chi., R. Is. and Pac., the K. C., Wy. and N. W., and the Union Pac. Railways; 30 miles N. of Topeka, 56 miles W. of Leavenworth. It is the seat of Campbell University (non-sectarian, opened 1882), which in 1889–90 had 11 professors and instructors and 540 students, of whom 281 were women. It is a shipping-point for live stock, and has various manufactures and six periodicals. Pop. (1890) 2,727; (1895) 3,020.

Hölty, LUDWIG HEINRICH CHRISTOPH: poet: b. at Mariensee, near Hanover, Dec. 21, 1748; received careful home training, studied at the gymnasium at Celle, and in 1769 began the study of theology in Göttingen, where he was one of the founders of the *Dichterbund*, for which he wrote some of his best poems. He was very poor, and overwork, together with a disappointment in love, broke down his delicate constitution. A journey to Leipzig brought little relief, and careful nursing could not restore his health. He died in Hanover, where he was attempting to prepare a collection of his poems for publication, Sept. 1, 1776. His poems, mostly lyrics and ballads, show rare simplicity of thought, depth of feeling, and beauty of diction. See his *Gedichte* (edited by Halm, 1870); Friedrich Voigts, *Hölty, ein Roman* (Hanover, 1844); and Reute, *Hölty, sein Leben und Dichten* (1883).

Holtz'endorff, FRANZ. von: criminal jurist; b. at Vietmannsdorf, Prussia, Oct. 14, 1829; studied at Berlin, Heidelberg, and Bonn; 1861, Professor of Jurisprudence, University of Berlin; 1873, professor, University of Munich. Among the more important of his numerous valuable works are *Französische Rechtszustände* (1859); *Die Deportation als Strafmittel* (1859); *Das irische Gefängniss-System* (1859); *Prinzipien der Politik* (1869); *Encyklopädie der Rechts-*

wissenschaft (1870); *Handbuch des deutschen Strafrechts* (1874); *Encyclopädie der Rechtswissenschaft* (1885–89, 4 vols.); *Handbuch des deutschen Strafprocesses* (1888, 2 vols., with Jagemann). D. Dec. 4, 1884. Revised by C. H. Thurber.

Holtz Machine: See Electrical Machines.

Holtz'mann, Adolf: philologist; b. at Carlsruhe, May 2, 1810; studied theology at Berlin, Old German at Munich, Sanskrit at Paris, and was in 1852 appointed Professor of German Language and Literature and of Sanskrit at the University of Heidelberg. His most prominent writings are *Ueber den Urdant* (1843); *Ueber den Athanasius* (1844); *Indische Sagen* (1845–47); *Celten und Germanen* (1855); *Nebelungenlied* (1855); *Klage* (1859); *Altdeutsche Grammatik*; *Deutsche Mythologie*. It was Holtzmann who first advanced the theory that manuscript C of the *Nibelungenlied* represented the oldest form of the mediæval epic, and thus caused the great war over the origin of the *Nibelungenlied* among the students of German philology. His grammatical writings are by far superior to his other works. D. July 3, 1870. See W. Scherer, *Kleine Schriften* (1893).

Revised by Julius Goebel.

Holy Alliance: a compact entered into at Paris, Sept. 26, 1815, by the sovereigns of Russia, Austria, and Prussia, and afterward joined by the other European powers with the exception of Great Britain, Turkey, and the pope, and published Feb. 2, 1816. It was mainly the result of Mme. Krüdener's influence on the mind of the Czar Alexander, and its design was to exclude all members of the Bonaparte family from the thrones of Europe forever; to express the intention of the contracting powers to live together in Christian harmony; and to induce the people to faithful daily fulfillment of Christian duties. But under the controlling influence of Metternich it became an instrument for the suppression of liberalism in Europe. After the Congress of Aix-la-Chapelle (*q. v.*) its policy became clearly marked, and was illustrated in the congresses of Laibach, Troppau, and Verona (*qq. v.*), which resulted in armed intervention in the affairs of Italy and Spain.

Holy Brotherhood: See Hermandád.

Holy Coat of Treves, The: a garment preserved in the Cathedral of Treves, in Germany, and supposed by many Roman Catholics to be the veritable seamless garment which was worn by Christ at his crucifixion, and for which the soldiers cast lots. The church authorities of Treves maintain that it has been in their possession since the early part of the fourth century, when the Empress Helena brought it there from the East. It is referred to in the eleventh century biography of Agritius, the bishop under whom this translation is said to have occurred. Much importance is also attached to an ivory tablet representing apparently the translation to Treves of a casket of relics in presence of Constantine and his mother Helena. This tablet has been referred to the eleventh century, but competent judges place it between the fifth and the eighth. Leo X. in 1515 acknowledged the existence of this relic at Treves, but he took care to make it manifest that he was trusting to the statements of the church authorities of Treves. The same may be said of the reply of Gregory XVI. to the church authorities of Argenteuil in France, who have hitherto claimed to be in possession of this relic. Many churches in the Middle Ages claimed to possess relics of "the clothing of the Lord," but it does not follow that they claimed the seamless garment, though it can not be denied that since the end of the twelfth century the Lateran Church supposed herself in possession either of the whole garment or of a considerable part. (See Beissel, *Geschichte des heiligen Rockes*, 1889, 398 pp.). Frequent pilgrimages are made to this shrine. Occasionally the relic is exposed; the last time was in the summer of 1891.

John J. Klaiz.

Holy Communion: See Eucharist.

Holy Communion, Sisters of the: a society of ladies of the Protestant Episcopal Church, founded in New York in 1845 by the Rev. Dr. W. A. Muhlenberg, and named from the church of which Dr. Muhlenberg was rector. They are not bound by vows, and do not wear a strictly uniform habit. They are devoted to the care of the sick in hospitals and to other charitable labors. They have charge of a shelter for respectable girls, a home for aged women, and a babies' shelter, all in New York city. Revised by W. S. Perry.

Holy Cross, Congregation of the: an association of regular clerks, founded by the Abbé Moreau in 1834. Their present rule was approved in 1856, in which year the Brotherhood of St. Joseph was merged into this congregation. They were introduced into the U. S. in 1842, and have now numerous establishments. There is a congregation of Canons Regular of the Holy Cross (anciently called Crutched Friars in England), founded by Theodore de Celles in 1211. They have a college at Watertown, Wis., and are numerous in continental Europe; are called also Croisiers and Cross-bearers.

Holy Cross, Sisterhood of the: an association founded in 1834 by the Abbé Moreau, at Mons, Belgium. The rule was approved in 1857. There are two orders of Daughters of the Cross and one of Sisters of the Cross, independent of the above.

Holy Ghost, or **Holy Spirit** [Heb. *Ruach Ha-Elohim* and *Ruach Jehovah*; Gr. πνεῦμα ἅγιον, with or without the article, and often without the adjective]: the Spirit of God, of Christ, of Jesus, of the Lord, etc., is the third Person of the Trinity, whose existence, character, and offices are revealed in the Bible. The term "Spirit" in Greek and Hebrew (as in many other languages) means "wind," then "breath," then "life," then the self-conscious, intelligent, self-determined, thinking substance of God, angels, and man. The term τὸ πνεῦμα ἅγιον, Holy Ghost, in Scripture and Christian theology, does not designate the spiritual substance common to the three Persons of the Godhead, but the third Person or Hypostasis existing in the unity of that substance. A condensed statement will be given (I.) of the scriptural and Church doctrine as to his personality, divinity, procession, and offices; (II.) of the history of opinion on the subject; (III.) of its literature.

I. Scriptural and Church Doctrine of the Holy Ghost. 1. *His Personality.*—The attributes of personality are intelligence, will, individual subsistence; and in Scripture all of these are predicated of the Spirit. (1) He uses the pronoun "I," and the Father and Son use the pronouns "he" and "him," when speaking of him (Acts xiii. 2; John xv. 26 and xvi. 13, 14); "When he (ἐκεῖνος) shall come . . . he shall glorify me." (2) His functions all imply distinct personal subsistence: he "speaks," "searches," "selects," "reveals," "reproves," "testifies," "leads," "comforts," "distributes to every man as he wills," "knows the deep things of God," "is grieved," etc. (Acts xiii. 2; 1 Cor. ii. 10, 11 and xii. 11; 1 Tim. iv. 1). (3) All Christians profess personal allegiance to the Holy Spirit precisely as to Father and Son. They are baptized εἰς τὸ ὄνομα—*into the name* of the Father, and of the Son, and *of the Holy Ghost* (Matt. xxviii. 19). If the two former are Persons, the latter must be. Hence he is our Sanctifier and Comforter. (4) Blasphemy against the Holy Ghost, and the possibility of "resisting," "grieving," and "doing despite to" him, imply his personality (Matt. xii. 31, 32; Mark iii. 28, 29; Luke xii. 10; Acts vii. 51; Heb. x. 29; Eph. iv. 30). (5) This has been from the beginning the common faith of all historical churches, and has been given expression in their creeds.

2. *His Divinity.*—(1) He is called by the exclusive names of God. What Jehovah says in the Old Testament the New Testament writers ascribe to the Holy Ghost. (Cf. Isa. vi. 9 with Acts xxviii. 25, and Jer. xxxi. 31–34 with Heb. x. 15; see Acts v. 3, 4.) (2) Divine attributes are predicated of him: (*a*) omnipresence (Ps. cxxxix. 7; 1 Cor. xii. 13); (*b*) omniscience (1 Cor. ii. 10, 11); (*c*) omnipotence (Luke i. 35; Rom. viii. 11). (3) Divine works are ascribed to him: (*a*) creation (Gen. i. 2; Job xxvi. 13; Ps. civ. 30); (*b*) inspiration (Heb. iii. 7; 2 Pet. i. 21); (*c*) miracles (1 Cor. xii. 9–11); (*d*) spiritual regeneration (John iii. 6; Tit. iii. 5). (4) Divine worship is to be paid to him (Matt. xxviii. 19; 2 Cor. xiii. 14; Matt. xii. 31, 32).

3. *The Procession of the Holy Ghost* is a technical phrase, doubtless originating in John xv. 26 ("the Spirit of truth which proceedeth from the Father"), but used by theologians to express the essential relation of the Holy Ghost to the other Persons of the Trinity. The teachings of Scripture and of the whole Church, Roman and Protestant, involve the following points: (1) There is but one God, and he is indivisible. Therefore there is but one indivisible being which is God. (2) This one whole being subsists eternally as three equal Persons, the entire being subsisting as each Person concurrently. (3) The Scriptures reveal (so far forth) the nature and relations of each Person by their names and relative actions. The Father is always first, the Son second, and the Spirit third. The terms Father and Son express an eternal reciprocal relation. The Father eternally begets the Son. The Spirit is the infinite personal "Breath" of God,

as the Son is his infinite personal "Word." He is the "Spirit of God" and "from God" (ἐκ τοῦ Θεοῦ, 1 Cor. ii. 12), and the "Spirit of the Father," "who proceedeth from the Father" (ὃ παρὰ τοῦ πατρὸς ἐκπορεύεται, John xv. 26). He is also the Spirit "of the Son" and "of Christ" (Rom. viii. 9; Gal. iv. 6). He is sent by and acts for the Father; so he is sent by and acts for the Son (John xvi. 7–14). (4) Hence the Athanasian Creed concludes (§§ 20–22), the "Father was made from none, nor created, nor begotten. The Son is from the Father alone, neither made nor created, but begotten. The Holy Ghost is from the Father and the Son, neither made nor created nor begotten, but proceeding." This the Church proposes not as an explanation, but simply as a statement of scriptural data. See PROCESSION.

The generation of the Son in the Nicene theology is an eternal constitutional (non-volitional) act of the Father, whereby he communicates his whole divine essence to the Hypostasis of the Son, whereby the Son is the "express image of the Father's Person" and "the brightness of his glory." The procession or spiration of the Holy Ghost is a like eternal act of the Father and of the Son, whereby they communicate their whole common substance to the Hypostasis of the Holy Ghost, whereby he becomes their consubstantial personal Breath. As these acts are eternal, they are neither past nor future, but present, without beginning or ending.

4. *His Offices in Nature.*—The "Spirit" or personal "Breath" is the Executive of the Godhead, as the "Son" or "Word" is the Revealer. The Spirit of God moved upon the face of chaos and developed cosmos (Gen. i. 2). Henceforth he is always represented as the author of order and beauty in the natural as of holiness in the moral world. He garnished the astronomical heavens (Job xxvi. 13). He is the organizer and source of life to all provinces of vegetable and animal nature (Job xxxiii. 4; Ps. civ. 29, 30; Isa. xxxii. 14, 15), and of enlightenment to human intelligence in all arts and sciences (Job xxxii. 8 and xxxv. 11; Ex. xxxi. 2–4).

5. *His Offices in Redemption.*—Christ promised his disciples on the eve of his crucifixion that he would send them the Spirit of truth as another *Comforter*, παράκλητος, *Paraclete*, *Advocatus* (Patron, Counsel, Champion, Helper, etc.; also applied to Christ himself, 1 John ii. 1). Although he had been the divine agent effecting the salvation of men ever since Adam, it is said that this Paraclete was not given until after the ascension and glorification of Christ (John vii. 39 and Acts ii. 32, 33); that is, he is now given with a universality, fullness, power, and clearness of manifestation infinitely surpassing that of the past. The present is the dispensation of the Spirit in contrast with the preceding preparatory dispensation of the law. (1) The Spirit fashioned the body of Christ in the womb of the Virgin, enriched and supported his human soul, and co-operated with him in all the offices he performed in his estate of humiliation (Luke i. 35; Isa. xi. 1, 2; John i. 32 and iii. 34). (2) He inspired the writers of both the Old and the New Testaments as to both thoughts and words (Mic. iii. 8; 1 Cor. ii. 10–13). (3) He teaches those who are spiritually minded the meaning of Scripture (1 Cor. ii. 14, 15), and applies to all the redemption purchased by Christ (John xvi. 13, 14). Hence he is called the "Spirit of grace" (Heb. x. 29), "of wisdom and understanding" (Isa. xi. 2), "of truth" (John xvi. 13), "of adoption" (Rom. viii. 15), "of prophecy" (Rev. xix. 10), "of promise" (Eph. i. 13), and "of glory" (Pet. iv. 14). He regenerates, sanctifies, and preserves the souls and raises the dead bodies of the saints (John iii. 6; Rom. xv. 16 and viii. 11). He is to the Church and to the individual Christian the immanent source of life—τὸ ζωοποιόν, the *Life-giver*. (4) He is the bond of life and the organizing principle of the historic Church on earth (1 Cor. xii. 13), and Church teachers and rulers are properly only the organs of the Holy Ghost (2 Tim. i. 13, 14).

6. *Blasphemy against the Holy Ghost* (Matt. xii. 31, 32; Mark iii. 29, 30; cf. also Heb. vi. 4–6 and x. 26, 27; 1 John v. 16).—This appears to be an intelligent, deliberate, and malignant "speaking against," and rejection of, the Spirit of grace by one who has been the subject of his full illumination and persuasion. It is never pardoned, because an intelligent preference of sin to holiness and a definite and final rejection of Christ's salvation. See Schaff, *Sin against the Holy Ghost* (1841).

II. HISTORY OF OPINION.—1. *The State of Opinion in the Early Church, and the Definition of the Universal Church Doctrine by the Council of Constantinople*, A. D. 381.—The Christian Church from the beginning expressed its faith in the terms which were gradually fixed in the (so-called) Apostles' Creed, which acknowledges a Trinity of divine Persons. Nevertheless, the prevalent conceptions were very vague and variable (see testimony of Gregory Nazianzen, *Orat. 31, De Spiritu sancto*, cap. 5), many Church writers regarding the Spirit as more decidedly subordinate to the Son than the Son to the Father. The complete statement of the final faith of the Church was introduced into the Nicene Creed by the Council of Constantinople (A. D. 381) in these words: "And I believe in the Holy Ghost, the Lord, the Giver of Life, who proceedeth from the Father, who with the Father and Son is to be worshiped and glorified, who spake by the prophets." The addition "and the Son" after the words "who proceedeth from the Father" is Western in origin, and was first given conciliar sanction by the Council of Toledo in 589; it has never been accepted by the Greeks. For the most detailed of the universally received definitions, see the Athanasian Creed (circa A. D. 450). These creeds, either in form or substance, have been adopted by all historical churches.

2. *Heretical Views.*—Some of the Gnostics considered the Holy Ghost and Christ two celestial *Æons*, generated to restore the disturbed harmony of the Pleroma. The Alogians and other ancient deniers of the divinity of Christ regarded the phrase Holy Ghost as another name for the single person of God. The Sabellians held that it designates one mode of divine operation and the phase of divine revelation peculiar to the present dispensation. The Arians and Semi-Arians regarded the Holy Ghost as the first and greatest creature of Christ, of superangelic but not divine perfection. After the Council of Nice these parties were called *Macedonians*, *Pneumatomachi*, and *Tropici*. All modern Arians and Socinians interpret the phrase Holy Ghost as a designation of the energy of God manifested in action. De Wette says the Spirit is God operative in nature; Schleiermacher says he is God operative in the Church.

III. LITERATURE.—Besides the creeds, especially the *Nicene* and *Athanasian Creeds*; and the histories of doctrine, such as Hagenbach's, Shedd's, Neander's; and Schaff's *Histories of the Christian Church*; see especially Owen, *Discourse concerning the Holy Spirit* (1674); Julius C. Hare, *Mission of the Comforter* (1846); Parker, *The Paraclete*; Buchanan, *The Office and Work of the Holy Spirit*; Daunt, *Person and Offices of the Holy Spirit*; Kahnis, *Die Lehre vom Heiligen Geist* (Halle, 1847); Lampe, *Disputationes de Spiritu Sancto*; Smeaton, *The Doctrine of the Holy Spirit*; Swete, *On the History of the Doctrine of the Procession of the Holy Spirit*. Revised by B. B. WARFIELD.

Holy Ghost Flower, or **Dove Flower**: the *Peristeria alata*, an orchidaceous plant of Central America, having white symmetrical floral envelopes, and the stamens and pistil united into a column which curiously resembles a bird with expanded wings. It is venerated in its native regions as the symbol of the Holy Dove, the form in which the Divine Spirit descended at the baptism of our Lord. The plant is not uncommon in cultivation.

Holy Ghost, Order of the (Roman Catholic): (1) An order, at first consisting of hospital knights of St. Augustine; was founded in 1178 by Guido of Montpelier, and in part removed to Rome in 1204, receiving the hospital in Sassia. Here they became in part canons regular, and after many vicissitudes the knightly branch of the order ceased in 1700 to exist, but the canons regular are not yet extinct. In 1254 the Hospitallers of the Holy Ghost, a secular branch of the above, were organized, containing both brethren and sisters. The latter, called White Sisters, are still numerous and active in benevolent works. With them became connected another sisterhood of the Holy Ghost, established in 1212. (2) Another congregation of canons of the Holy Ghost was confirmed in 1588. (3) Congregation of the Holy Ghost, founded by Claude Desplaces in Paris in 1703, united in 1848 with the Congregation of the Immaculate Heart of Mary, founded in 1841 by François Marie Paul Libermann. It carries on works especially among the blacks in Africa. J. J. K.

Holy Grail: See SANGREAL.

Holyhead: seaport-town of North Wales; on an island of the same name as the town, forming the western part of Anglesea County, and connected with the main portion of Anglesea by a huge causeway and a bridge; 60 miles E. of Dublin and 264 N. N. W. of London; lat. 53° 19′ N., lon. 4° 34′ W. (see map of England, ref. 7-C). The island is mainly a barren rock (8 miles by 3½), and the town is irregu-

larly built, although it contains numerous fine buildings. Ship-building and rope-making are carried on. Holyhead is most notable for the breakwater by which harbor accommodation is provided for the packet service between England and Ireland, and at the same time an important harbor of refuge is constituted. The work is 1½ miles long and cost £1,500,000. The successful bridging for military purposes of the Menai Straits by Stephenson's tubular bridge decided a moot question as to the terminus of the great railway route between London and Dublin and choice of site for harbor in favor of Holyhead. See *Engineering* (Sept. 26, 1873). Pop. (1891) 8,726.

Holy Innocents' Day: See INNOCENTS' DAY.

Holy Island, or **Lindisfarne**: an island off the east coast of England; lat. 55° 40' N., lon. 1° 47' W.; 2 miles off the coast of Northumberland, 10 miles S. S. E. of Berwick-upon-Tweed, and 3 nautical miles N. of the Farne islands proper. It has an area of 2,457 acres, and although nearly 2 miles distant from the mainland at high tide, it can be reached at low tide by walking across the uncovered sands. Lindisfarne in 635 became a bishop's see, and was the episcopal seat of St. Cuthbert. In 900 the see was transferred to Durham. Holy island is a favorite bathing-place, and its old castle and ruined abbey are interesting objects.

Holy League: a name applied to several alliances of European princes for war or defense. (1) That of 1511, between the pope, Julius II., Spain and Venice, to expel the French from Italy. It lasted till the Truce of Orthes (1513). (2) That of Nuremberg (1538), between Charles V. and the Catholic princes of Germany against the League of Schmalkald. (3) That of 1571, of the pope, Venice, and Spain against the Turks. (4) The league entered into in 1576 at Péronne, by the heads of the Catholic party in France, under the leadership of Guise, for resistance to the spread of Protestantism and opposition to the succession of the Calvinistic princes to the French throne. It is probable, however, that the latter reason was much more urgent than the former. At all events, the league was anything but holy, either in purpose or in proceedings, and it led to the renewal of the bloody civil wars, which were not ended until 1590, when Henry IV. of Navarre won the battle of Ivry against the forces of the league under the Duke of Mayenne. (5) That of 1609 between the pope and the Catholic states of Suabia and Bavaria. (6) That of 1684, Poland, Germany, and Venice against the Turks.

Hol'yoake, GEORGE JACOB: social and religious reformer; b. at Birmingham, England, Apr. 13, 1817. His father was an iron-worker, and his mother a manufacturer of buttons, and he began to work in her shop when he was six years old; worked under his father, who was foreman of the Eagle foundry, from his twelfth year to his twentieth; was a good workman and invented several machines. The Mechanics' Institute gave him a liberal education. He meant to be a civil engineer, but was gradually drawn into teaching, lecturing, and journalism. Proofs of his ability as a teacher can be found in his work on Euclid, his *Mathematics no Mystery*, *Practical Grammar*, and *Public Speaking and Debate*. The book last named was the fruit of his own wide experience in public speaking. This began in his youth. In 1837 he heard Robert Owen, of Lanark, for the first time, and was so taken with his social theories that he became one of his "social missionaries," and was stationed at Sheffield. In a little while he became Owen's second lieutenant, William Pare, of Birmingham, being the first. The organization of the Rochdale Pioneers in 1843 marked a new departure of Owen's movement, and a much more fruitful one than the first. Holyoake became the principal exponent of this movement, and a most persuasive one. He has since been its principal historian. See his *History of Co-operation* (1875–79), a book as remarkable for its personal reminiscences as for its account of co-operative distribution, its early struggles, and its magnificent success. In 1841, while lecturing at Cheltenham, he was asked a question which he answered with an apt quotation from the Bible, to which he gave a novel turn, whereupon he was tried for blasphemy and sent to prison for six months, but there has been no subsequent trial for blasphemy in England. His interest in secularism dated from his imprisonment, and after his release he was engaged about equally in advocating co-operation and in founding secular societies. These societies were not atheistic, and still less anti-theistic, but were based on the declared sufficiency of this present life for all needful moral inspiration, without any supernatural sanctions. The societies multiplied rapidly, and Mr. Holyoake became the president of their central organization, the London Secular Society, of which, after 1858, Mr. Bradlaugh was president for many years, while Mr. Holyoake went deeper into journalism and industrial and political reform. The secular societies were generally republican clubs, Mr. Holyoake looking to Thomas Paine's *Rights of Man* as the gospel of political reform. For several years he edited *The New Moral World*, and then for fifteen years *The Reasoner*. From time to time he was regularly connected with several other journals, one of them the Chartist *Cause of the People*, on which W. J. Linton, the distinguished engraver, an ardent English republican, was associated with him. He was prominent in the repeal of "the taxes on knowledge," and his fines for printing an unstamped newspaper amounted to £600,000, a *reductio ad absurdum* of the whole business. His personal experiences are described in *Sixty Years of an Agitator's Life*, a desultory but fascinating book (1892). His genial common sense and humorous kindliness and broad humanity have won for him in his old age the admiration and esteem of many who do not sympathize with his distrust of theology in morals and monarchy in politics. To his distrust of competition in industry, and more especially of competitive distribution, the objection has not been so wide. See CO-OPERATION and SECULARISM. J. W. CHADWICK.

Hol'yoke: city; Hampden co., Mass. (for location of county, see map of Massachusetts, ref. 3–D); on the Connecticut river, and the Con. Riv. and the N. Y., N. H. and H. Railways; 8 miles N. of Springfield. It derives excellent water-power from the Connecticut river; has a bridge connecting it with South Hadley Falls, system of water-works which cost $250,000, a granite city-hall which cost $412,000, electric lights, and electric street railways, and contains 10 churches, 12 public schools, and 3 daily, 3 weekly, and 3 monthly periodicals. The census returns of 1890 show that 477 manufacturing establishments (representing 69 industries) reported. These had $22,738,233 capital, employed 12,150 persons, paid $5,736,706 for wages, and $12,427,539 for materials, and received $24,091,667 for products. The principal industries were the manufacture of paper, 19 establishments, $9,672,259 capital, and $8,205,714 value of products; cotton goods, 5 establishments, $5,554,356 capital, and $4,392,722 value of products; woolen goods, 5 establishments, $1,638,081 capital, and $1,475,090 value of products; 12 foundries and machine-shops, with $1,447,183 capital, and $1,195,022 value of products; and stationery and other paper goods, 9 establishments, $1,145,191 capital, and $1,408,937 value of products. Pop. (1880) 21,915; (1890) 35,637; (1895) 40,322. EDITOR OF "TRANSCRIPT."

Holyoke, Mount: a steep, narrow ridge of greenstone trap in Hampshire co., Mass., separating the towns of Hadley and Amherst on the N. from South Hadley and Granby on the S. It is 7 miles long, and terminates in Belchertown on the E. Its west extremity is separated from Mt. Tom by a cleft through which the Connecticut river flows. The name is appropriately limited to the west extremity, where there is a hotel upon the summit, which is reached by a railway whose cars are drawn up by a stationary engine. The highest point is 1,120 feet above the sea. Mt. Holyoke is well timbered.

Holy Rood: See TRUE CROSS.

Holy Saviour, ORDER OF THE: See BIRGITTA, SAINT.

Holy Sepulchre: the tomb in which our Lord lay. It was hewn out of a rock in a garden in the place of the crucifixion, just outside the walls of Jerusalem. Cf. the passages Matt. xxvii. 33, 39; Mark xv. 22, 29; John xix. 17, 41; Heb. xiii. 12. In the opinion of many the spot has not yet been identified, and never will be. The traditional site, fixed upon early in the fourth century, is a cave now inclosed in marble within the pile of buildings known as the Church of the Holy Sepulcher. The edifice, begun by Constantine in 326 and dedicated in 335, was destroyed by the Persians under Chosroes in 614; rebuilt after about sixteen years; destroyed again by Caliph Hakim, the Fatimite, in 1010; again rebuilt in 1048; enlarged and improved by the crusaders (after 1099); suffered severely from fire in 1808; and in 1810, after extensive repairs, was consecrated anew. In Fergusson's opinion, the architecture of the edifice is "wholly of an age subsequent to that of the crusades, and without a trace of the style of Constantine." It contains chapels for Greeks, Latins, and Armenians, with smaller

apartments for Copts, Jacobites, and Maronites. The pretended miracle of the holy fire on Easter Eve each year is one of the greatest scandals in history. The identity of this traditional site, first disputed by Korte, the German bookseller, in 1738, has been ably argued for by Williams (*Holy City*, London, 1845), and ably argued against by Robinson (*Biblical Researches*, Boston, 1841; *Later Researches*, 1856). Fergusson (*Ancient Topography of Jerusalem*, London, 1847) identified the cave underneath the mosque of Omar with the holy sepulchre, but his view is now considered untenable; Barclay (*City of the Great King*, 1858) and others look for it on the east side of the city, just outside of St. Stephen's Gate, either N. of it or S. of it. Fisher Howe (*The True Site of Calvary*, New York, 1871) argued for a site outside of the Damascus Gate, on the north side of the city, near the spot known as the Grotto of Jeremiah. This identification is advocated by Conder (*Tent-life*, London, 1878). The top of the knoll is 2,550 feet above the sea and 110 feet above the Haram. Probably it was the "Place of Stoning," where St. Stephen suffered martyrdom, and this constitutes an objection to the view, as a rich man like Joseph was unlikely to build a private tomb immediately adjoining so notorious a spot. Bishop Gobat, of Jerusalem, advocated the view that the site was on the hill E. of Jeremiah's Grotto, directly N. of the temple.

Revised by S. M. Jackson.

Holy Sepulchre, Order of the: (1) Canons Regular and Canonesses of (Augustinian), founded at Jerusalem in 1099 or 1114. They spread throughout Europe. The canons ceased to exist in the seventeenth century, but there are still nuns who live in seclusion and instruct children. (2) Knights of the Holy Sepulchre, perhaps founded by Alexander III., and still found in small numbers. They are appointed by the pope as guardian father, and by the Patriarch of Jerusalem. The Latin Patriarch of Jerusalem is grand master. An order of this name existed in England from 1174 to the seventeenth century. The Franciscans once had the sole right to confer this rank.

Holy Spirit Plant: same as Holy Ghost Flower (*q. v.*).

Holy Thursday: See Ascension Day.

Holy Water: in the Greek, Roman Catholic, and the various Oriental churches, water which has been blessed by a priest and is used in religious ceremonies. Its use in churches is very ancient, and it is by many believed to be derived from a custom of the ancient Hebrews.

Holy Week: the last seven days of Lent, the week before Easter, popularly known in continental Europe as *Still Week*—often called *Passion Week*, but that name is also given to the week preceding it. It contains Palm Sunday, Spy Wednesday, Maundy or Holy Thursday, Good Friday, and Holy Saturday. It is a penitential season, in commemoration of our Lord's passion and death.

Ho'lywell: town of Flintshire, North Wales; 15 miles N. W. of Chester (see map of England, ref. 8–F). It received its name from the well of St. Winifred, which is said to be the most copious spring in Great Britain. In its vicinity are found the richest coal, lead, and copper mines in the kingdom, and besides its manufactures of cotton and flannel Holywell has many establishments for lead and copper smelting. Pop. (1891) 3,018.

Homburg, hōm'boorch, or **Homburg-vor-der-Höhe**, -fōr-dăr-hö'e [*Homburg* is Germ. for older *Hohenburg*, high fortress; *hoch*, *hoh-*, high + *burg*, fortified place]: town of Central Germany; capital of the former landgraviate of Hesse-Homburg; 8 miles N. N. W. of Frankfort-on-the-Main (see map of German Empire, ref. 5–D). It is famous for its mineral springs and elegant bathing establishments, which, before the closing of the gambling-saloons, attracted more than 10,000 visitors annually. The waters are very saline and contain a large proportion of carbonate of lime. They are used for rheumatism, skin diseases, and diseases of the stomach and intestines. The gambling-saloons were closed in 1872, the Prussian Government refusing to renew the lease then running out. On a neighboring hill stands the castle of the former landgraves, built in 1680, but afterward several times enlarged. The city has some woolen and linen manufactures. Pop. (1890) 8,863.

Home, Daniel Douglas: spiritualist; b. near Edinburgh, Scotland, Mar. 20, 1833; was adopted by an aunt who took him to the U. S., and became distinguished as a spiritualistic medium, marvelous phenomena having, it is asserted, attended him from infancy. He resided mainly in Europe after 1855; became a Roman Catholic in 1856; was twice married, both his wives being Russian ladies of high birth; became secretary of *The Spiritual Athenæum*, London, in 1866; published *Lights and Shadows of Spiritualism* (1877), also two volumes of an autobiographical character. A continuation, *The Gift of D. D. Home*, was published by his widow in 1890. D. at Auteuil, France, June 21, 1886.

Home, Henry: See Kames, Henry Home.

Home, or **Hume**, John: dramatist; b. at Ancrum, Roxburghshire, Scotland, in 1722; studied theology at the University of Edinburgh; fought on the Hanoverian side in the rebellion of 1735; was appointed minister at Athelstaneford in 1746. In 1756 his tragedy of *Douglas* was produced at Edinburgh with great success, but the circumstance that it was written by a clergyman caused such a scandal that Home resigned his office in 1757. George III. gave him a pension and a sinecure office, and he continued to write tragedies—*Alonzo*, *Alfred*, *Aquileia*, etc. He also wrote a *History of the Rebellion of 1745*, but his *Douglas* and the story connected with it have alone survived. D. in Edinburgh, Sept. 5, 1808. There is a collected edition of his works in three volumes by Henry Mackenzie, 1822.

Revised by H. A. Beers.

Homel': a town of Russia; in the government of Mohileff; 132 miles S. of Mohileff; on the highway to Tchernigoff, and on the right bank of the Sosh, an affluent of the Dnieper (see map of Russia, ref. 7–C). It has important sugar-refineries, and carries on a brisk trade in the agricultural products of the surrounding country. Pop. 26,200.

Homeopathy: same as Homœopathy (*q. v.*).

Homer: city; capital of Claiborne parish, La. (for location of parish, see map of Louisiana, ref. 6–C); on the La. and N. W. Railroad; 50 miles E. N. E. of Shreveport. It is in a large cotton-growing region, and has two weekly newspapers. Pop. (1880) 718; (1890) 1,132.

Homer: village; Calhoun co., Mich. (for location of county, see map of Michigan, ref. 8–I); on the Kalamazoo river, and the Cin., Jack. and Mack., the Lake S. and Mich. S., and the Mich. Cent. railways; 23 miles W. S. W. of Jackson, 46 miles S. by W. of Lansing. It is the center of a large grain-trade, and has manufactures of agricultural implements, dairy products, oil-stoves, and bath-tubs. Pop. (1880) 893; (1890) 1,063; (1894) 1,157.

Homer: village; Cortland co., N. Y. (for location of county, see map of New York, ref. 5–G); on the Del., Lack. and West. Railroad; 33 miles S. of Syracuse. It is an agricultural and dairy region, has numerous manufactures, and contains a free academy (founded in 1819), two national banks with combined capital of $175,000, and a weekly newspaper. Pop. (1893) estimated, 3,016.

Homer (in Gr. *Ὅμηρος*): Greek poet. The authorship of the *Iliad* and the *Odyssey* was attributed to Homer by the unanimous voice of classical antiquity. He was the earliest of all Greek poets whose works were known in the classical period, and men of modern times agree that he is the chief of all epic poets. His personality, however, is nowhere even indicated in his poems, and the ancients themselves knew neither where nor when he lived. Some thought him a Chian and others an Athenian. More than seven cities claimed him as their own. He was called Melesigenes (*of the race of Meles*, which was a stream near Smyrna) and Mæonides (*son of Mæon*), but all details of his parentage and life are lost. The historian Herodotus thought that he lived about 400 years before his time, or 850 B. C.; others thought that he lived 1000 B. C.; others placed him about 750 B. C. The story of his blindness and that of his Chian birth seem to have rested on a passage in a so-called Homeric hymn (*Hom. Hy. to Apollo*, 172), which is now held to be of much later composition than the *Iliad* and *Odyssey*. The fine bust of Homer in the British Museum, as well as similar heads in other collections, is wholly ideal.

The two poems which have been considered Homeric until within a century are the *Iliad* (*The Poem of Ilium*, 15,593 verses) and the *Odyssey* (*The Poem of Odysseus*, 12,120 verses), each of which is divided into twenty-four books. Both belong to the same cycle of myth, and each is supplemented in many details by the other. The story in brief is this: Paris, the voluptuous son of Priam—King of Ilios (Ilium), a city on the Trojan plain, near the Hellespont, in the northwest corner of Asia Minor—is aided by Aphrodite (Venus), the goddess of love, to carry away the beautiful Helen, daughter of Leda and Zeus (Jupiter), from her hus-

band, Menelaus, King of Sparta. The injured husband's brother, Agamemnon, King of Mycenæ, a citadel in a recess of Argolis, rouses the Greeks who are called in the poems Achæans and Argives to avenge the insult, and to recover Helen and her treasures. Achilles, Ajax, Odysseus (Ulysses), Diomed, the eloquent Nestor, and many other chieftains follow the summons with their men. Nearly 1,200 ships and about 100,000 men assemble at Aulis in Boeotia, and set sail for Troy. For ten years they are encamped before the city. Since they brought with them no supplies, they are obliged to make many expeditions for plunder, and destroy many towns in the neighborhood, slaying the men or selling them into slavery, and taking the women prisoners. Among the captives is a daughter of an old priest of Apollo, who is given as a prize of honor to Agamemnon. The *Iliad* opens in the tenth year of the war, with the visit to the Greek camp of this old priest, offering rich ransom for his daughter. The Greek king rudely dismisses the suppliant, and the god Apollo avenges the slight to his minister by sending a pestilence upon the Greeks. When the cause of this plague is known, Achilles demands the return of the maiden. This is granted, but the king makes good his loss by seizing the prize of Achilles, who now sulks in his tent. In the three following days of battle the Trojans have the advantage, and finally break into the Greek camp. Patroclus, the friend of Achilles, is slain. Roused by the death of his comrade, Achilles reënters the combat, and on the fourth day of battle slays Hector, Priam's noblest son. The action of the *Iliad* lasts for six weeks, and closes with the ransom and burial of Hector's body. The *Odyssey* opens ten years later. Odysseus (Ulysses), on leaving Troy, was driven to the south, to the land of the Lotus-eaters; thence to the island of the Cyclopes, where Polyphemus devoured six of his comrades, and was blinded by him; to the land of the gigantic Læstrygonians, where he loses most of his fleet; to the home of Æolus, ruler of the winds, and to the island of the enchantress Circe. At last the sea-nymph Calypso cares for him as he is cast upon her island. At the opening of the *Odyssey* the hero has been absent for twenty years from his home on the island of Ithaca. His faithful wife, Penelope, still looks and longs for his return. His son, Telemachus, whom he left as an infant, has abandoned hope for his father. More than a hundred young nobles throng the palace of Odysseus, each hoping for the hand of Penelope and the throne of Ithaca. Their suit is importunately rude. The goddess Athene (Minerva) persuades Zeus to order the return of Odysseus, who reaches his home after many trials and sufferings, and at last slays the insolent suitors, and regains his wife and kingdom. The action of the *Odyssey* covers only six weeks, but the story of the preceding ten years is told by the principal hero, by Menelaus, and by Nestor—a device which Vergil uses in his *Æneid*, where Æneas tells Queen Dido the story of the destruction of Troy, and the wandering of the Trojans. The brief time of action doubtless aids in giving to the story the impression of unity.

The meter of the Homeric poems is the dactylic hexameter, which was introduced to Rome from Greece and used by Vergil. In modern times Voss used this verse for his German translation of Homer, and Goethe in his dainty little epic *Hermann und Dorothea*. It is most familiar to English readers from Longfellow's *Evangeline* and Clough's *Bothie*. Homer's verse, however, is much lighter than that of Vergil or Longfellow; the early Greek language was far better suited to that rhythm than the heavy Latin and the English. The verse is long, but has pauses within it which give it a freedom from monotony above all other verses.

The Homeric poems have been compared often with the *Æneid* and the *Paradise Lost*; but Prof. Jebb well sums up the characteristics which distinguish the literary epic of Vergil and Milton from Homer: "It is learnedly elaborate, while Homer is spontaneous; it is apt to be allusive, while Homer is direct; in language it is often artificially subtle, while Homer, though noble, is plain." Mr. Matthew Arnold has enumerated the chief characteristics of Homeric style as nobility, simplicity, rapidity, and plainness: he is never ignoble, intricate, slow in movement, nor obscure. The *Iliad* and *Odyssey* are highly dramatic. The poet's personality is entirely in the background. Half of the verses are put into the mouth of some of his characters. The verses between the speeches often serve as mere stage directions. Plato called Homer the first of tragic poets, and Aristotle said that he alone of epic poets saw rightly what he should say himself and what he should make his characters say.

Some of the ancients ascribed to Homer the authorship of several poems which are not extant, as well as *The Battle of the Frogs and Mice* (*Batrachomyomachia*), and a collection of thirty-four so-called hymns, which are preserved. The burlesque *Battle of the Frogs* seems to be of late composition—perhaps 150 B. C. The "hymns" contain some old elements. Most of them were designed simply as proëms or introductions to the recitation of epic lays.

Until the nineteenth century most scholars thought of the composition of the *Iliad* and *Odyssey* as analogous to that of the *Paradise Lost*—written by a single poet on a definite plan. In 1795 Friedrich August Wolf, of Halle, published a famous volume of prolegomena to Homer, in which he maintained that the art of writing was unknown to the Greeks of Homer's time; that so long poems could not and would not have been composed without the aid of writing; that the different lays of which the *Iliad* and the *Odyssey* are made up were not put together until the time of Pisistratus, tyrant of Athens in the sixth century B. C.; and that the *Iliad* and the *Odyssey* are not by the same author. Wolf's arguments are not all convincing, but his work gave the first strong impetus to what is called the "higher criticism" of ancient literature. In 1837 Lachmann, of Berlin, brought forward arguments from internal evidence against the original unity of the poems, urging that inconsistencies proved a difference of authorship. He found sixteen separate lays in the *Iliad*. In 1859 Kirchhoff analyzed the *Odyssey* into an original germ of 1,200 verses and a number of additions and continuations. No modern scholar believes in the unity of the poems in the sense in which this was held till the nineteenth century. On the other hand, the art of writing has been shown to have been known in Greece far earlier than Wolf thought; and few now hold Lachmann's view—that the *Iliad* is a conglomeration of independent lays. A large part of the beauty of the poems lies in the details, but a certain unity exists—which is not due to the somewhat apocryphal editors of the court of Pisistratus, but to some poet who, for convenience, may be called Homer. Much very ancient poetic material was used freely by later bards. Some parts of the poems are evidently suggested by other parts, and some other more or less uncertain criteria of age have been discovered, so that scholars are pretty well agreed that some "books" and passages are of comparatively late origin, while in the ultimate analysis men are still widely divided. The dialect of the poems indicates that Greek epic poetry was cultivated first by the Æolians in Thessaly at the foot of Mt. Olympus. Perhaps these carried it to Asia Minor, where it was perfected by the Ionic Greeks with a retention of many old forms and formulas. The excavations of Dr. Schliemann since 1869 do much to give a kind of historic basis to the Homeric poems. Towns of similar culture, of wealth, and power are found to have existed at Mycenæ and Ilium (the modern Hissarlik) about 1400–1100 B. C. The ordinary date of the destruction of Troy, 1184 B. C., can not be maintained as exactly historical, but is probably not very far from the truth. The details of Homer's story are doubtless fictitious, but the fact of such a conflict between Greeks and Trojans is credible. The customs pictured in the poems are, in the main, those of the age of the poet who is conscious that he is of a degenerate time, and appeals to the Muse (not to his memory) as his authority for his facts. The testimony of archæology favors the view of the early composition of the poems, i. e. perhaps eight or nine centuries B. C., although they may not have been in their present form before 700 B. C. The division into "books" is due to the Alexandrian scholars of about 250 B. C. Many discrepancies exist in quotations from Homer by classic authors and in the most ancient MSS., but most of these differences are not important.

The best MS. of the *Iliad* is Venetus A, of the eleventh century of our era. The best edition of the entire *Iliad* with English notes, is that of Leaf in two vols.; the best of the *Odyssey* is that of Hayman in three vols. The fullest critical apparatus is found in the editions of La Roche and Ludwich. The number of translations is countless, including those of Chapman, Pope, Cowper, Derby, Worsley, Bryant. Excellent prose translations are those of Palmer and of Butcher and Lang for the *Odyssey*; those of Lang, Leaf, and Myers for the *Iliad* are not quite so good. An admirable introduction to Homer is Jebb's little work, *Homer*, treating of the literary characteristics of the poems, the Homeric world, Homer in antiquity, and the Homeric question. Leaf's *Companion to the Iliad* is designed particularly as a commentary for English readers. Lang's *Homer*

and the Epic gives the Homeric question from the standpoint of the *littérateur*. Gardner's *New Chapters in Greek History* presents in intelligible form the archæological evidence with regard to the Homeric age. See Epic Poetry and Greek Literature.

Thomas D. Seymour.

Homer, Winslow: genre-painter; b. in Boston, Mass., Feb. 24, 1836; was a pupil of the National Academy, New York, and of F. Rondel; became National Academician 1865; is a member of the American Water-color Society. He is one of the ablest and most original of American artists, whose works are notable for a fine sense of color, great truth to nature, and virile sentiment. He is an admirable water-color painter. One of his best works, *Eight Bells*, is in the collection of T. B. Clarke, New York. Studio at Scarboro, Me.

William A. Coffin.

Home Rule: in general, the control of its own affairs by a political division; specifically, the principle on which a strong party in British politics desires to fix the governmental relations of Ireland to Great Britain. The movement for Home Rule is the most recent form in which the Irish political consciousness has formulated its protest against the union of Great Britain and Ireland, effected by Pitt in 1800. O'Connell's movement for repeal collapsed in 1843, and all vestiges of the protest it embodied disappeared after the abortive insurrection of 1848. The great agitator, in his latest years, was disposed to favor some plan less extreme than unconditional repeal of the Act of Union. He gave a temporary support to a project of federation of the two kingdoms, as distinguished from the mere personal union that repeal was designed to re-establish. This project came to nothing at that time, but its underlying thought was adopted by the Home-rulers. The formal beginning of the Home-rule movement dates from May 19, 1870. On that day a meeting at Dublin of a number of men interested in Irish politics resulted in the formation of a Home-rule Association. The dominant feeling among those who took part in this action was that of dissatisfaction with the legislation of Parliament on Irish affairs, though the grounds of the dissatisfaction were most diverse. The Conservatives were incensed at Mr. Gladstone's disestablishment of the Irish Church; both Liberals and Conservatives disliked his proposed land legislation, though for diametrically opposite reasons; and a sprinkling of the old repealers and Fenians in the meeting stood on the broader ground of Irish nationalism. But however heterogeneous its elements, the Home-rule Association entered upon a successful political career. Its purpose, as defined in its official programme, was to obtain for Ireland the right and privilege of managing her own affairs by a national parliament, whose competence should include all matters relating to her internal affairs, and control over Irish resources and revenues, subject to the obligation of paying a just proportion of the imperial expenditure. After the popularity of the movement had been demonstrated by successes in several by-elections, a reorganization of the association was effected in 1873. The name was changed to the Home-rule League, and in the general elections of 1874 the Home-rulers returned members for sixty out of the 103 Irish constituencies. The career of the party thus fairly inaugurated in Parliament falls into four clearly distinguishable periods:

I. *Butt's Leadership, 1870–79.*—Isaac Butt, a Dublin lawyer, was identified with the cause of Home Rule from the beginning. An able lawyer and a good parliamentarian, he was readily accorded the leadership of his party by all its various elements. The policy adopted in Parliament, following the idea of the original platform, was that of acting as a party only on the questions of Irish government and Irish needs, while following old party affiliations on other business. This was indeed the only policy under the circumstances which would insure the cohesion of the different elements. Accordingly, the main achievement of the party during this period was to call attention to Irish affairs through the debate on an annual motion, which motion was regularly voted down. The transition to a different policy was prepared by the activity of Biggar and Parnell, who entered Parliament in 1874 and 1875 respectively, and who began soon to attract attention by a course of general obstructive tactics in English business in the Commons, often with the sympathy and support of the radical element of the Liberal party. Butt and the majority of the Home-rulers in Parliament strongly condemned the course of the obstructionists and aided the Government against them, but public sentiment in Ireland tended rather to favor the policy of opposing the Government all along the line, and by every possible means. With the growing influence of the Parnell idea the Home-rule party continually lost the support of its Conservative and Whiggish Liberal members, but more than made up for them in the followers it attracted from the lower classes of the Irish people. Butt died in 1879, and his place as parliamentary leader was for a time filled by William Shaw, a Liberal. But Parnell was steadily developing his policy, and winning more and more of the party's support. As early as 1878 the party meeting in Dublin had declared in favor of acting as a party on all parliamentary business, and the English Home-rulers had recognized Parnell as their leader. In October of 1879 the decisive step toward radicalizing the party and the whole movement was taken by Parnell, when he put himself at the head of the Irish Land League. Backed by the influence which the agrarian agitation gave him, Parnell contributed most to the gain of eight members for the Home-rulers in Parliament in the election of 1880, and in May of that year he was formally chosen leader of the parliamentary party. The transformation of the party had now been practically completed. Parnell through the land agitation, like O'Connell through the agitation for Catholic relief, had consolidated the Irish masses in a movement against British domination, and though the end of Home Rule was logically distinguishable from the end of repeal, each movement alike found its ultimate strength in the traditional antipathy of the Celtic Catholic peasantry toward their Saxon Protestant masters. The turn thus given to the Home-rule movement rendered the adhesion of the more moderate members wholly impossible, and in the beginning of 1881 the Shaw faction in Parliament formally severed its connection with the party, the occasion being the violent obstruction by Parnell and his followers to the Government's coercion policy against the Land League.

II. *Land League Agitation and Parliamentary Obstruction.*—This period extends from the merging of the movement into the land agitation to the adoption of its principle by Mr. Gladstone in 1886. The most conspicuous questions during these years were those connected with the Land Act of 1881, the Arrears Act of 1882, and the fatal activity of the physical force element among the Irish. Nothing better illustrates the tendencies of the period than the name taken by the organization in which, after the suppression of the Land League, the purposes of the suppressed body and of the Home-rule League found united expression. The Irish National League was formed Oct. 17, 1882, and in its title were expressed the aspirations that the Parnell policy, whether deliberately or not, tended strongly in fact to encourage. The Nationalists, in spite of coercion, played a shrewd and successful political game. In Parliament their membership was increased at every by-election, and their perfect discipline, under Parnell's skillful leadership, rendered them a source of the greatest embarrassment to Mr. Gladstone's government. As a third party their avowed policy was to oppose any ministry that refused preference in public business to the demands of Ireland. Accordingly, in 1885 they united with the Conservatives in overthrowing the Gladstone government, and in the elections that ensued they secured eighty-five out of the 103 Irish seats, and one seat from England. But even more important than the absolute number—showing as it did an impressive unity of sentiment in the Irish electorate—was the fact that this compact party of eighty-six members held the balance of power in the House of Commons. Whether or not the government of Ireland was yielded up, the government of both Great Britain and Ireland was now practically at the mercy of Mr. Parnell. A tentative advance by the Conservative viceroy, Lord Carnarvon, toward an understanding with the Nationalists had no results. Mr. Gladstone, on the other hand, now, after serious reflection and consultations, came out unequivocally in favor of granting the Irish demands.

III. *Liberal Co-operation.*—On Jan. 27, 1886, the Nationalists joined the Liberals in overturning the Salisbury government, and the third period of Home-rule history formally began. On Apr. 8 Mr. Gladstone introduced his first Home-rule Bill. But the adoption of the Nationalists' demands proved immediately fatal to the unity of the Liberal party. All the genius of Mr. Gladstone was unable to carry his following intact into the new way. The Prime Minister's reasons for taking up Home Rule were based partly on present political expediency and partly on broad historical justice. He held that if parliamentary government had been difficult before, now, with the Nationalists

holding the balance of power, it would be impossible; that Irish affairs could be administered only through coercion, a policy which, while good for an emergency, was most demoralizing when made permanent; and that the manifold wrongs that had been done to Ireland in the past could be adequately atoned for only by a frank concession of self-government, which would secure the union of the islands through gratitude and a sense of common interests rather than as of old through brute force. But the Marquis of Hartington, Sir Henry James, Joseph Chamberlain, and other prominent Liberals, while admitting the difficulties of the situation, were unable to agree that the plan proposed by Mr. Gladstone was the proper remedy. His bill provided for a legislative body for Ireland, to sit at Dublin and to exercise the law-making power for that island over all subjects save those especially enumerated in the act as reserved for the imperial Parliament. Such a re-establishment of the Irish Parliament, even with the restrictions with which it was hedged, seemed to the dissentient Liberals, as to the Conservatives, altogether too much of a concession to the separatist element in the Irish Nationalist party. The bill was denounced as a step toward the dismemberment of the British empire, and especial stress was laid upon the impolicy of subjecting to the Celtic and Catholic masses the Saxon and Protestant minority. Some suggestions were made by Mr. Chamberlain and others, looking to provincial or district legislative bodies, so that while all should enjoy Home Rule, the Ulster Protestants at least should be free from Catholic domination. But no proposition of this sort could find favor with Mr. Parnell's party, who demanded at the very least so much recognition of Irish nationality as was involved in a single legislature at Dublin. In the debate on the Home-rule Bill the Government's chief difficulty was with the provision by which the Irish members were excluded from the imperial Parliament. This, the opposition held, not only revealed the completeness of the empire's dismemberment, but laid the sure foundation for constant friction, in the fact that the Irish people would be called upon to pay customs and excise taxes, in the imposition of which they would have no voice. Nor would the retention of the Irish members at Westminster be preferable; for in that case, while Great Britain would be excluded from all concern in Irish internal affairs, Ireland would have the same influence as at present over purely British business. A third suggestion, which came to be known as the "in-and-out plan," was that Irish members should sit at Westminster for business that affected Ireland, but should be excluded when other business was before the House. But against this it was urged that a ministry might have a majority on one set of business and lack it on another, so that the old system of government would be impossible. When the bill, after a most exciting debate, came to a vote on the second reading, the dissentient Liberals (or Liberal Unionists, as they came to designate themselves) went with the Conservatives, and the measure was rejected by 343 to 313. Mr. Gladstone appealed to the electors, but the returns left him in a minority in the Commons. The new house stood, Gladstonians, 191; Nationalists, 86; combined Conservatives and Liberal-Unionists, 394. Lord Salisbury, with a Conservative cabinet, now took the reins of power, supported by the Liberal-Unionists, and announced a programme of strong government for Ireland, by which order should be assured as a preliminary to some extension of local self-government to the people. Mr. Gladstone at the same time renewed his professions of devotion to the cause of Home Rule, and continued the alliance of Liberals and Nationalists. With the failure of the Home-rule Bill, the land agitation, which had been in abeyance pending Mr. Gladstone's movement, was resumed under the auspices of prominent Nationalists. It was met by the Government with a very rigorous Coercion Act, very vigorously executed under the direction of Mr. Balfour, Secretary for Ireland. By 1890 the agitation had greatly subsided, and the Government brought in, and in the following year carried, its great Land Purchase Bill, which was designed to satisfy all reasonable discontent of a purely agrarian character. Its Local Government Bill for Ireland was introduced in 1892, but never got beyond the second reading. Meanwhile a remarkable series of events had terminated the Parnell period of the Home-rule movement. In a divorce suit in which Mr. Parnell was co-respondent, which was tried in Nov., 1890, very unpleasant revelations were made as to his private life. The propriety of his retirement from Irish leadership, at least temporarily, was broached, but received no approval from him. (See PARNELL, CHARLES STEWART.) Mr. Gladstone thereupon declared that under the circumstances the cause of Home Rule was hopeless, and his continuance as Liberal leader impossible. Parnell then opened a bitter attack on the Liberals, and the Nationalists were confronted with the necessity of choosing between their leader and the Liberal alliance. The result was a rupture in the party, the majority of the Nationalist members refusing longer to recognize Parnell's leadership. From Parliament the quarrel was carried to the Irish constituencies. The Parnellites managed to retain control of the National League's organization, and Parnell sought to rouse the old extremist feeling of hatred toward all English parties. But the priesthood threw its influence against him, and the by-elections showed his faction in a decided minority. The opposing faction in Parliament chose Justin McCarthy as leader, and in Ireland, Mar. 10, 1891, a new organization was formed, known as the National Federation. Mr. Parnell's sudden death, on Oct. 6, did not heal the breach in the Nationalists, his followers, under the leadership of J. E. Redmond, declining fellowship with those "who in obedience to foreign dictation hounded to death the foremost man of our race."

IV. *Divisions among the Nationalists: Home-rule Bill of 1893.*—The fourth period of the Home-rule movement opened thus with both Liberal and Nationalist parties split on the great question. As the end of Parliament's term drew near, Mr. Gladstone renewed his declarations that Home Rule was the question of questions, and so held the McCarthyites to him, while the Liberal-Unionists tended more and more to full coalition with the Conservatives. Parliament was dissolved June 28, 1892, and in the elections in July Mr. Gladstone secured a majority of forty, counting all the Nationalists. The Nationalists lost five seats through their factional contests, the McCarthyites securing seventy-two, and the Parnellites nine. The new government assumed power in August, and on Feb. 13, 1893, Mr. Gladstone introduced his second Home-rule Bill. While differing in many details, its general character was not distinguishable from that of its predecessor. The problem of Irish representation at Westminster was solved on the "in-and-out plan," the number of members being reduced from 103 to eighty. A bill of rights was added to the restrictions on the legislative body's power, and a new financial adjustment was proposed. The bill passed its second reading Apr. 21, by 347 to 304, and was finally adopted by the Commons, Sept. 1, by 301 to 267. During the discussion Mr. Gladstone dropped the "in-and-out plan," and left the eighty Irish members with the same rights as the other members of the House of Commons. The opposition had long before announced its purpose to use the House of Lords to thwart the Gladstonian project, and accordingly, after a short debate, the Lords, on Sept. 8, rejected the bill by 419 to 41.

WILLIAM A. DUNNING.

Homestead: borough; Allegheny co., Pa. (for location of county, see map of Pennsylvania, ref. 5–B); on the Monongahela river, and the Penn. and the Pitts. and Lake Erie Railways; 8 miles S. E. of Pittsburg. It contains one of the largest steel-manufacturing plants in the U. S., established by Andrew Carnegie, and usually employing nearly 6,000 persons. It also has manufactures of glass and firebrick. In July, 1892, the borough was a scene of a serious labor disturbance, which necessitated the calling out of the National Guard of the State. Pop. (1880) 592; (1890) 7,911.

Homestead Laws (in the United States): legislation enacted in order to secure to some extent the enjoyment of a home and shelter for a family or individual by exempting, under certain conditions, the residence occupied by the family or individual from liability to be sold for the payment of the debts of its owner, and by restricting his right of free alienation.

Meaning of the Word Homestead.—The word homestead in ordinary usage signifies simply the place where the family resides and has its home, but in legal language the word has the special signification of the family residence owned and occupied in compliance with certain statutory regulations, by operation of which the owner's right of alienation is subjected to certain restraints, and the property is protected by certain exemptions from being sold upon judgment and execution.

General Features of Homestead Laws.—Nearly all of the States and Territories of the U. S. have passed homestead laws which vary one from the other in many of their pro-

visions, but, with a few exceptions, they have certain characteristics in common.

The purpose of the homestead laws, with the exception of one or two States, is to protect the family, to secure to it a home, and to provide against its members becoming deprived thereof by misfortune or by the incapacity or improvidence of the head of the family. This being so, the homestead laws may be taken advantage of in general by any person, rich or poor; but in a few States provision is made only for the families of poor debtors, or for needy widows and orphans. These laws in general favor marriage, oppose divorce, and postpone a partition of the homestead estate.

The laws of the States provide in general, subject to certain exceptions, as stated above, that a homestead exemption may be claimed by a husband or other head of a family (and in some States a widow, or, under certain circumstances, a wife) by claiming the right according to the methods prescribed by statute—that is, generally by placing on record a written declaration of the claim. The homestead must be owned and occupied by the claimant, and may be held either by freehold, leasehold, or equitable title only. A temporary absence, with intent to return, will not take away the homestead exemption-right where it is made dependent upon occupation.

The amount of property exempted varies in rural land from 40 to 200 acres; in land in a city, town, or village from one lot to an acre, and in the case of one State 5 acres in small towns; it varies in money value from $500 to $5,000.

In the case of the exemption being claimed by a married person, it can be alienated or incumbered only by the joint deed or consent of husband and wife, and after the death of the owner, leaving minor children surviving, the alienation or incumbrance is absolutely restricted during the minority of the children. The right of temporary disposition may be restricted either expressly by constitutional or statutory laws, or impliedly by provisions continuing the exemption to the marital successors, or continuing it to the children, or by any absolute disposition by law of the property exempted.

The homestead property remains liable without exceptions for purchase-money debt; for State, county, city, and school taxes; and generally for mechanics', laborers', and material men's liens, for improvements thereon, and (with more numerous exceptions) for other liens by laborers or mechanics, for fiduciary obligations of an officer, guardian, or trustee, and for a tort of the owner or wife. It is liable also for obligations existing at the time of the passage of the law under which the homestead exemption is claimed, and although it has been held by some of the State courts that under their laws the homestead was exempted from debts contracted before the passage of the act, the Supreme Court of the U. S. has reversed the decisions and declared such exemption to be unconstitutional (*Edwards* vs. *Kearzy*, 96 U. S. 595) as being in violation of the provisions of the Constitution of the U. S. forbidding the impairment of the obligation of contracts.

It is held in the common-law States (which include all except Louisiana) that homestead-exemption rights are not in derogation of any common-law right of the creditors of a person, and consequently in these States these laws are in general construed liberally, so as to carry out the intent of the laws. The courts nevertheless will take into consideration—in some States to a greater degree than in others—the fact that it has long been customary to give credit in reliance upon property which by law is placed beyond the reach of creditors, and will accordingly restrict the liberality of construction to do justice as nearly as may be.

The general statutory provisions of the different States are as follows:

In Alabama the homestead exemption extends to 80 acres of farming land, not exceeding $2,000 in value, and occupied by the owner; or in lieu thereof, city or town property, not exceeding the same amount in value, occupied by the owner. It inures to the benefit of the widow and minor children, if any. Any instrument waiving the exemption must be attested by a witness, and a husband can not alien or mortgage the homestead except with the joint consent of his wife. It is not exempt from laborers' or mechanics' liens.

In Arizona the exemption extends to real property not exceeding $4,000 in value, in favor of every head of a family, the declaration claiming which must be recorded. The claim may be made by a person having charge of the premises in behalf of the owner who is entitled to the claim. The exempted property can not be sold or alienated in any way without joinder of the wife. On the death of either husband or wife, they holding a homestead exemption, it vests in the survivor, and on the death of the survivor inures to the benefit of the minor children, if any.

In Arkansas the exemption extends to 160 acres of land outside of any town not exceeding in value $2,500, not reducible to less than 80 acres without regard to value. In a city or town an acre worth not more than $2,500 is exempted, not reducible to less than a quarter of an acre without regard to value. The exemption may be claimed by a resident who is married or the head of a family, and is subject only to specified laborers' or mechanics' liens for improvements thereon or for judgment against persons for the recovery of money collected in a fiduciary capacity.

In California the homestead may be selected and claimed (1) by any head of a family to a value not exceeding $5,000; (2) by any other person to a value not exceeding $1,000. The homestead may be selected from the community property or the separate property of the husband or that of the wife, she consenting. The husband and wife must join in executing a conveyance or mortgage. When the homestead was exempted out of community property, it vests in the survivor; when from separate property, it vests in the heirs or devisees of the former owner, subject to the power of the court to assign its use for a limited period to the family of the deceased.

In Colorado the exemption extends to homestead property to the value of $2,000, in favor of every head of a family occupying the same, and inures to a surviving husband or wife and the minor children, if any.

In Connecticut any person owning and occupying a building as a dwelling may, by a written declaration of his intent to hold the same as a homestead, claim an exemption to the value of not more than $1,000, subject to the expenses of his funeral and last sickness; it descends to his widow, if any, for life, and to his children during their minority. The husband or widow may relieve his or her right of occupation.

In Delaware and in the District of Columbia there is no homestead law.

In Florida every head of a family residing in the State may have exempted 160 acres of land outside of any city or town, or half an acre in any city or town, with $1,000 worth of personal property and improvements on real estate. If such 160 acres be afterward included in an incorporated city or town, it still remains exempt, except with the consent of the owner to change. It is liable for labor performed on the homestead. The exemption inures to the benefit of the widow and heirs of the party taking the benefit of it, and the husband and wife must unite in a conveyance.

In Georgia, by the constitution (of 1877), there are exempt in favor of every head of a family, or trustee of a family of minor children, or every aged or infirm person, or person having the care and support of a dependent female of any age, who is not the head of a family, realty or personalty, or both, to the total value of $1,600. The property is liable for material furnished therefor, for labor thereon, or for incumbrances removed therefrom. If the debtor has not availed himself of this exemption, he may, under previously existing laws, claim as exempt 50 acres of land, and 5 additional acres for each child under sixteen years of age, including the dwelling-house thereon, if not worth more than $200 and not lying in a city, town, or village. If the land be in a city, town, or village, the exemption extends to $500 in value.

In Idaho the homestead to the value of $5,000 is exempted in favor of any head of a family, and $1,000 in favor of any other person, and may be of separate or community property in case of married persons. It is liable for laborers' or mechanics' liens, and may be sold or incumbered by husband and wife joining.

In Illinois the exemption extends to the farm and dwelling thereon of every householder having a family, and occupied as a residence, whether owned or possessed by lease; to the value of $1,000. The exemption continues after death for the benefit of decedent's wife or husband occupying the homestead, and also of the children, if any, until the youngest attains the age of twenty-one years. Husband and wife must join in releasing the exemption. The property is liable for improvements thereon.

In Indiana real or personal property to the value of $600 is exempted, remaining liable, however, to liens for labor thereon. No other or homestead exemption is provided. The right of exemption can not be waived by contract.

In Iowa the exemption extends, in favor of every head of a family, to a homestead not embracing more than one dwelling-house and the appurtenant buildings, or if within a town plat to ground not exceeding half an acre in extent, otherwise not more than 40 acres, in either case without limit of value. It is liable for work, labor, or materials thereon, and for debts incurred previous to its purchase not sufficiently secured by other property. At the death of the husband or wife the occupying survivor may elect to retain the homestead for life, in lieu of his or her share in the property of the deceased. On the death of both husband and wife, or a single owner of a homestead, the property descends to the issue, if any, according to the rules of descent, or as directed by will. If there be no issue it becomes liable to past debts.

In Kansas a homestead, occupied by the family of the owner, is exempted to the extent of 160 acres of farming land, or of an acre within the limits of an incorporated town or city. Such homestead becomes the absolute property of the widow and children, or either, if any, provided they continue to occupy it after decedent's death. It can be aliened only by the joint consent of a husband and wife possessing it.

In Kentucky there are exempted the lands, including the dwelling-house and its appurtenances, of the owner, up to $1,000 in value. A surviving husband or widow and the minor unmarried children may occupy the homestead as exempt.

In Louisiana the exemption extends to the lands, buildings, and appurtenances of every head of a family, owning and occupying the same, up to $2,000 in value. A husband whose wife owns, or has the enjoyment of, property to the amount of $2,000 can not claim a homestead exemption. The surviving widow or minor children, if any, if in indigent circumstances, may demand enough to make their total property worth $2,000. No renunciation of rights of exemption is valid, but the homestead may be sold. The claim of homestead exemption must be made in writing, sworn to, and recorded in the book of mortgages. The property is still liable for the payment of mechanics' and laborers' liens, and for debts incurred in an official capacity by a public officer, fiduciary, or an attorney at law.

In Maine the exemption extends to the land, dwelling-house, and appurtenances of a householder in actual possession (and not the owner of an exempted lot purchased from the State) up to the value of $500, but the exempted property is subject to mechanics' and material men's liens. The claim of exemption must be filed in the registry of deeds.

In Maryland there is no homestead-exemption law, but $100 worth of property is exempted from execution on judgments, except such as are obtained for seduction or breach of promise to marry.

In Massachusetts the exemption extends to a homestead estate not exceeding $800 in value, owned or rightly possessed by lease or otherwise, and occupied by a householder having a family. The homestead estate survives until the youngest child is twenty-one years of age, or until the death or marriage of his widow, the widow or a child occupying it. To exempt a homestead, a declaration duly signed, sealed, and acknowledged, must be recorded, and in case the marriage relation exists the homestead can be conveyed or mortgaged only by the joinder of husband and wife.

In Michigan the homestead right may be claimed by every householder in not over 40 acres of land in the country, or a house and lot in a city or village, not exceeding $1,500 in value in either case, and continues so long as occupied by the widow or minor children of the person entitled to it while alive. It is exempt from all contract debts, express or implied.

In Minnesota the exemption extends to 80 acres of land, and a dwelling-house thereon occupied by the owner (who must be a resident of the State), and not included in the plat of any incorporated town, city, or village, or in lieu of this, at the owner's option, land not exceeding one lot, if within the platted portion of such a town, city, or village having over 5,000 inhabitants, or half an acre in a town of less than 5,000 inhabitants. Such a homestead is not subject to attachment, levy, or sale upon execution—the right surviving to the widow or minor children occupying the homestead.

In Mississippi the exemption extends in favor of every occupying householder having a family, to not more than 160 acres of land not exceeding in value $2,000, or, when the homestead is recorded as such, $3,000 in value. If no declaration selecting a homestead is made by the individual, the law designates one. It may be sold or mortgaged only by the joint instrument of husband and wife, and inures to the benefit of the widow or widower and children, if any.

In Missouri the homestead extends (in favor of every householder or head of a family) to not more than 160 acres of land in the country, not exceeding $1,500 in value, or not more than 18 sq. rods in cities of 40,000 or more inhabitants, not exceeding $3,000 in value, or to not more than 30 sq. rods, not exceeding $1,500 in value, in towns or villages with less than 10,000 population. It inures to the benefit of the widow and children, if any, till the youngest becomes of age. A married woman may, by filing a written declaration, claim a homestead in a tract of land occupied by her and her husband, or by her alone if her husband has abandoned her, and it can then be conveyed or mortgaged only with her consent.

In Montana the exemption extends to not more than 160 acres used for only agricultural purposes, and a dwelling-house thereon occupied by the owner, and not included in any town plat, city, or village, or to land not exceeding a quarter of an acre, within a town plat, city, or village, and a dwelling-house thereon, and its appurtenances, owned and occupied by a resident of the State, in either of these cases not exceeding in value the sum of $2,500. The exemption is in favor of a married man, or the head of a family, and the exempted property is liable for the wages of a clerk, mechanic, laborer, or servant.

In Nebraska the exemption extends to not more than 160 acres of land not in a city or village, or to a parcel of land not exceeding in amount two contiguous lots in a city or village, in either case not exceeding in value $2,000, and may be claimed by any head of a family. The homestead can be conveyed or encumbered in case of married claimants only by the joint instrument of husband and wife; it descends discharged of debts.

In Nevada the exemption extends to a dwelling-house with its land and appurtenances, not over $5,000 in value, and may be claimed by either a husband or wife, or other head of a family, by a written declaration acknowledged and recorded as conveyances are required to be. It can be aliened or mortgaged only when the wife joins in the conveyance, except when the wife is a non-resident. The exemption inures to the benefit of the surviving husband or wife and children, if any.

In New Hampshire the exemption extends to a homestead, or interest in a homestead, not exceeding $500 in value, in favor of the owner thereof. The right survives to the wife or husband, and during minority to the children.

In New Jersey the exemption extends to the lot and buildings thereon, occupied as a residence, and owned by the debtor, being a householder and having a family, to the value of $1,000. In the case of husband and wife, both must join in a sale, unless the owner invest $1,000 of the price in a new homestead.

In New Mexico the exemption extends to a homestead or interest in a homestead not exceeding $1,000 in value, in favor of every person having a family and every widow.

In New York the exemption extends to a lot of land with one or more buildings thereon, not exceeding in value $1,000, in favor of a householder having a family and owning and occupying the same. The claim of exemption must be recorded. The exemption survives in the case of a decedent woman to her children until the youngest child is twenty-one years of age; in the case of a decedent man to his widow and children, until the majority of the youngest child and until the death of the widow.

In North Carolina the exemption extends to the real estate not exceeding $1,000 in value, in favor of the occupying owner thereof, resident in the State. The homestead right survives to the widow and children until the majority of the youngest surviving child, and during the widowhood of the widow.

In North Dakota the exemption extends to a homestead not exceeding in value $5,000, in favor of every head of a family owning the same and residing in it. The homestead is subject to execution and sale for the payment of liens of material men, mechanics, and laborers. Husband and wife must join in conveying or mortgaging it.

In Ohio a family homestead not exceeding $1,000 in value

is exempted in favor of the husband and wife living together, or a widow or widower living with an unmarried daughter or an unmarried minor son. The wife may claim an exemption if the husband fails to do so. The exemption inures to the benefit of the husband or wife and minor children. The exemption does not extend to a judgment rendered on a mortgage executed by a debtor and his wife, nor to a claim for manual work or labor less than $100, nor to a vendor's nor to a material man's lien, or the lien of a mechanic for work on the dwelling-house.

In Oklahoma the exemption extends to 160 acres of land in one tract or parcel, not in a town or city, or to a lot or lots not exceeding one acre in a city, town, or village, the same being used for the purpose of a family home. In the former case, 80 acres of the homestead upon which the dwelling-house is located are exempt from all claims, and any mortgage, either legal or equitable, is null and void; except for the excess of over 80 acres, the exemption is in favor of every husband or head of a family residing in the Territory.

In Oregon, Pennsylvania, and Rhode Island there is no homestead exemption.

In South Carolina the exemption extends to the homestead and its land, whether held in fee or by any lesser estate, not exceeding in value $1,000 with the yearly products thereof, in favor of every head of a family residing in the State. In case a woman having a separate estate shall marry the head of a family, who has not sufficient property of his own to constitute such a homestead, she is entitled to such a homestead exemption. The homestead-exemption right can not be waived or alienated.

In South Dakota every head of a family is entitled to a homestead exemption of 160 acres of land with the improvements thereon, or in lieu of this a house or lot, or lots in any town or city not exceeding, in either case, $5,000 in value. This exemption is absolute from attachment on mesne process and from levy and sale on execution.

In Tennessee a homestead or real estate in the possession of, or belonging to, a head of a family, and the improvements, if any, thereon, altogether not exceeding $1,000 in value, are exempt from sale under legal process during the life of such head of a family, and the exemption inures to the benefit of his widow and children. The exempted property may be sold by the joint consent of the husband and wife, when that relation exists, by a conveyance duly executed as required by law for married women.

In Texas the homestead exemption extends to not more than 200 acres of land not in a town or city (in one or more parcels, with the improvements thereon), or in a city, town, or village, to a homestead consisting of a lot or lots not to exceed in value $5,000 at the time of their designation. The homestead property must be used for the purpose of a home, or as a place to exercise the calling or business of the head of a family.

In Utah the exemption is to every head of a family of a homestead to be selected by the debtor, to the value of $1,000 for the judgment debtor, and $500 for his wife, and $250 for each other member of his family. The executor or administrator must include the homestead in the inventory of the decedent's estate, and the widow and children, if any, may occupy the homestead until the granting of the letters of administration and return of the inventory. The court may set apart all the exempt property as a provision for their support.

In Vermont the exemption extends to the dwelling-house, outbuildings, and land used in connection therewith, not exceeding $500 in value. The homestead exempted can be conveyed only by a deed in which the wife joins. The exemption inures to the benefit of the widow and children, during their minority, or, if there be no minor children, to the widow alone.

In Virginia the exemption extends to either real or personal estate, not exceeding $2,000 in value, in favor of every householder residing in the State, and must be claimed by a writing signed by the householder, and duly recorded. The exemption may be waived by a writing signifying the intention of waiver. Real estate set apart may be sold or incumbered by the joint deed of husband or wife, or by the householder alone, if unmarried. The exemption inures to the benefit of the widow and minor children after the death of the householder, and if he die without claiming it the right survives to the widow and minor children. If the widow claim dower or jointure, she can not claim the homestead exemption, but the rights of the minor children remain unaffected.

In Washington every householder being the head of a family may claim the exemption of a homestead not exceeding $1,000 in value.

In West Virginia a husband, wife, or parent, or the infant child of deceased or insane parents, may hold exempt a homestead to the value of $1,000 by executing and acknowledging, in the manner in which deeds are executed and acknowledged, a writing in a prescribed form, which must be recorded in the public land records in the county where the homestead is situated before the debt against which the exemption is claimed is contracted. The homestead is exempt from all debts or liabilities, and is not affected by the increase in value above $1,000 unless such increase is caused by permanent improvements on it. The exemption inures to the benefit of minor children until the youngest has attained the age of twenty-one years.

In Wisconsin the exemption extends to a homestead of not more than 40 acres not included in any city or village, and used for agriculture, but when included within a city or village, of not more than a quarter of an acre without limit of value, in either case, in favor of the occupying owner, resident in that State. The exemption extends to the property held jointly or in common, and to any estate of less than a fee, held by lease or otherwise, and the exempted property, when claimed by an assignor in voluntary assignment, need not be specifically described.

In Wyoming every householder, being the head of a family owning and occupying a homestead, may claim an exemption not exceeding in value the sum of $1,500. The exemption inures to the husband or widow, and minor children, if any, upon the death of the person, seized of the homestead. The homestead may consist of not more than 160 acres of farming land, or of a house and lot, or lots in any town or city. A sale or mortgage by a husband is not binding against his wife, except she freely join in the deed or mortgage.

F. STURGES ALLEN.

Homicide [Lat. *homicidium*, from *homo*, a man, and *cædere*, to kill]: the killing of one human being by another. The word *homicide* is the most comprehensive designation employed in law to denote the causing of a person's death by human agency, and has reference to every mode by which such an act may be committed, whether it be innocent or criminal. There is no resulting implication, therefore, from the mere use of this generic appellation, that the act to which it is applied constitutes a legal offense or is attended with any legal responsibility.

CLASSES OF HOMICIDE.—Homicide, at common law, is divided into three classes—justifiable, excusable, and felonious. In the ancient history of English jurisprudence there was an essential distinction between justifiable homicide and that termed excusable, since the former was regarded as involving no imputation of guilt whatever, while the latter did partake, in some slight degree, of criminality. As a consequence of this distinction, acts of justifiable homicide received no punishment, while those which were deemed excusable merely were attended by a forfeiture of the offender's goods. But at a very early period the imposition of this or any penalty for acts which were either attributable to pure accident or were done in necessary self-defense was felt to be a sentence of unjust severity, and the person charged with the offense escaped the consequences by being held entitled to a writ of pardon and restitution as a matter of course and right, or the judges, in order to relieve him of the expense of suing out the writ, would permit or direct a verdict of acquittal. Any practical diversity between the two kinds of homicide therefore became virtually obsolete, since both were adjudged equally undeserving of punishment. The old names, however, were retained, and a difference was still asserted to exist between them, because excusable homicide did involve some trivial element of heinousness, though too slight to merit any legal penalty. But the distinction, if maintained at all, is too vague and shadowy to be of any importance, and all kinds of homicide not felonious are better termed defensible or innocent. As, however, the old designations are still employed in the law of Great Britain, and in some of the U. S., they will be retained for the sake of convenience in this article. Felonious homicide is the killing of a human creature without justification or excuse, and is divided into manslaughter and murder. These two subjects will be examined under their respective titles, so that acts of a defensible nature will alone be considered here. See MURDER and MANSLAUGHTER.

I. *Justifiable Homicide.*—This is of various kinds. (1.)

Where the proper officer executes a criminal in strict conformity with his sentence. Such an act is not only not wrongful, but is obligatory upon the officer as a legal duty. It is, however, necessary that the officer should follow the sentence precisely, otherwise the act may amount to murder. (2) Where an officer of justice (or other person acting in his aid), in the proper performance of a legal act which he is required to perform, kills a person who resists or prevents him from executing it. An officer who has authority to arrest and imprison may repel force by force in the attempted discharge of his duty, even to the extent of killing his assailant if he can not otherwise take the person whom he intends to arrest into custody, or it is necessary for self-protection. So, if a person charged with a felony escapes after arrest or flees to avoid an arrest, the officer is justified in killing him if it be impossible to effect his capture. It is a further rule that a private individual may justify a homicide necessarily committed in preventing the escape of one who has actually committed a felony. There will be no such justification, however, if the alleged crime be merely a misdemeanor. Jailers may prevent the escape of prisoners by killing them if it be necessary. But in all such cases killing must only be resorted to as the last alternative, without which the performance of the officer's duty can not be accomplished. (3) Where the prevention of a forcible and atrocious crime renders the homicide necessary. Whenever any offense of a felonious nature is attempted, such as murder, robbery, burglary, arson, rape, etc., either the person whose life or property is endangered, or any one who has knowledge of the intended crime, may use every effort to prevent its commission, and causing the death of the offender is justifiable if the imminent danger can not otherwise be averted. Nor is it essential to his justification to show that the crime would actually have been perpetrated if the act of homicide had not been performed. For a person under such circumstances is warranted in acting upon a natural and reasonable presumption, and if there be sufficient indications of a felonious design and of an immediate purpose to carry it into execution, he may conclude that there is actual premeditation, and use the same means for his protection as would, if such were really the case, be allowable. Therefore, if an empty pistol be pointed at any one who believes, and has reason to believe, it to be loaded, and a threat is made to fire it immediately, the person who supposes his life to be in danger may kill his assailant with impunity. But if he knew the weapon to be unloaded, he would not be justified in such an action. Under no circumstances can the homicide be committed if the crime can be averted by less severe precautions, or unless the necessity continue to the time when the felon is killed. Hence if the killing occur after a seizure of the wrongdoer has been effected and he has been properly secured, it will be murder. (4) Killing of the enemy during time of war in the actual prosecution of hostilities is, of course, justifiable on the ground of military necessity.

II. *Excusable Homicide.*—This is of two kinds: (1) By misadventure or accident. This is, however, innocent only when the person committing the homicide is engaged in a lawful act, without any intention of inflicting injury upon another, and without any failure to use proper precautions to prevent danger. If the act is unlawful, the homicide will be felonious. If the head of a hatchet which a person is using, and which he has reason to believe is firmly fastened, flies off and kills a bystander, or if a wagoner drives over and kills a person lying on the road upon a dark night, the homicide is accidental and excusable. Likewise if death results from a dangerous surgical operation or medical treatment which was reasonably resorted to, the homicide is excusable. The degree of care and prudence to be exercised is variable under different conditions. The use of poisons or dangerous weapons would require much greater precaution than the employment of articles not in themselves liable to occasion injury, as, for instance, the common utensils in everyday use. The lawful act which results in a person's death may be the administering of reasonable and moderate correction by a parent or school-teacher or other person occupying a position of similar authority. But the homicide is only innocent in such a case when the bounds of a proper restraint upon the severity of the punishment are not exceeded. In like manner, if several persons should engage amicably in athletic sports, and by some unfortunate mischance one of them should be killed, he who occasioned the death would be innocent. (2) Homicide in self-defense, or in protection of one's property or his wife, child, parent, or servant. But under this head are not included cases of defense against felonious crimes, which have been already considered, but only against any other modes of attack or injury which may be attempted, as in cases of common assault or trespass, where there is no intention to commit a felony. The distinction is of considerable importance, on account of the difference in the nature of the legal obligation which is imposed upon the person against whom an offense is perpetrated to seek to avoid the commission of homicide. When an attack is made with intent to kill, or any other felony is attempted, the person whose life or property is endangered is under no duty to seek to avoid the threatened injury by availing himself of every practicable means of escape, but he may stand his ground, use every possible means of defense, and kill the wrongdoer if a reasonable and necessary precaution requires such an act. But when the attempted injury is not felonious, homicide can not be committed in defense unless all available measures are first adopted to escape from or avert the danger. Therefore, if a simple assault be committed, though the person assailed may protect himself by blows, he must, as the old phrase expresses it, "retreat to the wall," or forbear as long as is consistent with safety before he ventures to kill his assailant. In the defense of property retreat is not necessary in order that the homicide may be justified, since that would be a yielding of the property without attempting protection; but the wrongdoer must first be requested to leave a house or to refrain from interfering with goods before preventive measures can be adopted, and even then the trespasser can not be killed unless he persists so strenuously in effecting his purpose that such a course is rendered necessary. Only a reasonable degree of force can be used against an intruder if that will prove sufficient. A felony is so heinous an offense that the laws regard the destruction of life no disproportionate penalty if the wrongful act be persisted in; but offenses of any less degree ought not to entail so fearful a punishment unless they can, by no practicable means, be otherwise averted. In the U. S. crimes are generally defined by statute, and the principles relating to homicide have therefore received various modifications. Very essential alterations, however, have rarely been made. The distinction between justifiable and excusable homicide has in some States been discarded, but the same classes of offenses which were formerly included under these respective designations have usually, to the same extent, been declared innocent.

Revised by F. Sturges Allen.

Homilet'ics [from Gr. *δμιλητικός*, pertaining to conversation, affable, deriv. of *δμιλεῖν*, mingle with, converse with, deriv. of *δμιλος*, assembly, throng; *δμός*, together + *ἴλη*, crowd]: the science which treats of the structure, composition, and delivery of the sermon. The word homiletics was first used in the latter half of the seventeenth century. Its meaning is broader than its derivation from the word *homily* would imply. Two other words have been suggested as substitutes for homiletics: "halieutics" and "kerystics," but neither of these words has come into general use. Chrysostom and Augustine, both of whom had been teachers of rhetoric, were the first to treat sacred rhetoric as a distinct branch of study. For a long while homiletics was considered as the synonym of "sacred rhetoric." But as there are not two kinds of logic, so there can not be two kinds of rhetoric. Homiletics presupposes both logic and rhetoric, and builds its system upon them, applying their principles to the work of the Christian pulpit. The sermon is distinguished from all other orations both by its subject and its object; it finds its motive, its authority, its materials, and its end in the Word of God; it speaks of and for God to men, and it aims to bring men to God in faith and love and service. The preacher is to unfold the teachings of the divine Word and impress them upon the minds and hearts of men.

After the Reformation, during the sixteenth and seventeenth centuries, with the revival of preaching, came a far more careful and elaborate study of homiletics. It has been said that Erasmus (perhaps the name of Melanchthon should be added) was "the link between the older treatises and Protestant homiletics." Since the early part of the nineteenth century the science of homiletics has been more and more recognized as a most important discipline, not a mere branch of general rhetoric, but the leading department in practical theology, which includes, with homiletics, *poimenics* (or pastoral theology), *liturgics* and *catechetics*. Treatises have been multiplied greatly in recent years, until

their number is formidable, if not confusing, to the student. Homiletics classifies sermons as textual, topical, or expository. Other classifications have been suggested, but this is the one which is commonly accepted. Rules are given for the construction of sermons in each of these classes. Dealing in general with the preparation of the sermon, this is the accepted principle: A sermon must have a text to give it authority; it must have a theme to give it unity; it must have a plan to give it order; it must have a fitting style to give it adaptation; it must have a proper delivery to give it effectiveness. This involves not only a knowledge of logic, rhetoric, and elocution, but above all a knowledge of God and of man. Directions are given, in the treatises on homiletics, upon the choice and the interpretation of the text, upon the gathering of materials and their logical and practical arrangement, upon the introduction, the proposition or theme, the statement and the order of the heads, upon illustration, and upon the peroration or application, as well as upon the proper style for public discourse and upon the formation and use of the voice in speaking. Thus the several parts of the sermon are separately considered. Not only has homiletics to do with methods of preparation, but also with the different modes of delivery, with the manuscript or without it, memoriter preaching and extemporaneous preaching. Special treatises on the subject of extemporaneous preaching, with practical directions and suggestions, have been published, of which three may be mentioned: *Art of Extempore Speaking*, by Bautain; *Preaching without Notes*, by Storrs; and *Extempore Speech*, by Pittenger. All writers agree that while rules and directions are important and helpful, the individuality of the preacher must be free and untrammeled, and must be developed and cultivated. All agree that depth of conviction, sincerity, and a divine earnestness, fearless and faithful, are fundamental necessities to effective preaching. Careful lists of books on homiletics will be found in Kidder's *Treatise on Homiletics*, appendix, and in Blaikie's *For the Work of the Ministry*, appendix. More recent works, Broadus's *Preparation and Delivery of Sermons*, Van Oosterzee's *Practical Theology*, Hoppin's *Homiletics*, and Phelp's *Theory of Preaching* and his *English Style in Public Discourse*, should be mentioned as important contributions to the literature of this subject.

THOMAS S. HASTINGS.

Homily [from O. Fr. *homelie*, from Mediæv. Lat. *homi'lia*, homily, sermon, from Gr. *ὁμιλία*, conversation, familiar talk, lecture, homily, sermon. See HOMILETICS]: a familiar and informal discourse. It is impossible to discriminate sharply between the homily and the sermon on the ground of their intrinsic qualities. It is customary to say that the homily is a more familiar and informal discourse than the sermon. Plotius says that "the discourses of Chrysostom were homilies rather than sermons." Historically the distinction is clearer. One of the early provincial councils in the sixth century enjoined that "if for any reason the presbyter could not preach, the deacons should read 'homilies of the holy fathers.'" Many collections of homilies were made at an early period. Alfred the Great translated the homilies of Bede. *Homilarium* (Med. Lat.) was the title given to such collections. In the latter part of the eighth century Charlemagne directed Paulus Diaconus to prepare a new *homilarium* (A. D. 788) which should be a collection of "*the best* flowers out of the beautiful meadows of the Fathers, that those who were unable to preach might read them." The homilies were arranged according to the festivals and seasons of the ecclesiastical year, and the passage for the day was called a *pericope*, or section. Hence the use of homilies in the churches came to be known as the "pericopic system." Each homily began with the words "Post illa verba textus" (after these words of the text), and so these homilies were popularly known as "postils." Hence in the Latin of the Middle Age *postillare* meant to preach or to read a homily. Manuscript copies of Charlemagne's *homilarium* are preserved in many of the libraries of Europe. In the reign of Edward VI. what is known in England as the *First Book of Homilies* was prepared and published in 1547, under the direction of Cranmer. Under Elizabeth in 1563 the *Second Book of Homilies* was edited by Jewell. In both of these volumes various preachers are represented. These homilies were designed for the use of the inferior clergy who were not qualified to make sermons; the language of the article (thirty-fifth) which enjoined their use requires that they may be read in churches by the ministers, diligently and distinctly, that they may be *understanded* by the people.

In the homily there is less of homiletic art than in the sermon; it is usually a familiar exposition of Scripture without structural or rhetorical form or finish. The term homily has been displaced in modern usage by the term sermon, and has become mainly historical.

THOMAS S. HASTINGS.

Homin'idæ [Mod. Lat., liter., those belonging to the man-tribe; Lat. *homo*, *hominis*, man + Gr. patronymic suffix *-ίδαι*, descended from]: a family established for the reception of man, in contradistinction to the other families of Primates. In contrast with those other families, man is distinguished (1) by his habitually erect form (except in infancy), the fore limbs being withdrawn completely from the *locomotive* series and transferred to the *cephalic*; (2) the foot has the inner toe produced and developed as a "great toe," and this is in the same plane with the others; (3) the hair is scant, except upon the top of the head, but it varies in extent and development on other parts of the body according to the race as well as to the individual; (4) the teeth form an uninterrupted series in each jaw (there being no diastemata, or interruptions, for the reception of enlarged canines in the opposite jaws); and (5) they are in number thirty-two, of which each side of each jaw has two incisors (I. 2), one canine (C. 1), two premolars (P. M. 2), which succeed two deciduous molars, and three permanent and later developed molars (M. 3); furthermore, (6) a bony external auditory meatus is developed, and at the bottom of this is a membranum tympani; (7) the nose has its median septum thin and narrow, and the nostrils are correspondingly approximated. In the first four mentioned characters man contrasts with all the other members of his sub-order, but in the last three mentioned (5–7) he agrees with the apes and monkeys of the Old World, in contradistinction with the monkeys of the New World. In his organization generally man agrees closely with the higher apes (*Simiidæ*), and this similarity extends to the brain as well as to the other parts of the organization. The brain differs chiefly in size and the development of the gyri and sulci of the cerebrum. The extent of agreement is expressed by the association of man with the monkeys of the Old World in one group, opposed to the monkeys of the New World, and the combination of all those in a major group (sub-order *Anthropoidea*), contrasted with the lemurs (*Lemuridæ*), *Tarsiidæ* and aye-aye (*Daubentoniidæ* or *Chiromyidæ*), which are combined in a corresponding sub-order (sub-order *Prosimiæ*). Such are the characters which distinguish man as a member of the animal kingdom, and which have induced naturalists to adopt the classification thus sketched; but it is to be remembered that in this case no attention is given to psychological characters, or to those other endowments which distinguish man so trenchantly from all the other members of the animal kingdom, to which in his purely physiological nature he belongs. These important characters more fitly belong to another province, and will be treated under the title MAN.

THEODORE GILL.

Homocercal: See HETEROCERCAL.

Homœop'athy [from Mod. Lat. *homœopa'thia*, homeopathy; Gr. *ὅμοιος*, like, similar + *πάθος*, what happens to one, experience, feeling. But *πάθος* had the further derived meanings of suffering, calamity, disease, ailment, from which is taken the Mod. Lat. and Eng. meanings]: a system of therapeutics founded upon the principle that "like cures like," that is to say, that a drug is capable of removing morbid conditions, naturally existing, which are similar to those it is capable of producing. This principle or law in therapeutics was first announced by Hippocrates long before the Christian era as one of the methods of applying drugs for removing disease, but owing to the fact that the knowledge of what drugs were capable of producing was extremely limited, and also that Hippocrates made no effort to increase his knowledge in that direction, the application of the law soon fell into disuse. It was rediscovered and announced by Hahnemann in 1796 in Hufeland's *Journal*, in a paper entitled *An Attempt to Find a New Principle for the Discovery of the Healing Power of Medicines*. Hahnemann collected and arranged all that was known concerning the positive effects of drugs upon the healthy, and also made extensive investigations into the properties of new drugs by experimenting with them upon himself, his family, and his friends.

Thus a new materia medica, adapted to the requirements

of homœopathy, arose and developed from year to year, as new observations of the positive effects of drugs upon healthy human beings were added.

Materia Medica.—Homœopathy demands a materia medica exclusively its own for the application of its distinctive therapeutics. Old-school works are useless, and since Hahnemann promptly recognized this prime necessity, he must be recognized as the founder of the homœopathic system, if not the discoverer of the law of similars: the law would be inapplicable without a record of drug-effects upon the healthy. At first all cases of poisoning were collected, then these positive effects were supplemented by experiments, and to this latter work especially Hahnemann devoted the remainder of his life. Since his time many physicians, singly or in unions, have prosecuted the all-important work of proving drugs. A collection of these results constitutes a materia medica; homœopathic, because it is to be used exclusively for homœopathic therapeutics, and it is not expected to contain any theories of drug-action nor to be used for the purpose of *producing* similar, effects in the sick (physiological therapeutics), but only to *remove* similar effects or symptoms from the sick (substitutive or homœopathic therapeutics). The arrangement of the records of drug-effects or symptoms is a subject of difference among those who practice homœopathy; some prefer to preserve the original narrative form of each record of poisoning or proving, others, following Hahnemann, prefer to separate from the original records the symptoms belonging to different parts of the body for convenience of reference only—this latter method is called the schematic method. For example, a patient complains of an affection located in the face; the homœopathist, wishing to apply a remedy which corresponds as accurately as possible, finds it convenient to have placed before him all of the symptoms of a probable remedy which also are referred to the face, and can then readily make the comparison and decide if the remedy be indicated. If the doctor has thought of aconite as probably indicated he turns to that drug, section face, and reads as follows:

Aconitum napellus.

FACE *objective*. Countenance pale and anxious. Livid and ghastly. Pale, with expression of anxiety and restlessness, etc. *Subjective*. Sensation of face growing large. Glowing heat in face. Cold sensation though hot to touch. Creeping pain on the cheeks. Sensation as if cheeks were swollen almost to double their size. Stinging and drawing in both jaws;

and so on for a hundred symptoms.

These symptoms are culled from various sources, and by a reference after each one (omitted here) the original source may be consulted. It is noticed that this drug produces a well-marked face-ache (tic douloureux), and hence will cure it provided the pain of the patient be similar to that of the drug with the characteristics of *aconite*, namely, stinging and drawing pains with sensations of heat and cold (often alternating), of swelling, and especially with extreme anxiety and restlessness of mind and body. All of the symptoms of a patient should be found in the indicated remedy, but should the records of the drug be imperfect, which is frequently the case, the therapeutist must look for a fair correspondence on three essential points, namely, location, sensation, and conditions of aggravation and amelioration; these being found the remedy may be exhibited with confidence (but in an amount far less than would suffice to produce similar effects in a healthy person), the disease will be supplanted by a transient drug-effect, and the patient speedily cured.

Hahnemann discovered, proved, and applied as many as *ninety-six* remedies. This number has been steadily increased by his followers, and now as many as 900 remedies are "booked," though of the great majority our information is of the most fragmentary character, and in some cases it is even doubtful.

The successful application of homœopathic therapeutics depends, first, upon a knowledge of the effects of drugs upon healthy people, and, secondly, upon a careful comparison of such effects with those observed in patients. When the correspondence is complete, or essentially so, the indicated drug will remove the symptoms of the patient. As a natural consequence of the homœopathic administration of drugs it was found necessary to reduce very greatly the amount of the drug given to produce a cure. It is necessary to avoid producing in the sick new effects of the drug, or of adding to the violence of the existing symptoms of disease, and it has been found by those who practice homœopathy that incredibly minute quantities of drugs are capable of obliterating the symptoms of a patient. It is found that diseased organs are much more sensitive than healthy organs to the action of those drugs which act directly upon them, and that an amount of a homœopathic remedy sufficient to supplant the disease is much less than that necessary to produce a similar disease in a corresponding organ in a state of health.

Rise and Progress of Homœopathy.—At the close of the eighteenth century, when homœopathy was promulgated by Hahnemann, therapeutics was in a most deplorable condition; empiricism was rampant. Most violent and heroic measures were resorted to to combat the most trifling ailments. The mortality of even ordinary diseases was frightful, and the revolution inaugurated by Hahnemann and homœopathic therapeutics was astounding. While Hahnemann was driven from place to place, forbidden to dispense his own remedies, homœopathy was eagerly adopted by many of the most learned and influential physicians and laymen. It spread throughout Europe, and before Hahnemann's death numerous and large hospitals and dispensaries were established in the principal cities of Europe, many of which were under the authority of the government. A military hospital, under homœopathic physicians, was established in St. Petersburg. Homœopathy spread to Great Britain and to the U. S. But at this time, about 1845, a systematic effort was made on the part of the professors and universities, as well as physicians holding offices under government, to arrest its progress. Physicians who adopted the homœopathic method were deprived of public office, denounced as quacks, and persecuted in every possible way. Since physicians are dependent upon their good professional name for their livelihood, these methods availed, and within ten years it was officially announced that homœopathy was practically dead. Its hospitals were closed, and its followers, who dared to proclaim themselves as such, were under a ban. Doubtless its rapid rise and progress were largely dependent upon the wonderful results obtained in the treatment of a most virulent epidemic of scarlet fever about the year 1800 which ravaged the European continent, and later to the wonderful prescience of Hahnemann in discovering and promulgating a knowledge of the curative remedies for Asiatic cholera in the terrible epidemic of 1830–32.

There seemed to be no reason why educated physicians should not practice this system of therapeutics as well as any other; consequently, so long as the system was not denounced as "infamous" by those in power and authority, it was eagerly studied and followed. This was especially the case in the U. S., where there was no "state medicine," and where a physician's influence and practice depended entirely upon his individual success. But even in the U. S. those who early embraced homœopathy were expelled from the medical societies, and were avoided by their former friends and companions, who refused to meet them upon professional or social equality. Still, in spite of all efforts, public and private, the system has grown steadily (much more slowly in Europe), until in the U. S. there are about 15,000 homœopathic physicians.

The refusal of the "old school" to consult with or assist physicians practicing homœopathy led to the cultivation of all the specialties in medicine, so that the homœopathic school is now quite independent, having its own specialists in every department, its own surgeons, and its own literature.

Efforts have been made and still are being made to establish in the various States of the Union a "state medicine" by means of examining boards, but this has, for the most part, failed of success, for the people are inclined to see fair play, and are glad to accord praise to success.

Institutions.—Hospitals and dispensaries were early established by homœopathic physicians in various countries where it was practiced. Many of the original and large hospitals have been closed, but even in foreign countries there has set in a slow, but perhaps more healthful, growth. Thus in Paris there are several flourishing homœopathic hospitals and dispensaries, with permanent endowments, which are yearly added to, and the growth of homœopathy, though slow, is steady, the ranks of homœopathic physicians being slowly recruited by the adhesion of physicians who have come to acknowledge and adopt homœopathic methods in therapeutics. In London the Homœopathic Hospital is being replaced by one many times larger.

In Europe homœopathic physicians are not known as such. Many "regular" physicians practice homœopathy as

they see fit, retaining, however, their official connection with the general professional public, or with the universities in which they may be professors.

In the U. S. the establishment and endowment of homœopathic hospitals has not been rapid, but it has been steadily progressing, and a very large number of hospitals and dispensaries are to be found in nearly all the large cities of the country, and even in some of the smaller towns. Hospitals for special diseases are also being established; thus in New York city the Ophthalmic Hospital, one of the largest institutions of its kind in the U. S., treats from 14,000 to 15,000 patients a year, and has connected with it a college with a charter from the State of New York, empowering it to grant the degree of "oculist and aurist," with a large corps of professors and instructors. In New York city there is also a most perfectly equipped and fully endowed hospital for children exclusively, namely, the Laura Franklin Free Hospital, containing fifty-two beds. Hospitals for the treatment of the insane are established in various States of the Union, and are under State control.

The necessity for medical colleges teaching homœopathy was among the earliest needs of the homœopathic profession in the U. S. The first homœopathic college was established in Philadelphia, the second in New York, and the third in Boston, and others in the great educational centers of the country. The older homœopathic medical colleges are still flourishing. There are now in the U. S. eighteen medical colleges in which homœopathic therapeutics is taught, and it can no longer be said that physicians practicing homœopathy are deficient in any branch of medical education, or unable to practice surgery, obstetrics, or any other branch belonging to a thorough medical education. Hospitals and dispensaries are connected with all of these medical schools, and clinical instruction is a prominent feature of the curriculum.

Results.—Comparative results of treatment of the two schools of medicine have formed a bone of contention, and there have been many bitter discussions on the subject. It may be said that the homœopathic method of prescribing remedies is much less likely to inspire the confidence of the patient than the methods of administering drugs which have a strong taste, or an immediate drug-effect. Homœopathy has grown in the confidence of the community only by virtue of its power to make people well. It would have no hold upon the people, and would speedily come to an end as a system, were it useful only for mildest forms of diseases. But the history of the epidemics of the most virulent diseases has borne testimony to its great superiority. This is eminently true of yellow fever, cholera, diphtheria, etc.

While it would be unwise to give statistics from institutions inaccessible, or from those of foreign countries, we seem to be justified in calling attention to two institutions in the State of New York open to public inspection and in complete running order, namely, the State Homœopathic Asylum for the Insane at Middletown, which claims to cure 50 per cent. more than any other asylum for the insane in the world not under homœopathic treatment, and the Laura Franklin Free Hospital for Children in the city of New York. In the homœopathic hospital the average mortality is only 3 per cent.

Its Future.—There can be no doubt that while large numbers of physicians have joined the homœopathic school as a protest against the intolerance of the "old school," rather than from their conviction of the truth of homœopathy or their exclusive practice of it, yet the great mass of the members of the homœopathic societies in this country and abroad practice pure homœopathy to the best of their ability. It is not an easy system of therapeutics to practice. It requires as much special investigation as the practice of any of the great specialties, and its most perfect and highest application will doubtless in the future be confined to what might be called "specialists in homœopathic therapeutics." Yet its ordinary application may continue to be attempted by the great mass of physicians who become satisfied of its superiority.

With the removal of the obstacles of public preferment, homœopathy will stand upon its own merits. If more successful in the cure of disease, the people will more and more demand homœopathic treatment at the hands of their physicians, and it will become necessary for all physicians to study homœopathic therapeutics. Whenever medical colleges shall agree to teach homœopathic therapeutics as a part of the regular curriculum, then will physicians feel free to cultivate homœopathy, either as a specialty or as a part of their regular medical practice, and a distinctive homœopathic school of medicine will disappear.

TIMOTHY FIELD ALLEN.

Homoge'neousness, or **Homogene'ity** [from Mod. Lat. *homoge'neus*, from Gr. ὁμογενής, of the same kind or race; ὁμός, same + γένος, kind, race]: equality of degree in an algebraic expression. Were these the symbols of abstract numbers *only*, the term would be nearly destitute of important signification. But the *principle of homogeneousness* applies to equations expressive of relations between symbols for physical magnitudes (as well as abstract numbers), and these physical magnitudes of various kinds, incommensurable with each other, are only made commensurable and susceptible of mathematical relations by simulation to abstract numbers through the agency of, for each, some arbitrary *unit*. Thus we measure *time* by *days* or hours; linear extension by *miles* or *feet*, etc., or *meters*, etc.—units, so called, of wholly arbitrary selection—while those of one kind (e. g. the *hour*) are wholly incommensurable with those of another kind (e. g. the *meter*), except that each is a *unit* and represented by the abstract number *one*. An equation expressing a relation between physical magnitudes should be true whatever be the arbitrary unit taken for each; and, indeed, failure to bear this test is a conclusive evidence of error. But a change of arbitrary unit will evidently cause a change in the numerical value by which each particular magnitude is expressed. Thus if f, f', l, l', t, t', etc., symbolize respectively *forces*, *lengths*, and *times*, and n, n', n', etc., *abstract* numbers, and we diminish the unit for each in the ratio of $\frac{1}{n}, \frac{1}{n}$, etc., these physical magnitudes will *then* be expressed by nf, nf', nl, nl', etc., and the relations expressed by $F(f.f' \ldots l,l' \ldots t,t', \text{etc.}) = 0$, should become, truthfully, $F(nf, nf' \ldots nl, nl' \ldots n''t, n''t' \ldots) = 0$, in which F denotes any function of the magnitudes.

Literal homogeneousness in general secures the existence of this condition; unless, indeed, some of the units called derived, are defined in terms of others, called fundamental, in which case homogeneity is secured only after replacing the derived units by their expressions in terms of the fundamental ones. See UNITS. Revised by S. NEWCOMB.

Homographs [from Gr. ὁμόγραφος, written alike; ὁμός, same + γράφειν, write]: words which concur in orthography, but are really distinct in origin and meaning; examples are *base* (low) and *base* (foundation), as well as *read* (present) and *read* (past). As distinguished from these, *homophones* are words which concur in sound, though really distinct in origin and meaning; examples are *beet* (vegetable) and *beat* (strike), as well as *base* (low) and *base* (foundation). Again, words which are both *homographs* and *homophones* are called *homonyms*; i. e. words which concur both in orthography and in sound but are really distinct in origin and meaning are *homonyms*; thus *base* (low) and *base* (foundation) are homonyms as well as homographs and homophones. For the class of homographs which are not homophones there is no special designation; it is unfortunate that the term homograph could not be limited in application to this class. The artificial orthography of the English written language, coupled with the varied sources of its materials, makes the number of such words particularly large; cf. *lead* (metal) vs. *lead* (verb); *sow* (subst. < O. Eng. *sugu*) vs. *sow* (verb < O. Eng. *sāwan* : Germ. *säen*); *tear* (verb < O. Eng. *teran* : *zehren* < Indo-Eur. *der-*; cf. δέρω) vs. *tear* (subst. < O. Eng. *tēar* : Germ. *zähre*; cf. Gr. δάκρυ); *bass* (fish, for *barse* < O. Eng. *bærs*) vs. *bass* (music, older spelling *base*, *bace* conformed to Ital. *basso*).

BENJ. IDE WHEELER.

Homology [from Gr. ὁμολογία, agreement, deriv. of ὁμόλογος, agreeing with, corresponding; ὁμός, like, similar + λόγος, word, reason, thought]: in biological science, a term implying identity of structure without, necessarily, similarity in function. The opposite term is *analogy*, which denotes similarity of function without implying any resemblance in structure. Thus the wing of a bird and the arm of man are homologous, in that they are essentially alike in bones, muscles, nerves, and blood-vessels, while their functions are totally different. On the other hand, the wings of butterflies and birds are analogous organs, since they are both used for purposes of flight, but they differ entirely in structure. Much of recent advance in biology has been due to a clearer recognition of homologies, and to the realization that different kinds of homologies exist. Thus it is frequently found that two organs agree well in structure, yet

the identity has been brought about in different ways. This is *homoplasy*. On the other hand, true homology or *homogeny* is the condition of a similar origin of the organs in question. Thus the air-tubes of spiders and those of insects are homoplastic, for while they agree in structure the one has been derived from the gills of an aquatic ancestor, the other from dermal glands. On the other hand, the wing of a bird and the arm of man are homogeneous, for they have a common origin in the reptilian leg. Still another homology—serial homology—may be recognized, in which parts the same in structure are serially repeated in the same organism. The ribs of man may serve as an instance. J. S. KINGSLEY.

Homology: in chemistry, a relation very common, especially among the compounds of carbon. It is well illustrated by the series of paraffins (see HYDROCARBONS), the peculiarity of the relation being found in the fact that any member of the series differs by CH_2 from that immediately preceding or immediately succeeding it. The relation is not confined to hydrocarbons, but is met with in all classes of carbon compounds. Thus there are the following examples:

Alcohols.		*Acids.*	
Methyl alcohol.....	CH_4O	Formic acid.....	CH_2O_2
Ethyl alcohol.....	C_2H_6O	Acetic acid.....	$C_2H_4O_2$
Propyl alcohol.....	C_3H_8O	Propionic acid.....	$C_3H_6O_2$
Butyl alcohol.....	$C_4H_{10}O$	Butyric acid.....	$C_4H_8O_2$
Amyl alcohol.....	$C_5H_{12}O$	Valeric acid.....	$C_5H_{10}O$
Hexyl alcohol.....	$C_6H_{14}O$	Caproic acid.....	$C_6H_{12}O_2$

It will be observed that there is the same difference between the succeeding members of each of these series as in the series of hydrocarbons. From a chemical point of view, the explanation of homology is quite simple. Marsh-gas, CH_4, is a saturated molecule (see CHEMISTRY), that is to say, it can not combine directly with anything, but its hydrogen atoms can be removed one by one, and other atoms or groups substituted for them. If one hydrogen atom is removed, the residue, CH_3, has the power to unite with other things. Two such groups can unite with each other and form a saturated or complete compound of the formula C_2H_6. This, in turn, may lose an atom of hydrogen and leave C_2H_5, and this can unite with a group, CH_3, forming C_3H_8, and so on. The second member of the series may be said to be formed from the first by the substitution of the residue or radical, CH_3, for hydrogen. The third is derived from the second in the same way, or, in general, an homologous series is one formed by the successive substitution of the radical CH_3, commonly called methyl, for hydrogen. This is the broadest definition of homology. In order that compounds may be regarded as strictly homologous, they must exhibit similarity in conduct. See CHEMISTRY. IRA REMSEN.

Homonyms [from Gr. *ὁμώνυμος*, of same name; *ὁμός*, same + *ὄνομα*, name]: words which are the same in spelling and sound, but really distinct in origin and meaning (see also HOMOGRAPHS and HOMOPHONES). Such are *lay* (verb, Germ. *legen*: Goth. *lagjan*) vs. *lay* (song, from O. Fr. *lai*, from Celtic *laid* (?)) vs. *lay* (of laity, from Gr. *λαϊκός*, of the people, *λαός*); *see* (verb < O. Eng. *sēon*: Germ. *sehen*, cf. Lat. *sequor*) vs. *see* (of bishop, viâ Fr. from Lat. *sedes*); *host* (in mass, from Lat. *hostia*, victim) vs. *host* (entertainer, from O. Fr. *hoste* > Mod. Fr. *hôte* < Lat. *hospes*, *-item*) vs. *host* (army, from O. Fr. *host* < Lat. *hostis*, enemy); *saw* (tool < O. Eng. *sage*: Germ. *säge*) vs. *saw* (maxim < O. Eng. *sagu*, cf. Germ. *sage*) vs. *saw* (past of *see* < O. Eng. *-sah*: Germ. *sah*); *list* (roll, from Fr. *liste*, of Germ. origin, cf. O. H. Germ. *līsta*, Mod. Germ. *leiste*, cognate with Eng. *list*, strip < O. Eng. *līst*) vs. *list* ("enter the lists," viâ Fr. *lice*, barrier, inclosure, prob. from Lat. *licium*, string). The latter word probably has its *-t-* from confusion of meaning with M. Eng. *list*, strip of cloth (: Germ. *leiste*). This illustrates the only way in which words can be said to tend toward each other in form. The natural tendency in language would be to avoid homonyms, and particularly homophones, as involving occasion for misunderstanding. The tendency is never toward likeness of form merely for the form's sake, but only that likeness of form may attend a supposed likeness of meaning. The impulse toward the production of like forms for words which would naturally remain unlike will always be found to have its initiative in a false impression of their relation in meaning, this false impression being encouraged by a resemblance in form. The existence of like forms for really distinct words becomes then a continual temptation to their misuse, and is undoubtedly a prominent factor in the modification of signification. Thus with the word *lists* above the possibility is always present of such a misuse as "be enrolled in the lists" for "enter the lists." The French *aloi* (O. Fr. *alei*, Eng. *alloy*) is derived from Lat. *adligā're*, combine, and originally meant "combination," but on account of its concurrence with the phrase *à loi*, "according to law," became restricted in application to the mixture of metals according to legal standard.

BENJ. IDE WHEELER.

Hom'ophones [Gr. *ὁμόφωνος*, of the same sound; *ὁμός*, same + *φωνή*, sound]: words which are the same in sound, but really distinct in origin and meaning; such are *dock* (verb) and *dock* (basin), as well as *peel* and *peal*. As distinguished from these *homographs* are words which are the same in spelling, though really distinct in origin and meaning; such are *lower* (compar. of *low*) and *lower* (frown), as well as *dock* and *dock*. Again, words which are both homophones and homographs are called homonyms; i. e. words which concur both in sound and in orthography are homonyms; thus *dock* and *dock* are homonyms as well as homographs and homophones. For that class of homophones which are not homographs there is unfortunately no special designation. The diversity of the sources of the English vocabulary and the extensive changes produced by the action of phonetic laws make the number of such words particularly large in English. Examples of homophones of diverse orthography are *right* (< O. Eng. *riht*: Germ. *recht*) vs. *write* (< O. Eng. *wrītan*: Germ. *reissen*) vs. *rite* (from Lat. *ritus*) vs. *wright* (< O. Eng. *wyrhta*; cf. Eng. *work*, Germ. *wirken*); *core* (viâ Fr. from Lat. *cor*, heart) vs. *corps* (viâ Fr. from Lat. *corpus*, body); *son* (< O. Eng. *sunu*: Germ. *sohn*) vs. *sun* (< O. Eng. *sunne*: Germ. *sonne*); *ale* (< O. Eng. *ealu*) vs. *ail* (< O. Eng. *eglan*); *bough* (< O. Eng. *bōh*: Germ. *bug*, cf. *πῆχυς*) vs. *bow* (< O. Eng. *būgan*: Germ. *biegen*). BENJ. IDE WHEELER.

Homoph'ony: See POLYPHONY.

Homop'tera: See HEMIPTERA and ENTOMOLOGY.

Homotax'is [Mod. Lat., liter., similarity of arrangement; Gr. *ὁμός*, like, similar + *τάξις*, arranging, arrangement: deriv. of *τάσσειν*, draw up, arrange]: in geology, a term applied to formations to indicate similarity in stratigraphic position, as distinguished from synchrony, or identity in time of deposition. In different areas or districts the sequences of formations are made out by means of their physical relations. The several formations of one district are then correlated with those of another by means of their contained fossils. For a long time it was supposed that the correspondences thus made out determined the precise synchrony of formations in different geologic areas, but modern opinion regards such determinations of synchrony as approximate only. The term homotaxis was introduced by Prof. Huxley for the purpose of avoiding in discussions of correlation the implication of precise chronologic equivalence. See *Quart. Jour. Geol. Soc.*, vol. xviii. (London, 1862).

G. K. GILBERT.

Homs, or **Hums**: the *Emesa* of Strabo and Pliny; town of Syria, in the valley of the Orontes; 1 mile E. of the river and about 86 miles N. E. of Damascus. It became a Roman colony under Caracalla (211–217 A. D.), was the birth-place of the Roman emperor Elagabalus (218–222), and was noted for its splendid temple of the Sun. Here Zenobia, Queen of Palmyra, was defeated by the Emperor Aurelian in 273 A. D. The modern town is well built, of black basalt, with which also most of the streets are paved. It is surrounded by a wall of no great strength, which suffices, however, to keep off the prowling Bedouin. No remains of its ancient magnificence have survived. It is a place of considerable trade, and has a population of about 30,000.

Revised by G. L. HENDRICKSON.

Honan, hō'naan' (literally, S. of the Ho or river, i. e. the Yellow river, which traverses the northern part from W. to E.): an inland province of China lying W. of Shantung and Kiangsu, and S. of Shansi and Chih-li, between the parallels of 32° and 37° N. lat. and the meridians of 110° and 116° E. lon. Area, 65,104 sq. miles. The eastern part belongs to the Great Plain; the western is traversed in a southeasterly direction by spurs of the Fu-niu range of mountains. (See CHINA.) The soil is fertile, and coal and iron of the best quality abound and have long been worked, especially in the regions lying N. of the Yellow river. The province is noted for the number of its rebellions and the turbulence of its inhabitants. Pop. 22,115,287. Capital, K'ai-fŭng-foo. R. L.

Honda, ōn'dä: a city of Colombia, in the department of Tolima; on the west bank of the river Magdalena, at the head of navigation of the lower river; 700 feet above the sea (see map of South America, ref. 2–B). It is at the mouth of a deep valley formed by the Gauli, a mountain torrent which here joins the Magdalena, and is spanned by an iron bridge. The climate is hot (mean temperature, 81·9° F.), but generally healthful. Honda is the principal river-port of the Magdalena and of the republic, and the center of a large portion of the trade with the interior. Steamers load and unload at Caracoli, just below. During the colonial period this point was still more important, much of the silver from Peru having been received here for shipment to Cartagena. In June, 1808, the town was almost destroyed by an earthquake, and has never fully recovered. Pop. about 5,000.

HERBERT H. SMITH.

Hondo: See JAPAN.

Hondt: the name of a celebrated family of Flemish engravers. The founder of the family, JOSSE HONDT, born at Wackene, in Flanders, in 1546, died in London, Feb. 16, 1611; he spent a large part of his life in England, where he sought refuge from the religious persecutions of the Spaniards. He was celebrated as an engraver of maps.—Of his sons, HENRY DE HONDT, THE ELDER, born at Ghent in 1573, died at The Hague in 1610; HENRY DE HONDT, THE YOUNGER, born in London about 1581, died at Amsterdam about 1650; and WILLIAM HONDT, born at The Hague in 1601, died at Dantzic. A series of portraits by Henry de Hondt the Elder of 144 artists, mostly Flemish, and of Melanchthon, Bugenhagen, Wycliffe, Savonarola, Calvin, and Knox are widely known; so are those by Henry de Hondt the Younger of Queen Elizabeth and William of Orange, and a view of The Hague.—ABRAHAM HONDT, who was born at Rotterdam in 1638, and died in London in 1691, also belonged to the family. He acquired a great name as a painter of animals.

Hondu'ras, British, or **Belize** [Honduras was so called by its Spanish discoverers from the depth of its waters; *hondūra*, depth]: a British colony in North Central America; lies geographically along the eastern seaboard of North Central America, between lats. 15° 53′ 55″ and 18° 29′ 5″ N., and lons. 87° 25′ and 89° 16′ W.; bounded on the N. by the Bay of Chetumal and the Mexican state Yucatan, on the W. and S. by the republics of Mexico and Guatemala, and on the E. by the Caribbean Sea. To the E. it embraces the numerous islands and reefs in Honduras Bay, including the large Turneffe island and the Ambergris island, which forms the eastern head of Chetumal Bay. The river Sarstoon, which flows into the Bay of Honduras, divides the colony on its south side from Guatemala. Its greatest length from N. to S. is 180 miles, while its extreme breadth is 57 miles. Its area comprises nearly 5,000,000 acres, or approximately 8,000 sq. miles. The extent of the seacoast amounts to 250 miles, and the land frontier has a length of 283 miles. The colony Cuba is distant 320 miles, from Key West in Florida 560 miles, and from Jamaica 600 miles. The land is very low on the coast and in the north, but rises inland to the Sand Ridge or "Cahune Ride," named from the cahune palm which grows there. The western part is but little explored. The highest known points are in the Cockscomb Mountains, near the center of the colony, where there are elevations about 4,000 feet in height. The country is well watered, and the Belize river is navigable for 175 miles.

The *Hinterland* of British Honduras consists of the spurs of the higher altitudes of Guatemala, its lowlands and alluvial washings of Guatemala and Mexico, both of which are rich in mineral wealth. So far as the geological survey of the colony has proceeded it has afforded encouraging hopes, coal, gold, and other precious metals having been discovered.

Agricultural Products.—There is much land uncleared, with a surface soil capable of yielding a succession of rich crops. The soil on the areas marked by the pine growth is sandy, and that producing the cahune palm is rich vegetable mould. The estimated acreage of cultivated land is 45,000 acres. Lands can be bought or leased from the crown on easy terms, and pastoral and grazing leases are grantable for any period not exceeding twenty-one years on certain conditions. The highlands offer good pasturage. The cutting of mahogany, logwood, and cedar on crown lands is subject to the payment of royalties, as is the tapping of rubber-trees. These industries are chiefly in the hands of large capitalists. The cultivation of the sugar-cane forms the chief industry in the Coroxal, Orange Walk, and Toledo districts. Rum and sugar are manufactured therefrom for home consumption. As Indian corn is the staple article of the food of the Indian and Spanish population, a large acreage is allotted to its cultivation. The colony, both on its high slopes and low-lying land, is admirably suited to the cultivation of coffee, *arabica* for the former, *liberica* for the latter. There is a small plantation of *arabica* in the Cayo district. Although British Honduras is conterminous with a large coffee exporting country, viz., Guatemala, little attention has been so far paid to the culture of this commodity. Upland rice thrives in the colony, and coffee and cocoanuts are raised. The most valuable species of the cacao (*Theobroma cacao*) and vanilla are found, but their culture has not been attempted. The same indifference applies to the culture of sarsaparilla, indigo, pimento, mace, and nutmeg. The systematic cultivation of pineapple, which thrives luxuriantly, would result in a profitable export, and very encouraging results could be obtained from the establishment of orange, lime, and lemon plantations. Next to its wood yield, the cultivation of bananas and plantains contributes most to the export importance of the colony. Tobacco grows luxuriantly, and its crop is of fair quality. The sapodilla (*Sapota achras*) abounds, and either as a fruit or gum yielder is valuable.

Climate.—For the tropics the climate may be described as pleasant. At low-lying Belize the highest mean temperature in 1892 was 90°, between the months of April and September, and the lowest in cooler months was 61°. The average for 1892 was 80°. Much more comfortable temperatures are experienced in the higher altitudes. The alluvial parts of the colony are subject to some malarial disorders, but they are of a mild type, while the highlands compare favorably with any similar altitudes in the tropics. The death-rate of the colony in 1892 was 40·73 per 1,000. The predominating wind is from the sea, viz., E. veering sometimes toward the N., at others toward the S. The number of rainy days in 1892 was 119, and the rainfall reported 72·64 inches.

Religion and Education.—The various religious denominations are represented by the Roman Catholic Church, the Church of England, the Wesleyan Methodist mission, the Baptist mission, and the Presbyterian Church. There are forty-four schools, distributed in all parts of the colony.

Currency, Exports, etc.—The Chilian, Peruvian, and Guatemala silver sols or pesos, together with bronze one-cent pieces of British Honduras, form the currency. The equivalent sterling value of the dollar varies according to the market price of silver, the fluctuation of the local market, and the selling price in New Orleans. On Oct. 15, 1894, the U. S. gold dollar was made the monetary standard. A central banking institution is needed in lieu of the system that now obtains, where each commercial house combines banking with its general business.

Belize, the capital of British Honduras, has weekly steam mail service with New Orleans, from which it is distant 863 miles. Its coast-line is illuminated by an efficient light service. There is no railway, but a preliminary survey has been partially made.

The chief exports are mahogany, logwood, fruit (chiefly bananas, plantains, and cocoanuts), and sugar. The total imports in 1895 were valued at $1,341,406, and the exports at $1,281,969. The estimated value of mahogany exported in 1892 was $389,855, and of logwood $616,838. The annual expenditure of the colony is about $225,000; the revenue about $250,000. The public debt in 1895 was £34,735.

Population.—According to the census returns for 1891 the population was 31,471, of whom 16,288 were males and 15,203 females, and represented an average of little more than four to the square mile. At the time only 305 persons were returned as being of European birth. The language most widely spread and used is Spanish, next stands English, then Maya (Indian), and lastly Carib.

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Honduras, The Republic of, or **Spanish Honduras**: one of the five republics of Central America, the central in position and the middle in size, [illegible] population, [illegible] dem-

sity of population per square mile. Area, 46,400 sq. miles, or about that of the State of Mississippi. On the N. and N. E. it is washed by the Caribbean Sea, with a coast-line of about 400 miles. To the S. E. is Nicaragua, with the river Wanks or Segovia as a boundary, as claimed by Honduras, which Nicaragua claims the whole of the basin of this river. To the S. W. Honduras borders on the Bay of Fonseca, with a coast-line of about 60 miles, and on the republic of Salvador. On the N. W. lies Guatemala. The most northern latitude is 16° 2′ N., the most southern 13° 2′ N.

Physical Configuration.—Like Mexico, Honduras consists essentially of a central plateau, but of less height and much less regular. It lies to the E. of the main Cordillera, and averages about 3,000 feet in height. The Cordillera proper runs on the whole parallel to the Pacific coast, at a distance of about 50 miles, but does not exceed 10,000 feet), is serpentine, and at Comayagua, near the center of the republic, is broken by a plain from 5 to 15 miles broad and about 40 miles long, called the plain of Comayagua. It is through this gap that the proposed interoceanic railway of Honduras is to run. The only volcanoes are on the islands in the Bay of Fonseca. From the Cordillera low ranges of mountains extend irregularly, especially toward the N. E.

The principal rivers are on the Atlantic versant. They are generally navigable to some extent for boats of light draught, but their mouths are usually impassable because of bars and coral reefs. The principal river, and the largest in Central America, is the one forming the southeastern boundary, called the Wanks in English, but also given the name of Segovia, Coco, and Yoro. It is 400 miles long. Next in size is the Ulua, near the northern boundary; it drains a very rich valley, in part very heavily wooded, occupying about a quarter of the republic. Parallel to it, and for much of its course only a few miles distant and in the same valley, is the Chamelicon or Chamelecon. In times of flood these rivers overflow the intervening low ground, and combine into one stream with two mouths.

The northern coast is usually low, and forms several lagoons, but no good harbors. Omoa, near the western end, was formerly an excellent port, but is now silted up. Puerto Cortez, just E. of Omoa, is the principal port on the north coast, and is the terminus of the railway to San Pedro; it is only an open roadstead. Along the coast is a chain of islands, 20 or 30 miles distant, and at the edge of deep water. These are the celebrated Bay Islands (*q. v.*). The largest is Ruatan, about 30 miles long by 5 broad, with two ports. This republic owns several islands in the Bay of Fonseca. The most important is Tigre, on which is the port of Amapala, the best port of Honduras.

The country falls into three divisions as to climate and productions. The first is the coast region and the valleys up to 300 or 400 feet. It is hot, humid, malarial, often marshy, the home of the banana. While not generally pestilential, this region is unwholesome to whites. The second is in the middle elevations up to 7,000 or 7,500 feet, averaging about 3,000 feet. It is suitable for coffee in its lower elevations, for the pine-apple, sugar-cane, and cotton in its middle parts, and for the fruits and productions of the temperate zone in its upper. It has a moderate rainfall and medium temperatures. This region occupies the most of the country, and is thoroughly wholesome for immigrants. It is in part occupied by savannas, and devoted to cattle-raising. The third climate is found on the upper mountains. It is foggy, wet, cool, and unwholesome. Hurricanes occasionally occur on the north coast. One on Oct. 12, 1892, was very destructive.

Population.—The total population in 1889 was 431,917; density 9 per square mile, or about that of Texas or Florida in 1890. The Indians of Honduras are relatively less mixed and more numerous than in the other Central American republics. The people of Aztec descent are very few, but there are some peoples of Cachiquil or Quichua relationship in the extreme west. The Lencas occupy a considerable part of the plateau, especially in the west. The mixture with Negro blood is greater in Honduras than elsewhere in Central America, except on the Mosquito Coast of Nicaragua. The Caribs are not rare on the Caribbean coast and the Bay islands. The whites are more common on the Pacific versant. On the Atlantic slope the population is very thinly scattered. In general the peons are peaceful, garrulous, and lazy. Morals are at a very low ebb. Politics in Honduras are very exciting. The revolutions are carried on by the whites, who lead their peon soldiers to the wars like sheep to the slaughter. The revolutionary idea in Honduras is especially strong, and, notwithstanding the admirable climate and extraordinary productiveness of the country, it will not be a suitable field for immigration until the government is more stable and less arbitrary. Of foreigners in Honduras in 1887 there were only 6,167, of whom 4,684 were from other Central American states, 1,033 from Great Britain, 185 from the U. S., 77 Spanish, 72 French, and 43 Germans.

Productions.—Honduras was very productive in the precious metals in Spanish times, and is not yet exhausted. Silver is still abundant on its Pacific slope, and the rivers on the Atlantic versant are said to be rich in placer gold, especially in the department of Olancho. Iron is found in considerable quantities, and there is some copper, lead, antimony, and lignite. The opal mines in the Gracias department are among the best in the world. The forests on the lower elevations are extensive, of large trees, and abound in mahogany, rose-wood, Brazil-wood, and numerous other woods of great known or prospective value. Rubber-trees abound, and the sarsaparilla and other medicinal plants are common. The coffee and tobacco of Honduras are of unusually good quality. Sugar is produced, but only rudely, and for home consumption. Maize is the chief support of the people. Bananas are grown in great quantities on the north coast and regularly shipped to New Orleans, whence they are rapidly distributed over the U. S. Cattle and hides are exported in considerable quantities. A railway extends from Puerto Cortez to San Pedro, 37 miles. It is a part of a proposed interoceanic railway, but though this part is a score of years old the remainder has not been attempted. There are 1,800 miles of telegraph.

Administration.—The executive power is vested in a president, elected every four years, but there have been few regular terms of presidents of late years, few having succeeded in serving their full term of office. The legislative power rests in a congress of deputies of thirty-seven members. The state is divided into thirteen departments, with the actual capital at Tegucigalpa. There are two universities, several colleges, and about 600 schools, with 23,000 scholars. The finances are in great disorder, owing to foreign and domestic war, but there has been some improvement since 1880. The foreign indebtedness, with accrued and unpaid interest, is about $40,000,000, and the internal debt about $10,000,000. The annual revenue is about $15,000,000.

History.—Columbus discovered Honduras in the summer of 1502, but as he was too ill to land, his brother Bartholomew acted in his stead, and on Sunday, Aug. 15, mass was celebrated on shore. From here Columbus passed along the coast E. and S. to Darien. Discovery was extended in 1522 and Truxillo founded in 1525. Conquest of the interior was begun in 1535, and pushed with such vigor that in a score of years it is said that a quarter of the Indian population (estimated in all at 400,000) had perished. Few events of importance mark the history of the province till the declaration of independence in 1821. By the treaty of Amapala, June 20, 1895, Honduras united with Nicaragua and Salvador to form a *Greater Central American Republic*, with a Federal Diet dealing solely with their foreign relations, each retaining its own original identity and autonomy as regards domestic affairs.

References.—Squier, *Honduras: Descriptive, Historical, and Statistical* (1870); Soltera, *A Lady's Ride Across Spanish Honduras* (1884); Wells, *Explorations and Adventures in Honduras* (1856).

Mark W. Harrington.

Honduras, Bay of or **Gulf of**: an inlet of the northwestern part of the Caribbean Sea; bordered by the shores of Yucatan, Belize, Guatemala, and Honduras, which together form nearly a right angle. Several lesser inlets open into it, the largest being the Gulf of Amatique at the point of the angle, in Guatemala, and the deep Bay of Chetumal, between Belize and Yucatan. There are numerous islands and keys along the shores, the most important being the Bay islands (Ruatan and others) off Honduras, and Turneffe off Belize. The Motagua, Belize, and numerous smaller rivers empty into the Bay of Honduras.

Herbert H. Smith.

Hone [O. Eng. *hān*, stone: Icel. *hein*, hone. Lat. *cūneus*, wedge, and Gr. *κῶνος* (whence Eng. *cone*) are not akin]: a stone of fine grain, used for giving a fine edge to steel blades. Hones are usually of much finer grain than ordinary whetstones and grindstones. They are made of several kinds of stone, often of Palæozoic age. Various greenstones, siliceo-argillaceous slates, etc., are used. One of the very best hone-stones used is the novaculite of Arkansas, of

Carboniferous age. There are also excellent oil-stones from Turkey, Austria, Siberia, England, Wales, and Scotland. For many purposes the stone from Turkey is considered the best.

Hone, William: clergyman and author; b. at Bath, England, June 3, 1780. His first attempts in the literary field were unsuccessful, but in 1817 he made a great hit by his pamphlets, illustrated by Cruikshank. One of them, a parody on the *Book of Common Prayer*, brought him before the courts (1817). He was acquitted, however, and a public subscription was made for him. He became, after 1830, a preacher to a congregation of Dissenters, and died at Tottenham, London, Nov. 6, 1842, in straitened circumstances. The most prominent of his writings are *The Political House that Jack Built* (1819); *A Slap at Slop* (1820); *Apocryphal New Testament* (1820); *Ancient Mysteries described, especially the English Miracle Plays* (1823); *The Everyday Book* (London, 1826); *The Table Book* (1827–28); *The Year Book* (1829). See *The Conversion of the Late William Hone, with further Particulars of his Life* (1853).

Revised by S. M. Jackson.

Honeoye (hō-nē̆e-oi') **Falls**: village; Monroe co., N. Y. (for location of county, see map of New York, ref. 4–D); on the Honeoye creek, and the Lima and Honeoye F. and the N. Y. Cent. and Hud. Riv. Railways; 16 miles S. of Rochester. It is in a potato, fruit, and grain producing region; manufactures flour, woolen goods, pumps, ax-handles, and foundry and machine-shop products; is provided with natural gas; and contains a high school, Masonic hall, and weekly newspaper. Pop. (1880) 1,098; (1890) 1,128.

Publisher of "Times."

Honesdale: borough (laid out 1827, incorporated 1831, made county-seat 1842); capital of Wayne co., Pa. (for location of county, see map of Pennsylvania, ref. 2–J); on the Lackawaxen river, the Delaware and Hudson canal, and the Erie Railroad; 32 miles N. E. of Scranton, 135 N. W. of New York, 160 N. E. of Harrisburg. It contains 5 Protestant, 2 Roman Catholic, and two Hebrew churches, graded public school, 3 public parks, public library, and 3 newspapers; has water-works and gas and electric-light plants; and manufactures green, cut, engraved, and decorated glassware, silk and woolen goods, boots and shoes, canal-boats, electric elevators, axes, castings for school-furniture, wheels for polishing glass, shirts, and trousers, etc. It is also a noted coal-dépôt, shipping by rail and canal 2,000,000 tons annually. The "Stourbridge Lion," the first locomotive used in America, made its trial trip from Honesdale on Aug. 8, 1829. Pop. (1880) 2,620; (1890) 2,816; within the radius of a mile, 7,350. Editor of "Wayne Independent."

Honey [M. Eng. *huni* < O. Eng. *hunig*: O. H. Germ. *honag* > Mod. Germ. *honig*]: the saccharine material collected from flowers by several kinds of insects for the food of themselves and progeny, especially by the honey-bee (*Apis mellifica*). In bee-honey there have been reported as present three kinds of sugar: common cane-sugar, or sucrose; dextrose; and lævulose, the last two being the chief constituents. Honey varies in aroma and flavor with the flowers from which it has been collected, clover honey, buckwheat honey, and wild honey being readily distinguishable in this respect; and some cases are on record of poisonous qualities derived from the like source. Honey is said to be now much adulterated with glycerin and glucose, and even imitated as a whole by combining the latter product with other materials and flavoring with appropriate essential oils. See Food.

Revised by Ira Remsen.

Honey-ant: See Ant.

Honey-buzzard: a name given in England to *Pernis apivorus*, a chiefly insectivorous bird of the falcon family, differing from other birds of the family in its food and in having the space between its eyes and bill completely feathered. *Pernis cristatus*, the crested honey-buzzard, is an Asiatic bird. Bees, wasps, and honey are sought by it.

Honeycomb-moth, or **Bee-moth**: a small lepidopterous insect (*Galleria cereana* and *G. alvearia*), of the *Pyralidæ* or snout-moth family. The larvæ spin silken galleries in beehives, running between the layers of honeycomb, upon which the young insects feed. The moth lays her eggs at evening, while the bees are at rest. It appears that neither moth nor larvæ are ever stung by the bees. The moth is a most formidable enemy to the bees.

Honey-dew: a sweet liquid found in drops on the leaves of various plants. It is sometimes an exudation from the plant itself, sometimes a secretion of aphids which infest the plant. F. A. L.

Honey Grove: city; Fannin co., Tex. (for location of county, see map of Texas, ref. 2–I); on the Gulf, Col. and S. Fé and the Tex. and Pac. Railways; 85 miles N. E. of Dallas. It is in an agricultural region and has two weekly newspapers. Pop. (1880) 884; (1890) 1,828.

Honey-guide: the name given to several small birds of the genus *Indicator* from their curious habit of guiding hunters to the hives of wild bees. There are about a dozen species, mostly African, although some occur in Asia and Borneo. Their general color is gray, with an olive or reddish cast. The honey-guides, although placed in a separate family (*Indicatoridæ*), are related to the cuckoos, and like them deposit their eggs in the nests of other birds.

F. A. Lucas.

Honey-locust: popular name of the *Gleditschia triacanthos*, a large and well-known leguminous tree of the U. S. It takes its name from a sweet substance, with which its long pods are filled when ripe. The tree has stout, often triple thorns, and is used as a hedge-plant. The wood is coarser than that of the common locust (*Robinia pseudacacia*), but is not much inferior to it.

Honey-suckers: popular name of the *Meliphagidæ*, a family of Old World passerine birds having a curious, cleft, tubular, fringed tongue adapted to extracting nectar from the flowers of the eucalyptus and other trees. Some of the species, however, feed to a large extent upon spiders. The bill is usually slender, curved, and rather long. The honey-suckers are chiefly found in Oceania and Australia, and are related to the sun-birds. F. A. Lucas.

Honeysuckle [M. Eng. *honysocle* < O. Eng. *hunisūge*]: the popular name of many shrubs, erect or twining, of the genera *Lonicera*, *Diervilla*, etc., and of the family *Caprifoliaceæ*. Many of them are common in cultivation, being prized for the fragrance and beauty of their flowers. The U. S. have several species, a few of which are seen in cultivation. Most of the finest ones are from Northern Asia or Europe. They have been much improved by cultivation. Many other plants, azaleas, aquilegias, etc., are locally known as honeysuckles.

Honeysuckle Family: the *Caprifoliaceæ*, mostly shrubs with opposite leaves, inferior two to five-celled ovary, and few stamens, attached at base to the gamopetalous corolla. The widely distributed species number about 230. The more important genera are *Sambucus* (the elders), *Viburnum* (arrowwood, including *V. opulus*, the snowball), *Lonicera*, (the honeysuckles, including many ornamental species), *Diervilla* (the bush honeysuckles, also cultivated for their beautiful flowers). Charles E. Bessey.

Honfleur, ôn flêr': town of France; in the department of Calvados, on the left bank of the Seine; 7 miles S. E. of Havre (see map of France, ref. 3–D). It is busily engaged in fisheries, and carries on a brisk trade, exporting eggs, butter, cattle, grain, and fruits, to the United Kingdom, and importing coal, iron, and timber. It was at one time of greater commercial importance than at present; much of its trade has been deflected to Havre. Pop. (1891) 9,450.

Hongkong [the local pronunciation of Chinese *Hiang-K'iang*, fragrant streams]: an island belonging to Great Britain; lying off the southeast coast of China, in the mouth of the Chu-kiang, or Pearl river; 38 miles E. of Macao and 75 S. E. of Canton. The latitude of a hillock in the center of the island is 22° 26′ 30″ N., and its longitude 114° 08′ 30″ E. The island is separated from the mainland of China by a narrow passage called Ly-ee-mun (*Li-yŭ-mŭn*), or Carpfishgate, a little over a quarter of a mile in width at its eastern end, but farther west, opposite the city of Victoria, its width is about 1½ miles. Its greatest length is about 9 miles, and its breadth a little over 4 miles. Area, 29 sq. miles.

Physical Features.—Hongkong is rocky and bare, and consists of a ridge of barren granitic hills, intersected by numerous deep and narrow, but fertile, valleys, through which flow never-failing streams of water. The highest peak, on the northern slope of which stands the city of Victoria, is 1,825 feet. There are five other peaks above 1,000 feet. The coasts are in the main steep and rocky, but are broken—especially on the south side—by numerous deep inlets, the chief of which are Deep-water Bay and Tai-tam Bay. There is little level ground, and less that is cultivable, as the soil is poor, consisting solely of disintegrated granite.

Wong-nei-chong, or Happy Valley—the only level tract of any extent, 30 acres, formerly devoted to rice-culture—has been made to yield, and is now occupied by the race-course.

Climate.—The temperature seldom rises above 93° F. (on the Peak it is 4° or 5° less), but the rainfall is excessive, the mean for twenty-one years being 86 inches. The atmosphere is consequently hot and muggy. Winter is the most delightful season. The unhealthfulness attributed to Hongkong is said to arise from the granitic disintegration going on. The neighborhood is subject to typhoons. In the typhoon of 1874, 1,000 houses were blown down, 33 ships and hundreds of junks were wrecked, and thousands of lives were lost.

Population and Races.—The population has increased immensely since the island became a British colony. In 1841 it was only 7,450, or, including Kowloon, 8,250; in 1891 it had increased to 221,441, of whom 210,995 were Chinese, 1,901 colored (Sikhs and other East Indians), and 8,545 were whites from Europe and America. Of the Chinese, 17,215 live in boats. The males numbered 157,585, and the females only 63,856.

The principal center of population is the city of Victoria, which stretches for nearly 4 miles along the northern coast, opposite the peninsula of Kowloon, 4 sq. miles of which now form part of the colony, having been ceded to Great Britain in 1861. The buildings, mostly white, rise in terrace-like rows along the hills which form the backbone of the island. The streets and roads are well-built, and kept in excellent repair. The principal mode of conveyance is by sedan-chair and jinrikisha. At Aberdeen, on the south coast, the sugar-refineries, ship-building yards, and graving docks are located. One of these is 465 feet long, 80 feet wide, and has a depth on the sill of 24½ feet at spring-tides. There is also a patent slip at Victoria.

Manufactures.—Aside from numerous small native establishments for the making of lanterns, umbrellas, leather boxes, toys, preserved ginger, etc., and rattan, bamboo, gold and silver, and other wares, Hongkong has 3 sugar-refineries, 6 tanneries, 5 distilleries, a ropework, and 2 foundries. There are also 103 granite quarries, and in 1892 dressed granite to the value of 207,077 haikwan taels (= $217,430 U. S. gold) was exported.

Commerce.—Hongkong is the great distributing center of the Far East and the commercial clearing-house of China. It is a free port, and has no custom-house. It has consequently no trade returns, and it is impossible to give statistics on this head. The volume of its trade, however, may be gathered from the shipping returns. According to the harbor-master, 33,080 vessels, aggregating 7,001,829 tons, arrived in port, and 32,960, aggregating 7,003,869 tons, left port. Of these,

5,719	vessels =	7,190,589	tons,	were British.
2,988	" =	3,088,454	"	" foreign
45,403	"	3,263,118	"	" junks (in foreign trade)
11,930	"	463,537	"	" junks (in local trade).

66,040 vessels = 14,005,698 tons.

The trade is chiefly with Great Britain and her colonies and dependencies, China, Japan, and the U. S. The total exports of all kinds to the U. S., as shown by the invoices filed with the U. S. consul, amounted in 1891 to $3,691,104. Of the 484,000 tons of coal imported in that year, 84 per cent. came from Japan, though rich Chinese coal-fields are not far distant.

History and Government.—Hongkong was ceded to Great Britain in 1841, and this was ratified by the treaty signed at Nanking in the following year. It was erected into a colony by an order in council dated Apr. 5, 1843. Since 1857 its affairs have been administered by a governor, aided by an executive council composed of the colonial secretary, the officer commanding the troops, the attorney-general, the registrar-general, the treasurer, and the director of public works. There is also a legislative council of five official and five unofficial members, three of whom are nominated by the crown (one being a Chinese), one is nominated by the chamber of commerce, and one by the justices of the peace. Justice is administered by a supreme court, a police court, and a marine magistrate's court. On Jan. 1, 1892, there were 502 prisoners in jail, of whom 27 were Europeans. The police force numbers 666, of whom 127 are British, 210 are Sikhs, and the rest Chinese.

Finance.—The public revenue of the colony is derived chiefly from land taxes and licenses, and from an opium monopoly. In 1891 it amounted to $2,025,302, and the expenditure to $2,449,086, including $580,013 for military purposes and extraordinary expenses. The military contribution for imperial defense is £40,000 per annum. There is an imperial garrison of 2,800 men stationed here, and a local artillery corps of 100 effective members. The China squadron of 29 vessels also has its headquarters here. The public debt, incurred for fortifications, sanitary works, etc., amounts to £200,000.

Education.—In 1891 there were 117 public schools with 7,672 pupils, maintained at an expense of $60,359, and 109 private schools with 1,985 pupils; a police school with 300 pupils, and a reformatory with 99.

Emigration and Immigration.—The movement of population between Hongkong and the mainland is very great. In 1891 emigration to foreign parts amounted to 43,660 adults, chiefly to the Straits Settlements (35,781), the U. S., British Columbia, the Sandwich islands, Australia, and Mauritius, while the immigrants numbered 103,587, chiefly from the Straits Settlements (83,391), San Francisco, Siam, and Australia and New Zealand. R. LILLEY.

Hon'iton: a town of Devonshire, England; on the left bank of the Otter; 17 miles by rail E. N. E. of Exeter (see map of England, ref. 14–E). The celebrated Honiton lace received its name from this place, though it is manufactured in many other places. Pop. (1891) 3,216.

Honolu'lu: capital of the Hawaiian islands; on the southern side of the island of Oahu, in lat. 21° 18' N., lon. 157° 55' W. Its harbor is formed by a deep and spacious basin in the coral reef which surrounds the island. It is safe at all seasons, and lined with substantial and commodious wharves. The steamers from San Francisco and Vancouver to Australia touch regularly at Honolulu. The city itself is situated among beautiful tropical surroundings, and enjoys an equable and healthful climate, the heat ranging between 60° and 87° F. Among its public buildings the most remarkable are the palace, the parliament-house, the Roman Catholic cathedral, the treasury, the post-office, the Bishop museum containing the feather cloaks of Kamehameha I., valued at $150,000, etc. It has 3 churches, 2 hospitals, a number of good schools, a public library, a theater, 5 printing establishments, a bank, billiard-rooms, fine stores, a telephone system, water-works, electric-lighting plant, etc., and its trade is considerable. Pop. (1890) 20,487. See HAWAII-NEI.

Hono'ria, JUSTA GRATA: a daughter of Constantius II. and Galla Placidia, and a sister to Valentinian III.; b. at Ravenna in 417 A. D.; lived after the death of Honorius in 423 and the usurpation of Joannes in Rome, at the court of Valentinian III. She was a woman of passionate and dissolute character, who is remembered chiefly for having caused an invasion of Roman territory by her invitation to Attila to come to Rome and claim her as his bride.

Revised by G. L. HENDRICKSON.

Hono'rius: Roman emperor from 395 to 423; b. at Constantinople, Sept. 9, 384; d. at Ravenna, Aug. 26, 423. At the death of Theodosius the Great (395) the Roman empire was divided between his two sons, Arcadius and Honorius. Honorius received the western part—Italy, Africa, Spain, Gaul, Brittany, and Illyria—with Ravenna for his residence; and as he was only eleven years old he was placed under the guardianship of Stilicho. Stilicho was a vigorous and successful ruler, but when he was treacherously killed at Ravenna (408) the barbarian tribes poured in over the frontiers and rebellion arose in all the provinces. Brittany was entirely given up; Gaul was overrun by Gothic and German invaders; Africa made itself independent under Heraclian; and Italy was thrice plundered, and Rome besieged and taken by Alaric. The weak and indolent emperor could do nothing, although Constantius, who had succeeded to the place of influence formerly held by Stilicho, made some successful resistance to the barbarians, and became so indispensable that in the year 420 he was raised to the rank of joint emperor with Honorius. Revised by G. L. HENDRICKSON.

Honorius I., POPE: a Campanian; became pope Oct. 27, 625, and died Oct. 12, 638. Special interest in this pope has arisen since the promulgation of the doctrine of papal infallibility from the fact that in letters to Sergius, Patriarch of Constantinople, Honorius agrees with Sergius in holding to but one will in Christ, but this was the Monothelite heresy. For this maintenance of a heresy Honorius was anathematized by name in the sixth General Council (680) by Pope Leo II. (662), also in the profession of faith made

by subsequent popes. (See Döllinger, *Fables Respecting the Popes* (Am. ed., pp. 226–256); E. F. Willis, *Pope Honorius and the New Roman Dogma*, London, 1879.) Roman Catholic writers maintain that he was never formally and officially condemned as a heretic, but only as a remiss and negligent pastor, and that the seemingly monothelitic expressions in his letters are capable of orthodox interpretation.—Honorius II., Antipope, Bishop of Parma; was elected in 1061, and deposed in 1064. D. in 1072.—Honorius II., Pope; was chosen in 1124, and died Feb. 14, 1130.—Honorius III. (*Cencio Savelli*), a Roman, succeeded Innocent III. in 1216, and after a disturbed pontificate died Mar. 18, 1227.—Honorius IV. (*Giacomo Savelli*) became cardinal-deacon in 1261, pope in 1285, and died Apr. 3, 1287.

Honors of War: stipulated terms granted to a vanquished enemy, by which he is permitted to march out of a town, from a camp or line of intrenchments, with all the insignia of military etiquette. The term is frequently but improperly applied to the compliment paid to distinguished personages, military, etc., when they appear before any armed body of men, or such as are given to the remains of a deceased officer, which are properly called *military honors* or *funeral honors*. The circumstances attending the latter vary in different countries, while respecting the former almost everything depends upon the general granting the capitulation. In some cases the troops of a besieged garrison are permitted to march out with drums beating, colors flying, etc.; in others they are required to lay down their arms at a named spot, and then depart; while in still other cases they are required to march back to their works, after having been permitted to march out either silently or with drums beating, and pile their arms in front of their works. In the civil war in the U. S. at the first surrender (Apr. 14, 1861), that of Fort Sumter, Major Anderson, commanding, was allowed to march out of the fort with colors flying and drums beating, bringing away company and private property, and paying a salute of fifty guns to his flag. At the surrender of the army of Northern Virginia (Apr. 9, 1865) the terms required the officers to give their individual paroles not to take up arms against the U. S. until properly exchanged, and each company or regimental commander to sign a like parole for the men of his command; the arms, artillery, and public property to be packed and stacked, and turned over to officers appointed to receive them; officers, however, were permitted to retain their side-arms, private horses, and baggage. Upon compliance with these terms each officer and man was allowed to return to his home, not to be disturbed by the U. S. authorities "so long as he observed his parole and the laws in force where he may reside." The surrender of the army of Gen. Johnston was received Apr. 26, 1865, on the same basis.

Revised by James Mercur.

Hontheim, hōn'tīm, Johan Nicolaus, von: an opponent of Ultramontanism; b. at Treves Jan. 27, 1701; studied jurisprudence at Louvain and Leyden; became ecclesiastical counselor to the consistory of Treves in 1728, Professor of Civil Law 1732, and Suffragan of the see of Treves in 1748. In 1788 he resigned his offices and retired to Montquintin, Luxembourg, where he died Sept. 2, 1790. Author of *Historia Trevirensis Diplomatica* (3 vols., 1750) and *Prodromus Historiæ Trevirensis* (2 vols., 1757). His *De Statu Ecclesiæ* (1763), published under the *nom de plume* of Justinus Febronius, maintained the theory that the General Council instead of the pope has supreme authority in the Church. The work was condemned by Clement XIII., and in 1778 Pius VI. commanded Hontheim to retract the doctrines taught in it. He complied, but his *Febronii Commentarius* (1781) showed that he had not abandoned the views which had given offense. See Febronianism.

Honthorst, hōn'tōrst, Gerard, van: painter; b. at Utrecht, Holland, in 1592; commonly called Gherardo della Notte, because after his sojourn in Rome, where he was much impressed by Raphael's *Deliverance of Peter*, he painted numerous pictures representing interiors lighted up by lamps or candles. He had many commissions in Rome, then went to England, where he painted several pictures, including portraits, for the king. He also visited several German courts, but settled finally in Ghent as painter in ordinary to the Prince of Orange, for whom his chief work was executed. D. at Utrecht, 1660. W. J. Stillman.

Honvéd: the Hungarian militia. The name was first used in 1848, when in order to combat the Austrian supremacy the Hungarian Diet called out about 200,000 men, who were interspersed among the regular soldiers. This militia was called *Honvédség* (defenders of the fatherland). Afterward, when after the defeat of 1866 the Austro-Hungarian Government increased the army according to the principle of universal military duty, and likewise established a Hungarian militia, the name was retained from regard to the national feeling of Hungary. The law of Dec. 5, 1868, gave an organization to this force which was modified by the law of 1888, which assimilated the Honvéd to the rest of the Landwehr of the empire. Hungarians serve for two years in the Honvéd and ten years in its reserve, receiving eight weeks' instruction, and subsequently, at two or three years' intervals, several other weeks' drill. The Honvéd on a war footing reaches a strength of about 200,000.

Revised by James Mercur.

Hoobly: See Hubli.

Hooch, Pieter, de (called also De Hōogh and De Hooge): painter; b. in Rotterdam, probably in 1632. He settled in Delft, where he married and was still living in 1655. There is but little known of the circumstances of his life; the biographies of nearly all the great Dutch painters are brief, because they lived in a comparatively peaceful community, and because there has been no clever writer to collect anecdotes about them, such as are current about the Italian artists. De Hooch was a great colorist and a most skillful and masterly painter; his favorite subjects are interiors with several figures, and he is perhaps unequaled in these. He painted portraits as well. He is one of the four or five men who, after Rembrandt, are at the head of the great Dutch school of the seventeenth century, to which modern French painting owes so much. D. probably in 1680. Among his famous works are, in the National Gallery, London, *A Dutch Courtyard* and *A Dutch Interior*, the latter being the important picture called by the French *Une Chanson Joyeuse*; in the Museum of Amsterdam, *The Wine-cellar*; in the Museum of Rotterdam, *A Concert*; in the Louvre, *Interior of a Dutch House, The Card-players*. Russell Sturgis.

Hood: the name of two noted English admirals, sons of a rector of Bath, England. The elder brother, Samuel, born Dec. 12, 1724, became admiral in 1780, Irish baron in 1782, English viscount in 1796. He fought with great valor against the French during the North American war of independence, and again in the war of 1793, when he commanded in the Mediterranean, took Toulon, which, however, he had to give up again, and expelled the French from Corsica. D. Jan. 27, 1816. The younger brother, Alexander, born in 1727, became admiral in 1782, Irish baron in 1794, British peer in 1796, viscount in 1800, and died May 3, 1814. He commanded under Lord Howe at Gibraltar and in the Channel in 1794, and gained in 1795 a victory over a French fleet off Lorient, which he attacked, though he was inferior in number to the enemy.

Hood, John Bell: soldier; b. at Owingsville, Bath co., Ky., June 29, 1831; graduated from the U. S. Military Academy and was appointed brevet second lieutenant of infantry July, 1853; transferred to the cavalry as second lieutenant in 1855, and promoted to be first lieutenant in 1858. Lieut. Hood was actively engaged on frontier duty until 1861, when he entered the Confederate army, serving in every position from first lieutenant to that of commander-in-chief of an army with the rank of lieutenant-general, serving throughout the Virginia Peninsular campaign, at the second battle of Bull Run, at Antietam, at Gettysburg, and at Chickamauga, where he lost a leg; in 1864 he succeeded Gen. Johnston in command of the army resisting Gen. Sherman's invasion of Georgia; met the Union forces in battle at Franklin Nov. 30, 1864, and at Nashville Dec. 15–16, soon after which he was relieved by Gen. Richard Taylor. After the war he settled in New Orleans. D. in New Orleans, Aug. 30, 1879. Revised by James Mercur.

Hood, Robin: the hero of many ballads, and almost of an epos, belongs, so far as our present knowledge enables us to speak, wholly to the traditional poetry of England; for it is more than likely that the quasi-historical and mythological data—passages in a chronicle, names of places, and local traditions—have been taken from the ballads. It is significant that the first mention made of Robin Hood, and known to us, connects him with ballads. Sloth, in *Piers Plowman* (version B, therefore about 1377), says that he knows "rymes of Robyn Hood." From that time on ample evidence shows Robin's enormous popularity in England, and will account for all mythological and historical references. The German Kühn thought "Hood" to be a

corruption of "Hooden," and this of the god Woden, and supported the etymology by appeal to certain names and customs; but few scholars now uphold this conjecture. Joseph Hunter (*The Ballad-hero, Robin Hood*, London, 1852) tried to show that Robin was an actual outlaw, who had been concerned in a rebellion in the reign of Edward II.; but actual proof of this theory is not forthcoming. We must therefore subscribe to Prof. Child's conclusion that Robin is "absolutely a creation of the ballad-muse." The best ballads about him, as well as the oldest, are *The Gest of Robin Hood*, an epos in little, based on several older ballads—that is, older than 1400, a probable date for the making of the *Gest*—and containing 456 four-line stanzas; *Robin Hood and the Monk*; *Robin Hood and Guy of Gisborne*; and *Robin Hood's Death*. Besides these there are other and poorer ballads, degenerating into vulgarity or inanity, but popular enough and gathered into so-called "garlands." A number of proverbs and current sayings cluster about Robin Hood, and are collected by Ritson in his well-known work (see below). The best known of Robin's companions is Little John, mentioned with him by a Scottish chronicler in 1420. Robin himself is the idealized outlaw. There were probably a Barnsdale cycle and a Sherwood cycle of ballads, but the Yorkshire forest is the favorite locality. Here Robin rules as chieftain over a band of young men, living by the king's deer and by frequent levies upon the purses of travelers, particularly of rich churchmen. He is very pious; loves the king; will harm no company "that any woman is in" (*Gest*, 10); and only takes from the rich to give to the poor. He relieves a knight in distress, but is constant in hostility to his official foe, the sheriff of Nottingham. His skill with the bow is of course beyond praise. The later ballads use him as a foil to favorites of the countryside—tinkers, beggars, shepherds—by whom he is commonly worsted in a contest with sword, staff, or fist. But in the best ballads he is a real outlaw-hero, generous, bold, humorous, and full of a rugged nobility. His end is ascribed to a prioress, his relative, to whom he goes in a fit of illness, and who treacherously causes him to bleed to death. See especially Hales, in the Percy Folio, i., 1 ff.; Ritson, *Robin Hood*, with much valuable material; Fricke, *Do Robin Hood Balladen* (Brunswick, 1883); and, best of all, Child, *Ballads*, v., 39 ff. F. B. Gummere.

Hood, Thomas: humorist; b. in London, England, May 23, 1799. From school he entered a counting-house, but his health failing, he was sent to Dundee, where he contributed various pieces to the local publications. Returning to London in two years with improved health, he entered the service of his uncle, Mr. Sands, to learn the art of engraving, in which he acquired some skill, which was of value to him in his subsequent career. In 1821 *The London Magazine* fell into the hands of some friends, and Hood became subeditor. In this position he formed the acquaintance of all the leading literary men of the time, and with Charles Lamb an intimacy sprang up which lasted during the latter's life. In this society his own powers developed, and his first separate publication, *Odes and Addresses*, soon appeared, being, however, the joint work of himself and J. H. Reynolds. *Whims and Oddities* appeared in 1826, followed by *National Tales* (1827), *Plea of the Midsummer Fairies, Hero and Leander, Lycus the Centaur, and other Poems*. In 1829 *The Comic Annual* was issued, and continued nine years. For a year he edited *The Gem*, in which appeared his poem entitled *Eugene Aram's Dream*. In 1831 he occupied Lake House, near Wanstead, where he wrote *Tylney Hall*, a novel. In 1838 *Hood's Own* was started, a monthly publication consisting chiefly of extracts from *The Comic Annual* series, with new contributions. His health still being delicate, he went to the Continent, where he remained for several years, and from Belgium published his *Up the Rhine*, constructed, as he says in the preface, on the groundwork of *Humphrey Clinker*. On his return to England he became editor of *The New Monthly Magazine*, from which he retired in 1843. In 1844 *Hood's Magazine* was started, for which he furnished most of the best work until near his death. A short time before his death, which occurred in London, May 3, 1845, he contributed *The Song of a Shirt*, *Bridge of Sighs*, and *The Lay of a Laborer* to *Punch*.

Revised by H. A. Beers.

Hood'ed Seal: a large seal (*Cystophora cristata*) found on both sides of the North Atlantic, so named because the males can inflate the skin on the upper part of the nose into a hood or crest. The adults are about 7 or 8 feet long, of a blackish color, lighter beneath and on the sides, with irregular white markings. The females are smaller and lighter colored. These seals are hunted for their hides and oil, and form a part of the catch of the Newfoundland sealing-fleet. This species is familiarly known among the sealers as the bladder-nose. F. A. Lucas.

Hoof [O. Eng. *hōf*; O. H. Germ. *huof* > Mod. Germ. *huf*, hoof]: the horny shell which covers the foot, or the separate digits of the foot, of certain herbivorous (or mostly herbivorous) mammals. It is the homologue of finger and toe-nails or the claws of other vertebrates. It is, histologically, composed of the agglutinated and dried cell walls of epithelium, with a small proportion of intercellular substance and of cell contents. Chemically, it consists chiefly of an albuminoid substance, of uncertain composition, provisionally called keratin. The hoofs of beef cattle are extensively used in making buttons, combs, and ornamental articles. Horse-hoofs are used in making prussiate of potash and in case-hardening iron. See Farriery.

Hooft, hōft, Pieter Cornelissen: poet and historian; b. in Amsterdam, Mar. 16, 1581; the son of a burgomaster of the city. As befitted the position of his family, he was given the most careful education, especially in the classics, which the Dutch were at that time eagerly beginning to employ in education. He early showed talents as a writer, producing, at the age of sixteen, a tragedy, *Achilles en Polyxena*, and some shorter pieces. These led to his joining the older Amsterdam "Chamber of Rhetoric" (*Rhetorykkamer*), then in its decline, but still retaining the glory of having been one of the foremost of those first institutions of the Renaissance in Holland. On June 11, 1598, Hooft set out on a long journey through France, Italy, and part of Germany. This left an indelible impression upon him. In Italy, especially, he found the Renaissance movement nearly approaching the period of its decay, yet still inexpressibly charming and magnificent. And when the young Dutchman returned to Holland in 1601 his mind was filled with ideals very different from the essentially bourgeois conceptions of the "Rederijker." He set himself to studying the classics, especially at first the Latin historians, though a second tragedy, *Theseus en Ariadne*, and further verses showed that he had not given up poetry. In 1606–07, to fit himself for a career, he studied jurisprudence at Leyden; and in May, 1609, he was given one of the most distinguished positions in Holland, that of high bailiff of Muiden and warden of Gooiland. The Castle of Muiden went with this office; and here for the rest of his life Hooft spent his summers, removing to Amsterdam in the winters, but in both places gathering about him the choicest spirits of Holland. This group of poets, scholars, and artists is known in the history of Dutch letters as the "Muiden Circle"; and the part it played in the intellectual life of Holland in the seventeenth century is all-important. Hooft continued to exercise this hospitality *en grand seigneur* until his death, which occurred at The Hague, May 25, 1647. As a writer, Hooft won renown both in verse and in prose. Besides the two tragedies already mentioned, we have from him two others—*Geraerdt van Velzen* (1613) and *Baeto* (finished 1616, published 1626). In all these, the imitation of the tragedies of Seneca is only too apparent, and it is now hard to find interest in them. Hardly more readable is the pastoral play *Granida* (1615), one of the fruits of Hooft's Italian experience; and the comedy *Warenaer* (1617), based upon the *Aulularia* of Plautus, is a heavy thing. As a prose-writer, Hooft was long almost a law-giver for the Dutch. And yet here too his models often served him ill. Of these the chief was Tacitus, whom he was said to have read fifty-two times, and whom he so evidently imitated as to be called himself the "Dutch Tacitus." Aiming first at purity and dignity of style, and then at Tacitean concision, Hooft sacrificed much of the natural force of the Dutch tongue. His prose works are *Hendrik de Groote* (1626); *Rampzaligheden der verheffinghe van den huize Medicis* (1636); *De Nederlandsche Historien*, his most famous production (1628–38; published 1642). His poems appeared in 1636 (new *Volledige intgave*, ed. P. Leendertz, Haarlem, 1864). See also his *Brieven* intg. d. J. van Vloten (4 vols., Leyden, 1855–57). A. R. Marsh.

Hooghly, or **Hugli**: town of British India, the capital of the district of Hooghly; in the Presidency of Bengal, on the left bank of the Hooghly river (see map of North India, ref. 7-I). It has a college in which both English and Asiatic literature are taught, and which was founded by a native. Pop., with Chinsura, 35,000.

Hooghly, or **Hugli River**: the westernmost outlet of the Ganges; formed in lat. 23° 25′ N. and lon. 88° 22′ E. by the confluence of the Bhagrutti and the Jellinghy, two branches of the Ganges, and considered the proper mouth of this river. It is about 200 miles long, 10 miles broad at its entrance into the Bay of Bengal, and although its mouth and shores are encumbered by mud-shoals, it is navigable for the largest vessels, its draught being 17 feet up to Calcutta. During the southwest monsoon the BORE (*q. v.*) appears here, and generally the tide is felt 17 miles above Calcutta. The waters of the Hooghly are considered holy by the natives.

Hook, JAMES CLARKE: marine and genre painter; b. in London, Nov. 21, 1819; pupil of the Royal Academy, London; won a gold medal there in 1845 for his picture *Finding the Body of Harold*, and a traveling scholarship in 1846 for his *Rizpah*, and went to Italy the same year. He painted Italian subjects at first, but since about 1855 has devoted himself to scenes of the life of English fisher-folk and marine subjects; was elected a Royal Academician in 1860. At the Paris Exposition of 1889 he received a first-class medal. His pictures are highly esteemed by British collectors. Studio in London. WILLIAM A. COFFIN.

Hook, THEODORE EDWARD: humorist; b. in London, Sept. 22, 1788. He was educated at Harrow. In 1805 his first farce was produced, *The Soldier's Return*, a comic opera in two acts, which met with great success, and was speedily followed by numerous farces and melodramas. But it was his own life at this time which attracted public attention toward him. His practical jokes were of the boldest kind, while his brilliant conversational powers, his remarkable talent for punning and improvisation, his convivial disposition, soon made him a favorite in aristocratic society and gained him the friendship of the prince regent, who in 1812 secured for him the appointment of accountant-general and treasurer of Mauritius. In 1818 irregularities were discovered in his accounts, and he was returned to England in arrest, but, no grounds for a criminal charge existing, he was soon liberated. In 1820 he assumed the editorship of the new journal *John Bull*, which at once reached, and for some time maintained, a large circulation. The board of audit declared him in 1823 a debtor to the crown in the sum of £12,000, and he was again arrested and confined for nearly two years. Although no portion of the missing funds was ever traced to Hook, and it was believed the guilty parties were among his subordinates, the Government never abated its claim, and at the death of Hook the small sum realized from the sale of his effects was claimed by the crown. In 1824 the first series of *Sayings and Doings* appeared, followed by the second in 1825, and third in 1828; *Maxwell* was published in 1830; *The Parson's Daughter* in 1833, etc.; in 1836 he became editor of *The New Monthly Magazine*; in sixteen years he published some thirty-eight volumes. D. Aug. 24, 1841. Revised by H. A. BEERS.

Hook, WALTER FARQUHAR, D. D., F. R. S.: Dean of Chichester; b. in London, Mar. 13, 1798; educated at Winchester and Oxford; B. A. 1821; was curate at Whippingham 1821–26, and at Mosely, near Birmingham, 1826–28; lecturer at St. Philip's, Birmingham, 1827–28; vicar of Holy Trinity, Coventry, 1828–37; of St. Mary's, Leeds, 1837–59. In 1859 he was appointed Dean of Chichester, where he accomplished much in the erection of churches, school-houses, chapels, parsonages, etc. His sermon (1838) entitled *Hear the Church*, which was published both in England and the U. S., and of which more than 100,000 copies were sold, is said to have prevented his promotion to the episcopate, the sentiments of this discourse being unacceptable to the Queen. His *Church Dictionary* (London, 1841); *Ecclesiastical Biography* (1845–52, 8 vols.); *Lives of the Archbishops of Canterbury* (1860–76, 12 vols.); and his numerous published sermons, pamphlets on education, etc., are all valuable. Dean Hook's *Church Dictionary* was republished in Philadelphia (1854) under the editorship of the Rev. Dr. (afterward bishop) William Bacon Stevens. See his *Life* by his son-in-law, R. W. Stephens (London, 1878). D. at Chichester, England, Oct. 20, 1875. Revised by W. S. PERRY.

Hooke, ROBERT: natural philosopher; b. at Freshwater, in the Isle of Wight, July 18, 1635. He was intended for the Church, but his instincts drew him to the study of mathematics, astronomy, and mechanics. In 1664 he became Professor of Geometry at Gresham College, London; in 1666 was appointed city surveyor, on account of a plan he presented for the rebuilding of London after the Great Fire, though the plan was not followed; in 1677 was made secretary of the Royal Society. D. in London, Mar. 3, 1703. While a young man the art of flying was the subject of his inventive speculations; he afterward accused Huygens of having stolen his invention of regulating the balance of a watch by a spiral spring, and laid claim to the first discovery of the principle of gravitation against Newton. The most prominent of his writings are *Micrographia* (1666); *Lectiones Cutlerianæ* (1678–79); and *Posthumous Works* (published by Waller in 1705).

Hooker, JOSEPH: soldier; b. at Hadley, Mass., Nov. 13, 1814; graduated at West Point, and entered the army as second lieutenant of artillery July 1, 1837; served in Florida against the Seminoles and in the Mexican war with especial honor, but resigned in Feb., 1853. On the outbreak of the civil war he tendered his services to the Government, and was appointed (May 17, 1861) brigadier-general of volunteers; and after the battle of Williamsburg, May 5, 1862, in which his division bore the brunt of the battle nearly all day, he was promoted to be major-general of volunteers. While in command of the First Corps he displayed great bravery at South Mountain and Antietam, being severely wounded at the latter battle. In Jan., 1863, Hooker succeeded Burnside in command of the Army of the Potomac, and in May following fought the battle of Chancellorsville, where, though outnumbering the enemy, he decided after two days' fighting to return to the north bank of the Rappahannock. At the time of the invasion of Pennsylvania by the Confederate army the Army of the Potomac, following, had reached the vicinity of Frederick, Md., when, owing to the refusal of Gen. Halleck to place the troops at Harper's Ferry at the disposal of Hooker, the latter was, at his own request, relieved from command of the army on June 28. For the skill and energy by which he first covered Washington and Baltimore from the meditated blow of the advancing enemy, Gen. Hooker received the thanks of Congress. In Sept., 1863, he was assigned to the command of the Twentieth Army-corps (Army of the Cumberland), and was distinguished at the capture of Lookout Mountain, battle of Missionary Ridge (Nov. 24–25), pursuit of the Confederate army, and the action of Ringgold, Ga., Nov. 27, 1863. In the invasion of Georgia by the army of Gen. Sherman, Hooker led his corps in the almost constant fighting up to and including the siege of Atlanta, until July 30, 1864, when on a question of command he was relieved at his own request. He subsequently commanded northern department, department of the East, and that of the Lakes; was breveted major-general U. S. army for gallantry at Chattanooga, and Oct., 1868, retired upon full rank of major-general. D. in Garden City, N. Y., Oct. 31, 1879.

Hooker, Sir JOSEPH DALTON, M. D., D. C. L., LL. D., C. B., F. R. S.: botanist; a son of Sir W. J. Hooker; b. at Halesworth, Suffolk, England, June 30, 1817; went in 1839 as botanist to the Erebus Antarctic expedition; was 1847–51 engaged in an expedition to the Himalayas; 1855–65 assistant director and 1865–85 director of the Kew Gardens; explored in 1871 Morocco and the great Atlas Mountains; visited the U. S. in 1877. Author of *Flora Antarctica* (1844–47); *Cryptogamia Antarctica* (1847); *Rhododendrons of the Sikkim-Himalaya* (1849–51); *Flora of New Zealand* (1852–54); *Himalayan Journals* (1854); *Sikkim-Himalayan Plants* (1855); *Flora Tasmanica* (1855); *The Student's Flora* (1870); with G. Bentham, *Genera Plantarum* (1862–63); *Flora of British India* (1874); and *Journal of a Tour in Marocco* (1878).

Hooker, RICHARD: theologian; b. at Heavitree, near Exeter, England, in Mar., 1554 (1553 according to Walton, and in 1554 according to Wood); studied at Oxford; became fellow 1577, and took orders in 1581. He became successively vicar in Drayton-Beauchamp 1584; Master of the Temple, London, 1585; rector of Boscombe 1591, and of Bishopsbourne 1595. His colleague in the Temple church was Travers, one of the most zealous Puritans in the times of Elizabeth, and between him and Hooker a sharp controversy arose, which occasioned the famous work of the latter, the *Laws of Ecclesiastical Polity*. The four first books were published in 1594; the fifth followed in 1597; the remaining three were posthumous. The work is a defense of the Church of England and Church establishments in general, and its learning and style are generally praised, even by such as hold opposite views. See his *Life* by Isaac Walton; also by J. Keble (1836). D. at Bishopsbourne, Nov. 2, 1600. Revised by W. S. PERRY.

Hooker, Thomas: clergyman; b. at Markfield, Leicestershire, England, probably on July 7, 1586; studied theology at Cambridge; preached in London, but, persecuted for nonconformity, fled England in 1630. After preaching in Delft and Rotterdam, he emigrated in 1633 to New England, and settled at Newtown (now Cambridge), Mass., whence in 1636 he removed with 100 others to the present Hartford, Conn. He and Stone were the first ministers of the Church there, and his influence was very great. D. at Hartford, July 7, 1647. He was a man of great ability, and a friend of popular government. His principal work is *A Survey of the Summe of Church Discipline*, written in connection with John Cotton. Some of his sermons were published in England. A selection of his works and a memoir of his life were published by the Rev. E. W. Hooker (Boston, 1849). See also Walker's *Life of Hooker* (1891) and Palfrey's *History of New England*. Revised by George P. Fisher.

Hooker, Sir William Jackson, D. C. L., F. R. S.: botanist; b. at Norwich, England, in 1785; became in youth a zealous botanist; traveled abroad in his favorite pursuit 1806–14; Regius Professor of Botany at Glasgow 1820; edited *The Botanical Miscellany* (1828–33); *The London Journal of Botany* (1834–51); was knighted 1836; director of Kew Gardens 1841–65. Author of *Tour in Iceland* (1811); *British Jungermanniæ* (1816); *Muscologia Britannica* (with Taylor, 1818); *Flora Scotica* (1821); *Exotic Flora* (3 vols., 1823–27); *Icones Filicum* (with Greville, 1826–27); *Icones Plantarum* (10 vols., 1836–54); *Flora Boreali-Americana* (1829–40); *British Flora* (1830); *Genera of Ferns* (1838–42); *Species Filicum* (1846–53); and many other botanical works. D. at Kew, Aug. 12, 1865.

Hook-squid: any one of certain cephalopods of the genera *Onychoteuthis* and *Enoploteuthis*; mostly, as far as known, of small size, but much dreaded for their long hooked tentacles and suckers and their voracious habits. There are nearly twenty known species, mostly found in warm seas. *O. banksii* ranges through most seas, warm and cold.

Hooper, John: bishop and martyr; b. in Somersetshire about 1495; studied theology at Oxford, but, having adopted the views of the German Reformers, was compelled to leave Oxford, and went to Switzerland. On the accession of Edward VI. in 1547 he returned to England; preached with great success in London, and was in 1550 appointed Bishop of Gloucester. In the beginning of the reign of Mary, in 1553, he was imprisoned, and as he refused to retract, he was condemned as a heretic, and burned at the stake at Gloucester Feb. 9, 1555. He wrote several works, among which was *Twelve Lectures on the Creed* (1581); also several interesting letters from him have been discovered, and published by Rev. C. Nevinson (Cambridge, 1852). See *Early Writings of Bishop Hooper* (1842) and *Later Writings* (1852), published by the Parker Society.
Revised by W. S. Perry.

Hooper, Samuel, M. A.: merchant; b. at Marblehead, Mass., Feb. 3, 1808. His father was engaged in the European and West India trade, and the son as his agent visited Russia, Spain, and the West Indies. Subsequently he engaged in the China trade and in iron manufactures. After serving in the State Legislature, he was, in 1860, elected to Congress to fill a vacancy, and was re-elected at each successive biennial election, serving until his death at Washington, Feb. 13, 1875. He served on the committees of ways and means, of banking and currency, and of the war debts of the Northern States, and to his efforts was in no small degree due the success of the national loan of Apr., 1861, and of the national banking system. He wrote two pamphlets on the currency question, which are notable for broad and comprehensive views. He was the founder of the School of Mines of Harvard University.

Hooper, William: a signer of the Declaration of Independence; b. at Boston, Mass., June 17, 1742; graduated at Harvard in 1760; studied law under James Otis; removed in 1767 to North Carolina, where he held many important public positions, serving in the old Congress 1774–77. D. at Hillsborough, N. C., Oct., 1790.

Hoopeston: city (founded in 1872); Vermilion co., Ill. (for location of county, see map of Illinois, ref. 6-G); on the Chi. and E. Ill. and the Lk. Erie and W. Railways; 104 miles S. of Chicago. It contains 9 churches, 2 public schools, Greer College, and 1 daily and 2 weekly newspapers; has two of the largest sweet-corn canning-factories in the world; and is surrounded by choice agricultural land. Pop. (1880) 1,272; (1890) 1,911; (1893) local census, 2,374.
Publisher of "Chronicle."

Hooping-cough: See Whooping-cough.

Hoo'poe [either imitative or from the shorter form *hoop*, hoopoe, from Fr. *huppe* < Lat. *upupa*, a name imitative of the bird's cry; cf. Gr. ἔποψ, ἔποπος, hoopoe]: a name given to birds of the genus *Upupa*, on account of their note; most commonly applied to *Upupa epops*, a species found in Europe, Asia, and Africa. The hoopoe is about 10 inches long, exclusive of the long, slender bill. The general color is

The hoopoe.

buff, or reddish brown, the back, wings, and tail varied with black and white. The most conspicuous feature of the bird is its high, compressed crest. There is a legend to the effect that King Solomon changed this crest to gold, but the birds, finding themselves in consequence continually slain by man, begged to have it changed back again. The hoopoe feeds on grubs, worms, and insects, and is very filthy in its habits, its nest being, in warm countries, a positive nuisance on account of its stench. Revised by F. A. Lucas.

Hoorn, hōrn: town of the Netherlands, in the province of North Holland; on the Zuyder Zee; 27 miles by rail N. N. E. of Amsterdam (see map of Holland and Belgium, ref. 4–F). Its fortifications have been transformed into promenades, and now it has importance only as a trading and manufacturing place. It has considerable ship-building and a naval college. Its harbor on the Hoornerkop, a bay of the Zuyder Zee, is good, and, though the large foreign commerce it carried on in the sixteenth and seventeenth centuries has gone, it has still a good trade with other parts of the Netherlands, and exports much butter and cheese. Pop. (1890) 11,112.

Hoo'sac River: a tributary of the Hudson; rises in Lanesboro, Berkshire co., Mass.; flows N. and N. W.; traverses the southwest angles of Vermont and Rensselaer and Washington counties, N. Y., affording abundant water-power, which is extensively utilized. It is called *Hoosick* in New York.

Hoosac Tunnel: a tunnel in the northwestern part of the State of Massachusetts; within the limits of the towns of Florida and Adams in Berkshire County. It is on the railway route from Boston, Mass., viâ Greenfield, to Troy, N. Y. The distance from Boston to the east entrance is 137 miles, and thence to Troy 54 miles. That part of the route in Massachusetts, W. of Greenfield, which embraces the Hoosac Tunnel is called the Fitchburg Railroad. The first question of tunneling Hoosac Mountain was raised in 1825, when a commission was appointed to examine the feasibility of a canal between Boston and the Hudson, but that project was abandoned when railways were introduced. Experimental work was begun in 1851, but no actual tunneling until 1856. In 1862 the State took possession, and the work was completed in 1873. The tunnel is a little more than 4¾ miles long, and is made large enough for two railway tracks. The greater part of the rock penetrated is a micaceous schist, exhibiting, however, widely variant conditions and characteristics in different portions of the length. A working-

shaft 1,028 feet deep, which was sunk near the center of its length, is an important aid in the ventilation of the tunnel. The cost of the tunnel and 39 miles of adjoining railroad, including the accumulation of interest, was about $13,000,000. See TUNNELS. Revised by MANSFIELD MERRIMAN.

Hoosic Falls: village; Rensselaer co., N. Y. (for location of county, see map of New York, ref. 5-K); on the Hoosac river and the Fitchburg Railroad; 26 miles N. N. E. of Troy. It contains a graded public school, graded Roman Catholic parochial school, agricultural implement works, malleable iron-works, steam sawmill, potato-digger factory, and knitting-mill, and two weekly newspapers. Pop. (1880) 4,530; (1890) 7,014. EDITOR OF "STANDARD."

Hope: town; Hempstead co., Ark. (for location of county, see map of Arkansas, ref. 5-B); on the St. L., I. M. and So., and the Ark. and La. Railways; 32 miles N. E. of Texarkana, 112 miles S. W. of Little Rock. It has water-works, lumber and planing mills, sewing-machine factory, and weekly newspaper. Pop. (1880) 1,233; (1890) 1,937; (1893) 2,525. EDITOR OF "GAZETTE."

Hope, ALEXANDER JAMES BERESFORD, D. C. L., LL. D.: son of Thomas Hope; b. in London, Jan. 25, 1820; educated at Harrow and Cambridge, graduating at Trinity 1841; member of Parliament for Maidstone 1841–52, and again in 1857; elected for Stoke-upon-Trent 1865, and in 1868 for the University of Cambridge, which he represented till his death; was president of the Royal Institute of British Architects 1865–67. He took an active part in the Church movement and in artistic architectural questions, strongly on the Gothic side. In 1844 he purchased the ancient buildings of St. Augustine's Abbey, Canterbury, which he restored and endowed as a college for missionary clergy. Author of *Letters on Church Matters*, by D. C. L.; *The English Cathedral of the Nineteenth Century*, and numerous pamphlets, etc. In 1854, by royal license, he assumed the name of Beresford, the name of his mother, who married a second husband, the Viscount Beresford. D. at his seat, Bedgebury Park, Cranbrook, Kent, Oct. 20, 1887.

Hope, Sir JAMES, G. C. B.: naval officer; b. at Edinburgh, Mar. 3, 1808; educated at the Royal Naval College; entered the British navy as midshipman 1822; became captain 1838; served near Buenos Ayres 1844–45; in the Baltic 1854–56; in the East Indian and Chinese waters 1859–60; was distinguished in the operations that led to the taking of Peking; transferred to duty in the West Indies 1863; became a G. C. B. 1865, a full admiral 1870; admiral of the fleet in 1879; principal naval aide-de-camp to the Queen 1873. D. at Carriden House, Linlithgowshire, June 9, 1881.

Hope, THOMAS: author; b. in London, about 1774, of a very wealthy family; made extensive journeys through Europe, Asia, and Africa; returned to England in 1796; and attracted considerable attention in 1805 by his book on *Household Furniture and Interior Decoration* (London). Less influence had *The Costumes of the Ancients* (1809); *Designs of Modern Costumes* (1812); and *Historical Essay on Architecture* (2 vols., 1835); but his romance, *Anastasius, or the Memoirs of a Modern Greek* (1819), made quite a sensation. D. in London, Feb. 3, 1831. After his death there was published an essay by him *On the Origin and Prospects of Man* (1831, 3 vols.).

Hopedale: town; Worcester co., Mass. (for location of county, see map of Massachusetts, ref. 3-F); on the Grafton and Upton Railroad. It was set off from Milford in 1886, and manufactures cotton machinery, iron and brass castings, milled machine screws, and other articles. Pop. (1890) 1,176; (1895) 1,377.

Hopfen, HANS: poet and novelist; b. at Munich, Germany, Jan. 3, 1835; studied law in Munich; contributed the beautiful hymns *Die Not* and *Die Sendlinger Bauernschlacht* to Emanuel Geibel's *Münchener Dichterbuch* (1862); became general secretary of the German Schiller Institute in Vienna in 1865; and in the following year made his home permanently in Berlin. His writings show a lively imagination, and a shrewd though somewhat uncouth humor, but are marred by an excessive regard for social conventionalities. Among his numerous works are *Peregretta* (1864); *Der Pinsel Mings* (1868); *Verdorben zu Paris* (1868); *Arge Sitten* (1869); *Aschenbrödel* (1869); *In der Mark* (1870); *Der graue Freund* (1874); *Juschu* (1874); *Verfehlte Liebe* (1876); *Bayrische Dorfgeschichten* (1878); *Die Geschichten des Majors* (1880; sequel 1890); *Gedichte* (1883); *Brennende Liebe* (1884); *Zum Guten* (1885); *Ein Wunderlicher Heiliger* (1886); *Robert Leichtfuss* (1890); *Der Stellvertreter* (1891).

Hoph'ra: the Hebrew name of Apries (Egyptian *Uah-ab-Ra*), an Egyptian king, 591–572 B. C., during the twenty-sixth dynasty. He made war on Tyre and Sidon, taking them and destroying the Cyprian fleet. In consequence, Nebuchadnezzar invaded Palestine and captured Jerusalem, causing the flight of many Jews to Egypt (Jer. xliv. 10), where they were welcomed and acquired possessions. Later, Apries took the part of the Libyans in a conflict with the Cyrenians, and was worsted. During a revolt which followed Amasis II. was declared king, and in the conflict for supremacy Apries was defeated and captured. He was taken to Saïs and strangled (cf. Jer. xliv. 30).

CHARLES R. GILLETT.

Hopkins, EDWARD: colonial governor; b. at Shrewsbury, England, in 1600; was a successful merchant of London; removed to Boston, Mass., in 1637, and to Hartford, Conn., in 1638; was seven times Governor of Connecticut between 1640 and 1654, and assisted in forming the union of the colonies of New England 1643. He afterward returned to England, became a member of Parliament, and held important offices under the Commonwealth. D. in London, Mar., 1657, bequeathing a portion of his estate to the support of schools in Hartford, New Haven, and Hadley in New England. The town of Hopkinton, Mass., was named for him, having been purchased in 1700 of the "praying Indians" with moneys of his which fell to Harvard College.

Hopkins, EDWARD WASHBURN: professor of Sanskrit; b. at Northampton, Mass., Sept. 8, 1857; graduated at Columbia College 1878; Ph. D., Leipzig, 1881; was instructor in Columbia College 1881–85; Associate Professor of Sanskrit and Comparative Philology, Bryn Mawr College, 1885, and professor in 1892; is author of *Mutual Relations of the Four Castes in Manu*; *Translation of Laws of Manu* in Trübner's *Oriental Series* (1884); *Essays on the Social and Military Position of the Ruling Caste in Ancient India* (1889), in *Journal of the Oriental Society*. C. H. THURBER.

Hopkins, ESEK: officer in the Revolutionary war in North America; b. at Scituate, R. I., in 1718; was commissioned by Gov. Cooke as brigadier-general at the beginning of the war of independence. In 1775 he was appointed commander-in-chief of the navy by the Continental Congress, and addressed officially by Washington as admiral. In the beginning he was very successful in his undertakings, but afterward he failed to fulfill the expectations of the Government, and, having neglected to appear at Philadelphia when summoned, he was dismissed from the service in 1777. He retired to North Providence, where he resided till his death, Feb. 26, 1802, taking part very actively in the politics of the State.

Hopkins, JOHN HENRY, D. C. L., LL. D.: Protestant Episcopal bishop; b. in Dublin, Ireland, Jan. 30, 1792; removed in 1800 with his parents to the U. S.; received a good education, and assisted Alexander Wilson in preparing the illustrations of four volumes of his *Ornithology*, and afterward was an iron-manufacturer in Western Pennsylvania. He failed in business in 1817; was admitted to the bar at Pittsburg in 1818; dissatisfied with the law he studied for holy orders, and on his admission to the ministry in 1824 became rector of Trinity church, Pittsburg, of whose church edifice he had been the architect. In 1831 he became assistant minister of Trinity church, Boston, Mass., and Professor of Systematic Divinity in a theological seminary in Massachusetts. In 1832 he was consecrated the first Bishop of Vermont, became rector of St. Paul's, Burlington, and afterward devoted much time to the establishment of the Vermont Episcopal Institute. He took a strong stand for the High-Church movement, and was an active member of the first Pan-Anglican Synod. D. at Rock Point, Vt., Jan. 9, 1868. Among his works are many brochures, sermons, etc., besides *Christianity Vindicated* (1833); *The Primitive Church* (1835); *Essay on Gothic Architecture* (quarto, New York, 1836); *The Church of Rome in her Primitive Purity* (1837); *The Novelties which Disturb our Peace* (1844); *Lectures on the Reformation, History of the Confessional* (1850); *The "Law" Controversy" Controverted* (2 vols., 1854); *The Christian Citizen* (1857); *A Scriptural, Historical, and Ecclesiastical View of Slavery* (1864); *The Law of Revelation* (1866). Bishop Hopkins wrote and published a *History of the Church in Verse* (1867). See *Life of Bishop Hopkins by one of his Sons* (New York, 1873). Revised by W. S. PERRY.

Hopkins, John Henry, D. D.: son of the Bishop of Vermont; b. in Pittsburg, Pa., Oct. 28, 1820; graduated at the University of Vermont 1839, and at the General Theological Seminary, New York city, 1850; ordered deacon June 30, 1850; advanced to the priesthood 1872; rector of Trinity church, Plattsburg, New York, four years, and of Christ church, Williamsport, eleven years. He founded *The Church Journal* in 1853, and continued its editor and proprietor until May, 1868. Author of many *Carols and Hymns* and a *Life of Bishop Hopkins* (1868), and numerous pamphlets, reviews, historical sketches, etc. D. near Hudson, N. J., Aug. 13, 1891. His *Life*, including extracts and selections from his writings, has been published (1894) by the Rev. Charles F. Sweet, under the title *A Champion of the Cross*.

W. Silvens Perry.

Hopkins, Johns: philanthropist; b. in Anne Arundel co., Md., May 19, 1795, was carefully educated; became a wholesale grocer, retired with an ample fortune in 1847, and became president of the Merchants' Bank and a director of the Baltimore and Ohio Railroad. He was never married, and was a member of the Society of Friends. In 1873 he founded the Hopkins Free Hospital, Baltimore, at a cost of some $4,500,000; an orphanage for colored youth, a convalescent hospital, and the Johns Hopkins University with 316 acres of land at Clifton, near Baltimore, and an endowment of $3,000,000, poor and deserving youth from Maryland and Virginia to receive free scholarships. These benefactions exceeded $8,000,000 in aggregate value. D. at Baltimore, Dec. 24, 1873.

Hopkins, Lemuel: political writer; b. at Waterbury, Conn., June 19, 1750; graduated at Yale College; practiced medicine at Litchfield, and removed to Hartford in 1784, where he died Apr. 14, 1801. With Trumbull, Barlow, and others, styled the "Hartford wits," he put forth the *Anarchiad*, advocating an efficient federal constitution. He wrote several satires and other poems, among which are *The Political Greenhouse*, *The Guillotine*, and *The Hypocrite's Hope*. Author of a favorite version of Psalm cxxxii.

Hopkins, Mark, M. D., D. D., LL. D.: educator; b. at Stockbridge, Mass., Feb. 4, 1802; graduated at Williams College in 1824; M. D. in 1828; was Professor of Moral Philosophy and Rhetoric in Williams College 1830–36; president of the college 1836–72; then resumed the former position; in 1857 he became president of the A. B. C. F. M., an office whose duties he discharged till his death. For over sixty years he was connected with Williams College. He was remarkably successful as an instructor. He published *Evidences of Christianity* (Boston, 1846; new ed. 1864); *Lectures on Moral Science* (1862); *Law of Love, and Love as a Law, or Christian Ethics* (New York, 1869; new ed. 1881); *An Outline Study of Man* (1873; revised ed. 1886); *Scriptural Idea of Man* (1883); *Teachings and Counsels* (1884); together with numerous sermons and reviews. D. at Williamstown, Mass., June 17, 1887. See Franklin Carter's *Life of Hopkins* (Boston, 1892). Revised by George P. Fisher.

Hopkins, Samuel, D. D.: theologian; b. at Waterbury, Conn., Sept. 17, 1721; graduated at Yale in 1741; studied theology with Jonathan Edwards. In 1743 he was ordained over a Congregational church at Housatonic, now Great Barrington, Mass.; in 1770–76 minister of a church at Newport, R. I., and again in 1779. In consequence of his labors against slavery the State of Rhode Island freed all her slaves born after Mar., 1784. He published several works, the most noted of which is *System of Doctrines* (Boston, 1793), and his views have had a wide influence. He was one of the leaders of the New England, or Edwardean, school of theology. His complete works were published in Stockbridge, 1805, with a *Life* by Dr. Stephen West, and in 1852 (Boston), with a *Memoir* by E. A. Park. He is the hero of Mrs. Stowe's novel *The Minister's Wooing*. D. in Newport, R. I., Dec. 20, 1803. Revised by George P. Fisher.

Hopkins, Stephen, LL. D.: a signer of the Declaration of Independence; b. at Providence, R. I., Mar. 7, 1707; was bred a farmer at Scituate, R. I.; removed in 1742 to Providence, where he became a merchant; was Speaker of the Rhode Island General Assembly 1741, 1744, and 1749; chief justice of the superior court 1751–55, 1755–56, 1770–76; was nine times Governor of Rhode Island between 1755 and 1768; a member of the Continental Congress 1774–76. He was author of *Rights of Colonies Examined* (1764), and other writings, and was long the chancellor of Brown University, then Rhode Island College. D. at Providence, July 13, 1785.

Hopkins, William, M. A., LL. D., F. R. S.: geologist; b. in England in 1793. With little early education, after an unsuccessful attempt at business, he entered at the age of thirty St. Peter's College, Cambridge, where he graduated as seventh wrangler, and, taking private pupils, became a celebrated mathematical teacher. Many eminent mathematicians were trained by him. From Prof. Sedgwick he imbibed a strong interest in geology, and his published writings treat chiefly of the application of the methods of mathematical analysis to the elucidation of problems of physical geology, such, chiefly, as the effects of elevatory forces from below in producing faults and fissures in the rocks, on the formation of crevasses in glaciers, on the geological theories of elevation and earthquakes, on the causes which may have produced changes in the earth's superficial temperature, and on the conductivity of rocks and some other substances for heat. His name is most widely known through his masterly mathematical investigation (*Phil. Trans.*, 1839–40–42) of the effects which internal fluidity should have upon the "precession of the equinoxes," and the result which he arrived at, that the solid crust of the earth must have a thickness of at least 800 or 1,000 miles. Though this conclusion is now reached in other ways, the soundness of his reasoning is questioned. Mr. Hopkins was president of the British Association 1853, and of the Geological Society 1851 and 1852. D. Oct. 13, 1866.

Revised by S. Newcomb.

Hopkinson, Francis: a signer of the Declaration of Independence; b. in Philadelphia, Sept. 21, 1737; was a grandson of the Bishop of Worcester, England. He graduated at Princeton in 1763; in 1765 was admitted to the bar. He held a profitable public office in New Jersey, of which he was deprived on account of his republican principles. He was a member of Congress from New Jersey 1776–77, and a resident of Bordentown. His witty and satirical writings during and after the Revolution had much influence in political affairs. He was an admiralty judge in Pennsylvania 1779–89; U. S. district judge for Pennsylvania 1790–91. His humorous and patriotic poetical and other pieces—*The Treaty*, *The Battle of the Kegs*, *Ode to Science*, *Essay on Whitewashing*, and many others—enjoyed an immense popularity, and were really meritorious. Three volumes of his *Works* were published in 1792. He had considerable artistic and musical talent. D. in Philadelphia, May 9, 1791.

Hopkinson, John, F. R. S.: electrical engineer; b. at Manchester, England, in 1849; educated at Owens College and at Trinity College, Cambridge (senior wrangler in 1871); is known chiefly as one of the earliest electricians to make a thorough and systematic study of the dynamo, and through his work in magnetism. He has published a considerable number of technical papers dealing with dynamo electric machinery, and with the magnetic properties of iron and steel. Upon the former subject his researches have been exhaustive. They have been embodied in a volume entitled *Original Papers on Dynamo Machinery and Allied Subjects*.

E. L. Nichols.

Hopkinson, Joseph, LL. D.: jurist; a son of Francis Hopkinson; b. in Philadelphia, Nov. 12, 1770; graduated at the University of Pennsylvania in 1786; became one of the ablest lawyers of his time, but is chiefly remembered as the author of the national song, *Hail Columbia*. He was (1816–20) a prominent member of Congress, and in 1828 was appointed U. S. district judge for the eastern district of Pennsylvania. D. in Philadelphia, Jan. 15, 1842.

Hopkinsville: city (laid out 1799, incorporated 1806); capital of Christian co., Ky. (for location of county, see map of Kentucky, ref. 5–E); on the Louisv. and Nashv. and the Ohio Val. railways; 71 miles N. W. of Nashville, Tenn. It is in a noted tobacco region, which also has large coal and iron interests; contains a State lunatic asylum, South Kentucky College (Christian, chartered 1849), public library, and six periodicals; and is engaged principally in the tobacco trade. The city was nearly destroyed by the Confederates in the civil war. Pop. (1880) 4,229; (1890) 5,833.

Hoplitod'romos (Gr. *ὁπλιτοδρόμος*): in Grecian antiquity, a race run by men in armor or carrying the large round shield of the hoplite or heavy-armed soldier. The statue in the Louvre known as the *Borghese Gladiator* is now thought to represent a runner in such a race. R. S.

Hoplophor'idæ [Mod. Lat., liter., belonging to the armor-bearing tribe; Gr. *ὁπλοφόρος*, arm-bearing, armed (here taken to mean armored) + patronymic suffix *-ίδαι*; *ὅπλα*, weapons

+ *φέρειν*, bear]: the Glyptodonts, an extinct family of loricate edentate mammals, most nearly related to the existing pichiegos (*Chlamydophoridæ*) and armadillos (*Dasypodidæ*), but also related to the extinct megatheriids. They were of large size, and some of them attained gigantic dimensions. The shell, or carapace, was not jointed, as in the armadillos, but, except in one genus, formed of numerous small bony plates, immovably united with one another; a breast shield or plastron was usually present, and the tail was covered with a complete bony sheath; the teeth were uniform in number in all species, eight on each side of each jaw; and nearly the whole of the vertebral column was ankylosed into a long tube. The family, also known as the *Glyptodontidæ*, comprises several genera and numerous species. It is specially characteristic of South America, and remains are found abundantly in Brazil and the Argentine Republic, but some species occurred as far north as Texas, Florida, and Kansas. In external appearance the Glyptodonts bore considerable resemblance to gigantic tortoises, and some of them attained a length of 12 feet or even more. The various forms exhibited two decided modifications in the structure of the members: (1) Some had four digits before as well as behind, as in the group comprising the genera *Hoplophorus* (Lund) and *Panocthus* (Burmeister); while (2) others had four digits before and five behind. This group includes one genus with two well-marked sub-genera (*Glyptodon*, Owen, and *Schistopleurum*, Nodot).

Revised by F. A. Lucas.

Hoppe-Seyler, hō̆p'e-zī'ler, Felix: physiologist; b. in Freiburg, Dec. 26, 1825. He was a physician in Berlin 1852–54; professor in Berlin 1860; in Tübingen 1861; in Strassburg 1872; author of *Handbook of Physiological and Pathological Chemical Analysis*, *Medico-chemical Investigations*, *Physiological Chemistry*; has edited the *Zeitschrift für Physiologische Chemie* since 1877.

Hoppin, James Mason, D. D.: clergyman; b. in Providence, R. I., Jan. 17, 1820; graduated at Yale in 1840; studied law at Harvard, and theology at Andover, and in Germany under Neander; became pastor of a Congregational church in Salem, Mass., Mar. 27, 1850, and was Professor of Homiletics in the theological department of Yale College 1861–79. Since 1879 he has been Professor of the History of Art in the Yale School of the Fine Arts. He has published *Notes of a Theological Student* (New York, 1854); *Old England, its Art, Scenery, and People* (Boston, 1867; 8th ed. 1886); *The Office and Work of the Christian Ministry* (New York, 1869); *Life of Andrew Hull Foote, Rear-Admiral United States Navy* (1874); *Memoirs of Henry Armitt Brown* (Philadelphia, 1880); *Homiletics* (1881); *Pastoral Theology* (1884); *Sermons on Faith, Hope, and Love*, etc. (1891); *The Early Renaissance and other Essays on Art Subjects* (1892). Has contributed many articles to *Bibliotheca Sacra* and *New Englander*.

Revised by George P. Fisher.

Hops and **Hop Culture** [M. Eng. *hoppe*, from Mid. Dutch *hoppe* : O. H. Germ. *hopfo* > Mod. Germ. *hopfen*, hops]: perennial dicœcious plants belonging to the *Urticaceæ*, or nettle family, and the method of cultivating them. Hops grow wild in most parts of the Northern U. S. and Europe. There is but one botanical species—namely, *Humulus lupulus*—but this is broken into varieties by cultivation. The hop is a climbing vine with harsh foliage and rough stems, twining with the sun—that is, from left to right. In its wild state it clambers up the stems of shrubs and copsewood, and reaches high up among the limbs of lofty trees. The root is perennial, but the stems die in winter. The pistillate flowers are clustered in short axillary catkins: the two-flowered leafy bracts are imbricated, and in fruit form a kind of membranaceous strobile. The fruiting calyx is sprinkled with yellow resinous grains (lupuline). The nervine, aromatic bitter tonic, and other supposed virtues of the hops, as imparted to beer, etc., reside chiefly in this yellow powder. The constituents of commercial hops are a highly aromatic essential oil, residing almost entirely in the yellow powder; a resinous substance, a bitter crystalline principle, tannic acid, gum, cellulose, extractive matter soluble in water, quercitrin, and, according to some, a waxy matter. The yellow powder, called lupuline, forms in a pure state about 10 per cent. of the whole.

The soil of a hop-yard should be made deep and rich; good corn or wheat ground will serve. It should be dry at all seasons, deeply and thoroughly worked, and subsoiling is a great advantage. It should be on sunny and elevated ground, where it may have the influence of the sun and air, and be exposed neither to high winds nor to early frosts. The confined atmosphere of valleys or close proximity to woods induces disease and favors parasitic insects. Though there are several varieties of hops, possessing diversities of flavor and appearance, the market seems to favor no particular kind as such. Hence growers select varieties which in their own localities enjoy a reputation as yielding most or suffering least from rust and insects. The best-known varieties are the "grape hop," which has large clusters, easily picked, the "English cluster," a free-fruiting, golden-yellow variety, with reddish stems, and the "Pompey hop," a rank grower, having medium-sized clusters of long green, quadrangular fruit, of very marked appearance, but said to be liable to rust and mildew. In the U. S. plantations of hops are not profitable S. of lat. 40°.

Hops are cultivated in hills set 7½ to 8 feet apart. The roots do not fill the ground until the end of the second or third year. The first year, therefore, any crop may be raised to fill the soil which will not interfere with the cultivation. The land being manured and plowed in autumn, and left rough, is plowed again in the spring, and marked off—best by furrows 8 feet apart each way. Stakes are set at the intersections of the lines to mark the hills. Cuttings ("sets") are obtained from some established and healthy yard. They are the shoots which come from the crown of the plant, and are removed at the annual pruning, cut in lengths containing two joints or four eyes, and sold by the bushel. They should be fresh, and may be kept in the cellar or in the ground until wanted. Two to four bushels are required to plant an acre. Three or four sets are placed equally distant near the center of the hill, just below the surface, their tops inclining together. As soon as convenient poles 6 or 8 feet high, like common bean-poles, are set. If the soil is rich, the sets vigorous, and planted early, a fair crop may be gathered the first year. In all hop-yards there must be some male hops, in order that the blossoms may become fruitful. The number required is about one hill in sixty or eighty. The male sets are therefore kept separate, and every seventh or eighth hill each way is set with male hops and distinctly marked. The ground is cultivated the first year in connection with the accompanying crop, and kept free from weeds, especially from grass. At the close of the season one or two forkfuls of coarse manure are thrown upon each hill, not only as a fertilizer, but to protect the plants through the winter. Autumn is the best time to cut poles for setting the next spring. These may be 16 to 25 feet in length, and of some durable timber. In hop-growing regions young trees fit for poles have long since been exhausted, and poles are brought great distances at heavy cost. This has given rise to certain patented systems of training which are more or less in vogue. One of the simplest is to set light sawed poles to stand about 8 feet high, one to each hill, and connect them at their tops by tarred hempen twine. The vines are trained upon these cords, except those of the male hills, which run upon lofty poles that their pollen may be scattered. The picking is much simpler and easier than picking from poles, and numerous advantages are claimed, such as freedom from disease and insects. The system has obvious and important merits.

In the spring of the second and subsequent years the earth is drawn away from the hills, the plants exposed, the crowns cut back to the new sprouts, taking usually an inch or two from the crowns. The poles, which are preferably 18 feet long, are pointed, and holes being made with an appropriately shaped crowbar, two and sometimes more are set to each hill, 15 to 18 inches apart and bending or inclining slightly away from each other, yet not so as to come near to the poles of other hills. The largest and strongest poles are set in the direction of the highest winds and around the outside. Ordinary corn-cultivators are generally used for hoeing hops, the ground being thoroughly plowed at least once early in each year. As soon as the vines are 2 feet long they must be trained to the poles, selecting two strong ones for each pole, and cutting the rest away. The vines are tied to the poles with bast-matting, old yarn, or cheap strings, and should be looked to frequently until all cling well to the poles. Hop-vines are very brittle in the morning or evening, but may be handled when the sun is hot. They must always be wound about the poles with the course of the sun. Tillage in the hop-yard continues until they bloom, and then, on account of some prejudice, it is discontinued usually until this is past and the hops are set. It is best to cultivate or stir the ground as often as the weeds start, and enough to keep [illegible]

Hops are usually ripe enough to pick by the last week in August, and the harvest continues several weeks. The hop is known to be ripe when the seeds are hard and purple or beginning to get purple. Men take the poles down, first cutting the vines for some feet above the ground and loosening them from the poles, which are then laid upon supports over the boxes or bins, into which women and girls pick the hops, taking care not to let leaves and stems fall in. If the picking is begun too early, the vines bleed, and not unfrequently are thus destroyed or receive great injury. The "horizontal" hop-yards, or those upon cords, offer thus a great advantage, for the strings are loosened at the poles, and the vines, thus lowered within easy reach, allow of the hops being picked into large baskets. The bins before mentioned usually hold 7 to 10 bush. When full they are emptied into immense bags, and taken upon wagons to the kiln, where they are dried immediately after picking, for they spoil quickly if they lie in heaps.

The kiln is a building ordinarily of wood, containing usually four rooms—a lofty stove-room, a low drying-loft immediately above the stove-room, a store-room on a lower level than the drying-loft, and a press-room beneath it. The kilns are built to correspond with the size of the yard, or two or more are used, and they are of various plans. There are several patent kilns or patented methods of drying. The floor of the drying-loft is of slats covered with a hempen carpet, tightly spun, but loosely woven to allow the air to pass freely. The hops are spread upon this carpet to the depth of 12 to 14 inches, and stirred when they become nearly dry. After from twelve to twenty-two hours' drying they are generally cured, and are shoved and swept off into the store-room. In one of these patent kilns the carpet rolls back and forth, thus carrying the dried hops and depositing them on the floor of the store-room. In another the carpet is on a frame which tilts when over the store-room floor. Hops are dry enough when they crumble two-thirds to pieces in the hand, and when the stems do not feel moist or cool when pressed by the lips. After the first heat, and subsequently, flowers of sulphur are burned in the stove-room. The fumes passing through the hops serve to lighten and brighten the color, and in case the hops are rusty the effect is very marked, but far more sulphur is needed. It is important to get hops dry enough, and they should be stirred once during the drying, but not until all perceptible steam has passed off. Should a charge get too dry, a pan of coals is set in the store-room, the ventilators are closed, and salt thrown upon them. This gives out moisture, which toughens the overdried hops. The fire must go down and the hops cool off considerably before they are removed to the store-room, and the newly dried hops can not be mingled with the others until the next day; and the best way is to leave them on the cooling floor, shoving them back as space is needed, keeping two or three charges spread over the floor all the time, and putting the oldest daily into the bins. After ten days or so, and within six weeks, the hops should be baled, the press being in the room below the cooling floor. The usual size of the hop bale is 20 or 24 inches, by 4 feet or thereabouts; screw-presses are generally employed. The press is lined with cloth made for the purpose called "Dundee sacking," and this is sewed tight after the pressing and before the pressure is relieved. Hops are marketed through commission merchants, and are consumed by brewers almost exclusively. The price is very variable, ranging in different seasons from 6 or 8 cents to upward of a dollar per pound. It is generally considered that hops may be profitably grown for 10 cents per pound.

Austria, Germany, France, Belgium, Russia, England, and the U. S. are the principal hop-producing countries. Hops are raised in the U. S. not only in sufficient quantities for home consumption, but for export. The production has vastly increased, it having been in 1850 about 3,500,000 lb.; in 1860, 11,000,000; in 1870, 25,456,699; in 1880, 29,480,106; and in 1890, 39,171,270. This amount was raised on 50,212 acres in seventeen States. Five of these States raised 99·48 per cent. of the entire crop of the U. S., as follows: New York, 20,063,029 lb.; Washington, 8,313,280 lb.; California, 6,547,338 lb.; Oregon, 3,613,726 lb.; and Wisconsin, 428,547 lb. Not only is the hop industry localized in a few States, but in a few counties of those States. Ten counties (5 in New York, 2 in Washington, 2 in California, and 1 in Oregon) produce 72 per cent. of the entire crop of the country. In 1893 the U. S. exported hops to the value of nearly four million dollars. Revised by H. H. Wing.

Hop-tree: a shrub (*Ptelea trifoliata*) of the rue family; found in the U. S. from Pennsylvania southward and westward. When kept trimmed to a single stem it attains a height of 30 to 40 feet. The leaves are trifoliate, with leaflets ovate, pointed, and downy when young. The flowers, borne in cymes at the ends of the new shoots, are greenish, small, and not conspicuous; they are polygamous—staminate, pistillate, and perfect ones being found on the same plant. The fruit is two-celled and two-seeded, having a broad wing, and resembles that of the elm, whence its generic name (Gr. πτελέα, elm). The flowers and bruised leaves have an unpleasant odor. The fruit is intensely bitter, and is destitute of the aromatic principle of the true hop, for which it is often substituted in the manufacture of beer. An infusion of the leaves and young shoots is used as a remedy for worms.

Hor: (1) a mountain of Arabia Petræa, forming a part of the range of Seir or Edom, upon which Aaron died. (Num. xx. 25–28, xxxiii. 38; Deut. xxxii. 50.) The summit, which is generally conceded to be the Mt. Hor of this incident, still bears the name of Mt. Aaron (Arab. *Jebel Harûn*), and, rising to the height of 4,580 feet above the sea, is the most conspicuous summit of the range. The mountain has a double top, and is surmounted by an edifice called Aaron's tomb, whose upper part is of later date than the crusades, but which is on the site of earlier structure. (2) An entirely different mountain mentioned in Num. xxxiv. 7, 8 as one of the marks of the northern boundary of the land which the Israelites were to conquer. The word *Hor* means simply "mountain," and in this instance probably designates the entire Lebanon range. Revised by S. M. Jackson.

Horace, Quintus Horatius Flaccus: Latin poet and satirist; b. at Venusia, in Apulia, Dec. 8, 65 B. C. His father, a freedman, was a collector of money paid at public auctions (*auctionum coactor*), owned a little farm, and had sufficient means to give his son a liberal education. After finishing his studies in Rome, Horace went, about 45 B. C., to Athens to study philosophy and rhetoric, but the murder of Cæsar and the civil war which ensued made him a soldier, and he fought as a tribune under Brutus in the battle of Philippi (42 B. C.). After the defeat he went to Rome in 41, having obtained pardon, and secured a clerkship in the quæstor's office, which he afterward gave up in order to devote himself entirely to literary pursuits. His first productions were satires, or, as he calls them himself, *sermones*, on account of the colloquial tone in which they are written. These he read to his friends, and thus by degrees he was admitted to the literary circles of Rome. He made the acquaintance of Varius and Vergil, who introduced him to Mæcenas, who again introduced him to Augustus, and Mæcenas appreciated his talent and his friendship so much that he gave him a fine country-seat near Tivoli, in the Sabine Mountains, and also a competency. The first book of satires was published about 35 B. C., the epodes about 30, although many of them were written earlier; the second book of the satires appeared also in 30. The first three books of the odes were published together about 23, the first book of epistles in 20, the *Carmen Sæculare* in 17, the fourth book of the odes in 13, and not long after the second book of the epistles and the long epistle *Ad Pisones*, generally known under the title of *Ars Poetica*, which some scholars refer to an earlier date (19 or 18 B. C.). D. Nov. 27, 8 B. C., and was buried at the Esquiline Gate, beside Mæcenas. In the epodes, or *iambi*, as Horace himself called them, the influence of Archilochus is most marked, in the satires of Lucilius, in the odes Alcæus, Anacreon, Pindar, Bacchylides, Archilochus, Stesichorus, Simonides, Sappho, and Callimachus have all been imitated. In the epistles Horace is most original, and is at his best as a poet of reflection. His love lyrics lack the fervor of Catullus, but in finish of form and diction he excelled all preceding poets, and remained unsurpassed by those following. On his odes he chiefly rested his claim to immortality, and through them he has secured it. He has been the favorite of scholars and statesmen, of poets and men of affairs, and has left a deep impression upon modern literature. Quintilian somewhat unjustly speaks of him as almost the only Roman lyric poet worthy to be read. In the time of Juvenal he was a school classic. Many grammarians composed commentaries to elucidate his meaning. The *Scholia* of Porphyrion of the fourth century are still preserved, as well as those of the Pseudo-Acron, which belong to a later period. The modern literature upon Horace is endless. For a sane and judicious estimate

of Horace's genius, see W. Y. Sellar, *The Roman Poets of the Augustan Age* (Oxford, 1892). For adverse criticism, J. J. Hartmann, *De Horatio Poeta* (Leyden, 1891). The best complete English edition is that of Wickham (2 vols., Oxford, 1887 and 1892). See also *Odes and Carmen Sæculare* by T. E. Page; *Epistles and Ars Poetica* by A. S. Wilkins; *Satires* by A. Palmer, all in the Macmillan Classical Series, London. Of German editions, may be mentioned Orelli (Baiter, Hirschfelder, Mewes) *ed. quarta maior* in two volumes, with a *Lexicon Horatianum* (Berlin, 1886–92); H. Schütz, 3 pts. (Berlin, 1880–83); A. Kiessling, 3 pts. (Berlin, 1884–88); and Mueller, *Satiren und Episteln* (Leipzig, 1891–93). Revised by M. Warren.

Horapollon (in Gr. Ὡραπόλλων): a grammarian who was born in Phenabythis, in Egypt, in the fourth century A. D. He taught first in Alexandria and then in Constantinople under Theodosius. He wrote commentaries on Sophocles, Alcæus, and Homer. He wrote in Egyptian a book on hieroglyphs (*Hieroglyphica*, edited by Leemans, Amsterdam, 1835), which in the fourth century was translated into Greek by one Philippus. While the work has been of great value to Egyptologists, it can be proved that it is a paraphrase of the original rather than a translation, and that Philippus, besides making additions to the original, did not always paraphrase accurately. A second Horapollon lived under the Emperor Zeno (474–491 A. D.). Little is known concerning either of them. J. R. S. Sterrett.

Hora'tii: three brothers chosen by King Tullus Hostilius as champions of Rome in the struggle with the city of Alba Longa, which was also represented by three brothers, the Curiatii. The contest being submitted to the issue of a combat between the champions, the Curiatii, who had succeeded in killing two of their opponents, were in turn slain by the survivor, who, feigning flight, cut down each of his pursuers in succession. Horatius, having in the moment of triumph killed his sister, who was betrothed to one of the Curiatii and had angered her brother by her lamentations, was condemned in consequence to be scourged to death, but on appealing to the people was pardoned and afterward sent to destroy Alba Longa. The account of these events as recorded by Livy, though obviously mythical, reveals the hostility which doubtless existed between Rome and Alba Longa. To the same family probably belonged another legendary hero, the famous Publius Horatius, surnamed Cocles, who in 507 B. C., when the Etruscans under Porsena besieged the city, defended the Sublician bridge with two comrades till the Roman citizens cut it down. Then, throwing himself into the Tiber, he reached the other shore in safety. The story forms the subject of a spirited ballad in Macaulay's *Lays of Ancient Rome*. F. M. Colby.

Horchen: See Horgen.

Hörde, hör'de: a manufacturing town of Prussia; in the province of Westphalia and the circle of Dortmund; 2½ miles S. E. of Dortmund (see map of German Empire, ref. 4–D). The neighborhood is very rich in iron and coal mines, and the manufactures of the town are all connected with iron—namely, smelting-works, foundries, puddling-works, rolling-mills, the fabrication of plated ware, etc. Pop. (1890) 16,347.

Ho'reb [= Heb. *chōreb*, liter., dry, desert]: according to some, a lower part or elevation of Mt. Sinai; others consider it to be a general name for the whole range of which Mt. Sinai was one of the principal summits. See Sinai.

Horehound [M. Eng. *horhowne* < O. Eng. *hārhune*: *hār*, hoar, white + *hune*, horehound]: the name of several labiate herbs of temperate climates. *Marrubium vulgare*, the common or white horehound, is naturalized in the Eastern U. S., but is a native of Europe and Western America. It is an excellent tonic remedy, very useful in coughs and colds, and is generally taken in sirup or candy. The fetid horehound (*Ballota nigra*) is also a naturalized plant from Europe. It resembles the former in appearance, taste, and properties. The water-horehound (*Lycopus europæus*) grows in Europe and America. It is considered a good tonic. *Lycopus virginicus* (bugle-wort) nearly resembles it, and is sometimes used on account of its expectorant properties.

Hor'gen, or **Hor'chen**: town; in the canton of Zurich, Switzerland; on the Lake of Zurich (see map of Switzerland, ref. 3–G); situated at an elevation of 1,500 feet above the level of the sea; is surrounded with fine vineyards, and has very important manufactures of silk, cotton goods, and chemicals. This handsome town is one of the principal centers of the Zurich silk-manufacture and wine-cultivation, and a general meeting-place for the boats plying on the lake. Pop. (1888) 5,519.

Horicon Lake: See George, Lake.

Ho'rites, or **Horims**: the aboriginal inhabitants of Mt. Seir before the Canaanites conquered Palestine (Gen. xiv. 6). Their name, which means "cave-dweller," is derived from Hori, the grandson of Seir (Gen. xxxvi. 22), and refers to their habit of dwelling in caves, of which there still are many extant in the cliffs of Edom. They were exterminated by the Edomites (Deut. ii. 12, 22).

Hori'zon [from Fr. *horizon* < Lat. *hori'zon* (whence Germ. *horizont*) = Gr. *ὁρίζων* (sc. *κύκλος*), the circle which bounds (the sight), partic. of *ὁρίζειν*, bound, deriv. of *ὅρος*, a boundary]: the line formed by the apparent contact of the sky and earth. This, or, more exactly, the circle upon the heavens bounding the plane which is tangent to the earth at the point where the observer stands, is the *sensible* horizon. The plane of the horizon of any observer is one passing through the point where the observer stands, and perpendicular to the plumb-line at that point. The *rational* horizon is a plane through the center of the earth parallel to the sensible horizon. This plane divides into two equal parts both the terrestrial and the celestial spheres. S. N.

Hormayr, Joseph, Freiherr von: historian; b. at Innsbruck, Austria, Jan. 20, 1782; studied law and was appointed to a place in the foreign office at Vienna; became in 1803 court secretary with the charge of the secret archives; was court commissioner in the Tyrol during the revolution of 1809 against the Bavarians, and was active in aiding the movement. After the armistice of Znaym he returned to Vienna, but his association with the Tyrolese revolutionists, who again tried to throw off the Bavarian yoke, caused his arrest and imprisonment in 1813; and though he was soon released and honored by an appointment as royal historiographer, he was not in sympathy with the conduct or policy of the Austrian court, and after a few years spent in retirement entered the service of Bavaria, in which he was made ministerial councilor in the department of foreign affairs; was Bavarian minister resident at Hamburg, and afterward filled the same office at Bremen. D. at Munich, Oct. 5, 1848. Among his works are *Kritisch-diplomatische Beiträge zur Geschichte Tirols im Mittelalter* (1802–03); *Geschichte der gefürsteten Grafschaft Tirol* (1806–08); *Oesterreichischer Plutarch*, etc. (1807–14); *Allgemeine Geschichte der neuesten Zeit* (1817–19); *Lebensbilder aus dem Befreiungskriege* (1841–44); and *Das Land Tirol und der Tirolerkrieg von 1809* (1845). F. M. Colby.

Horn [O. Eng. *horn*: Icel. *horn*: O. H. Germ. *horn* (> Mod. Germ. *horn*): Goth. *haúrn* < Teuton. *horn*; cf. Gr. *κέρας*: Lat. *cornu*: Ir. *corn*]: a hard projection, usually diminishing from its base to a point, on the heads of many animals, especially the cloven-footed quadrupeds. Horns are of various shapes, but those of the cow, bull, or ox, being most familiar, have become a popular descriptive term for all similarly formed projections—e. g. the horns of the moon. As a prominent symbol in ancient literature the horn signified strength, power, or dignity (Jer. xlviii.; 1 Sam. ii.), and with the Greeks abundance or fertility, as was set forth in the cornucopia, or horn of plenty. In all animals bearing them "the formation of the horns has been long known to be much influenced by the condition of the organs of generation; in the deer they acquire their full bulk and complete form just before the season of rutting." The most dignified of the deities, whether Semitic or Aryan, were represented as horned, and for a different reason all those which were most closely connected with reproductive nature—as, for instance, the rural gods.

Horns are of various types. The horn of the rhinoceros is a compact, fibrous, epidermal structure, practically a mass of fused hairs, firmly attached to a slight elevation or roughness of the skull, but not penetrated by any bony core. Horns of this character are situated on the median line of the skull, and in existing species, where two horns are present, one lies directly behind the other. Some fossil species, however, possessed a pair of horns, one on either side of the nasal region, and there is reason for believing that some extinct animals (*Uintatherium*) may have had as many as three pairs of such horns. The horns of sheep, oxen, and antelopes are outgrowths of the frontal bone covered by a sheath of united horny fibers, commonly known as horn. The horns of these animals are never shed and are

never forked, and but one pair is present in existing species, with the exception of the little four-horned antelopes of India. Among sheep and oxen the horn cores are hollow, being continuations of the frontal sinus; in antelopes the horn core is solid. The horns of the North American prong-horn antelope resemble those of oxen in being outgrowths of the frontal bone covered with a horny sheath, but there is this important difference between them, that the horny sheath of the prong-horn is slightly forked and is shed and renewed yearly. The giraffe has a pair of short unbranched horns, consisting of bone covered with hairy skin. These bones are not processes of the skull, but are firmly joined to it, being attached to both the frontal and parietal bones. The young are born with rudimentary horns, and are the sole horned mammals that enter the world thus armed. The horns, or more properly *antlers*, of deer are outgrowths of the frontal bone, and are shed and renewed annually. While growing, antlers are soft and spongy in texture, permeated by blood-vessels, and covered with skin clothed with short, soft hair. They are then said to be in the velvet. They reach their full growth in about three months, when the circulation of blood gradually ceases, the antlers become hard, and the enveloping skin is soon rubbed off. In this condition they are carried for about four months longer, and then fall off or are broken away from the supporting bones.

In olden times horns were extensively used, especially among the Northern races, for drinking-cups, and in Saxon and Norman sculptures a horn is the common goblet.

Manufactures of Horn.—The peculiar texture of horn, its toughness and agreeable natural colors, have always caused it to be a favorite material for many works, though the increasing cheapness of glass, gutta-percha, and metal wares has caused a great disuse of it. At one time there was held annually in England a fair at which every object for sale was made of horn. As true horn consists, chemically, of albumen (keratin) and a little phosphate of lime, it is readily softened in boiling water or by heat; sometimes the process is aided by the addition of quicklime. It is usual to prepare the horns of oxen and sheep by steeping them for several weeks in cold water, which has the effect of separating the cored bony part from the cover of true horn. The latter is then heated, first for half an hour in boiling water, and then over fire. In this condition it may be cut or molded with great ease. To make sheets for lanterns or combs, the horn is slit lengthways at the side, heated and pressed out, either between plates or by machines, of which several have been invented. Care must, however, be exercised as to the application of both heat and pressure, since, owing to its peculiarly laminated structure and the striæ abounding through it—as may be specially observed in that of the rhinoceros—horn has a tendency to split. It receives dyes of different kinds, and is made to closely resemble tortoise-shell, but this process also is apt to render it fragile. Its softness may, however, be restored by steeping it in glycerine and water; and if it be then treated with nitric and pyroligneous acids, tannin, potash, sulphate of zinc, and water, it assumes a peculiar strength and great elasticity. As sheets or other pieces of horn may be incorporated together, there is little waste in the manufacture. There is an extensive manufacture in London of so-called Abyssinian drinking-cups, made of segments of horn straightened, colored in imitation of the beautiful gray and black cups brought from the plunder of Magdala. The horn of the rhinoceros has been greatly esteemed in all ages in the East, partly from a belief that it neutralized poison in liquids, and partly from its rich natural color and great beauty. It is often elaborately carved by the Egyptians and Chinese, and one from Canton has been seen which, owing to its exquisite work, cost $600. The Romans made oil-flasks both of ox and rhinoceros horn, and from an epigram in Martial it may be inferred that they too sometimes imitated the latter material with the former. The epigram is in reference to a lantern, and might serve as its inscription:

> Though by a bull I here of late was horne
> You'd say I am of true rhinoceros horn

These cups require occasional oiling, or they will "chip" or crack. In the East horn is a favorite material for the hilts of weapons, preference being given to that which comes from Sumatra. It is worked, like ivory, entirely with the chisel and without heat. Deer or buck horn is used in all countries for knife-handles. As it is simply bone, and of coarse cellular structure within, it is seldom or never made up except in such a manner as to preserve in part, at least, its agreeably colored and peculiar rugged structure. In Germany thousands of artisans are engaged in making from deer-horn ornaments which vary from carvings of almost microscopic delicacy to large articles of furniture. Immense numbers of deer-horns (of the *Axis maculata*) are annually imported into Germany and the United Kingdom for such work. The horns of the Eastern buffalo are in great demand. The interior of ox-horns is used to make "bone-earth"; the refuse of all kinds is applied to the manufacture of prussiate of potash and ammoniacal salts; while fragments of ox and buffalo horn, powdered, are of value as manure.

Revised by F. A. Lucas.

Horn [so called in English, as in many other languages, because originally made from the horn of an animal]: a wind instrument of music, usually of brass, much used in the orchestra. The French horn is coiled in such a way as to become portable, and its key may be modified by the insertion or withdrawal of suitable pieces. The valved horn is a modification of the older instrument. Various other wind instruments are called from their shape "horns," and in ancient times the horns of animals were employed as trumpets, but they probably served only as the means of calling. The horn is seldom played singly in the orchestra. A pair, at least, and in modern scoring two pairs, are usually employed.

Horn, Charles Edward: composer and conductor; b. in London in 1786; received his musical education mainly from his father, a German music-teacher residing in London. In 1809 he appeared at the English Opera-house as an opera-singer, and in the next year composed his first opera, *The Magic Bride*. As singer and composer, and later a conductor, he was connected with the English opera for many years. In 1832 he made a visit to the U. S. and conducted English opera in New York, and on Feb. 26 of that year his *Ode to Washington* was performed by the Handel and Haydn Society of Boston, and on Oct. 2, 1836, the same society produced his oratorio *The Remission of Sin*. Horn returned to England in 1843, and in 1845 his oratorio was sung under the new name *Satan*. In 1847 he returned to Boston, and on July 23 was elected the first conductor of the Handel and Haydn Society; before that the president was also the conductor. He produced his oratorio *Daniel's Prediction* in England in 1848, and in the same year was re-elected conductor of the Handel and Haydn Society of Boston. He died in Boston, Oct. 21, 1849. Besides the works named, he composed many operettas and music dramas, and many songs, including the well-known *Cherry Ripe*.

D. E. Hervey.

Horn, Edward Traill, D. D.: Lutheran pastor and writer; b. at Easton, Pa., June 10, 1850; graduated from Pennsylvania College, Gettysburg, 1869, and the Theological Seminary of Evangelical Lutheran Church in Philadelphia 1872; pastor in Philadelphia (Chestnut Hill) 1872–76; in Charleston, S. C., since 1876. Dr. Horn has been one of the leaders of the movement in behalf of a common service for all English-speaking Lutherans. He advocated it in an article in *The Quarterly Review* in 1881; became secretary of the joint committee, and saw its completion in 1888. He has been probably its most prominent and scholarly advocate and defender since its publication. He is one of the founders and was for a time president of the United Synod of the South. He has published several works, including *The Christian Year* (Philadelphia, 1876); *The Old Matin and Vesper Services of the Lutheran Church* (Gettysburg, 1882); *Outlines of Liturgics* (Philadelphia, 1890); besides numerous articles on liturgical and historical subjects in the reviews of the Lutheran Church.

H. E. Jacobs.

Horn, Gustaf Carlsson: soldier; b. at Orbyhus, Sweden, Oct. 22, 1592; studied at Rostock, Jena, and Tübingen; received his military training in Holland under Prince Maurice of Orange; and entered the Swedish army in 1624. Gustavus Adolphus called him his right arm, and after the battle of Lützen he made a brilliant campaign in the Rhenish Palatinate, but was taken prisoner in the battle of Nördlingen in 1634, and kept for seven years in the fortresses of Ingoldstadt and Burghausen. Having been exchanged in 1642 he returned to Sweden; commanded in 1644 in Scania against the Danes; was made a count and field-marshal in 1651. D. at Skara, May 10, 1657.

Revised by R. B. Anderson.

Horn, or **Hoorne**, Philippe, Count of: Flemish soldier and statesman; b. in 1522; a son of De Montmorency-

Nivelle, a Flemish nobleman. When his mother, having become a widow, married Count Horn, Philippe was adopted by his stepfather and assumed his name. He distinguished himself both in the battles of St.-Quentin and Gravelines and in the councils of Philip II. and Margaret, vicegerent of the Netherlands. He was a good Catholic, but he was tolerant. He was loyal to the Spanish crown, but he would not deliver up the rights of his native country without resistance. He joined Egmont and the Prince of Orange in opposing the aggressive policy of the Spanish court, but refused to sign the compromise of Breda or to fraternize with the "Beggars," the party of resistance, and gave further proofs of his loyalty by preventing a massacre of the Catholics at Tournay, and by taking the test oath exacted by Margaret. Like Egmont, he tried to pursue a middle course, deprecating alike royal oppression and popular resistance. The king nevertheless determined on his downfall, and when Alva arrived in the Netherlands Horn was seized, together with Egmont, at Brussels in 1567. A case was made out against him, and he was brought before the Council of Blood on the charge of treason. His accidental presence at the famous banquet of the "Beggars" was used against him with effect, and he was furthermore charged with having betrayed to the Prince of Orange the royal designs against the Netherlands. In spite of appeals from all parts of Europe to the royal clemency, he was beheaded June 5, 1568.

Revised by F. M. Colby.

Hornbeam [from *horn* + *beam*, here used in its earlier sense of tree < O. Eng. *bēam*, beam, tree : O. H. Germ. *boum* > Mod. Germ. *baum*, tree]: a name given to various trees. The hornbeam of Europe is the *Carpinus betulus*, a handsome forest tree which has very tough, white wood, highly prized by turners and joiners. It is also excellent fire-wood, and makes good charcoal. In the U. S. the *Carpinus caroliniana* is called hornbeam, lever-wood, iron-wood, and blue beech. It is very hard, tough, and close-grained. The hop-hornbeam, called also lever-wood or iron-wood, is a slender tree, the *Ostrya virginica*, with wood of the same qualities as those possessed by that of the former tree. Both grow extensively throughout the U. S. All the above belong to the family *Cupuliferæ*. Revised by L. H. Bailey.

Hornbill [so named in allusion to the peculiar beak]: the common name for a number of birds of the family *Bucerotidæ*, remarkable for the great size and peculiar development of their bills. In some species the base of the upper mandible is widely expanded, while in others, as in the rhinoceros hornbill, it may have a portion projecting forward and upward like a horn. Although so very large the beaks of these birds are very light, the bony portion of the mandible being porous or incompletely filling its horny sheath. The species vary in size from 1½ to 4 feet in length. The hornbills fly heavily and with an astonishing clatter of wings, and utter loud, discordant cries, the voice of the great hornbill (*Dichoceros bicornis*) having been compared by Wallace to something between the shriek of a locomotive and the bray of a jackass. The male of some species which nest in hollow trees plasters up the entrance to the nest after the female has entered, leaving only a narrow opening through which she may be fed, and does not release her until the young are about ready to fly. Fruit forms the principal portion of their diet, although they eat fishes and other food. The hornbills are confined to the warmer portions of Africa, India, and Malaysia, extending eastward to New Guinea. See Bucerotidæ. F. A. Lucas.

Hornblende [= Germ. *hornblende*; *horn*, horn (: Eng. *horn*) + *blende*, blende (whence Eng. *blende*), deriv. of *blenden*, blind, dazzle]: a term used in mineralogy, sometimes as synonymous with amphibole, sometimes to designate only the dark-colored varieties of that very variable mineral. In the former sense hornblende is a mineral crystallizing in the monoclinic system, but occurring also imperfectly crystallized, or massive, fibrous, and granular. Its hardness varies from 5 to 6, and its specific gravity from 2·9 to 3·4. In composition it varies much, being, however, essentially a silicate of magnesia and oxide of iron, with generally lime, and with or without alumina, manganese-oxide, or soda. It is one of the more important rock-forming minerals, occurring especially in granitic and metamorphic rocks, and volcanic rocks of deep-seated origin. It presents a great variety of forms and great differences in color; black and dark-green varieties are especially known as *hornblende*; lighter green as *actinolite*; white varieties as *tremolite*; and fibrous forms as *anthophyllite*, *asbestos*, and *amianthus*.

Hornblower, William Butler, LL. B.: lawyer; b. in Paterson, N. J., May 13, 1851; was educated at a collegiate school in New York city and at Princeton College, where he graduated in 1871 with high rank; graduated at Columbia Law School, 1875; was admitted to the bar the same year; became two years later junior partner in the firm of Carter & Eaton; rapidly rose to prominence in the practice of his profession; in 1890 was appointed by the Governor of New York member of a commission to propose amendments to the judiciary articles of the State constitution; president of the Princeton Alumni Association, and member of a number of prominent clubs; secretary of the executive committee of the New York Bar Association; nominated Sept. 19, 1893, by President Cleveland to be associate judge of the Supreme Court of the U. S. in place of Samuel Blatchford, but confirmation was refused by the Senate Jan. 15, 1894, by a vote of 30 to 24. Several members of the Hornblower family have been distinguished as jurists, and one of his grandfathers was a signer of the Declaration of Independence. Mr. Hornblower has made many contributions to legal literature, among the most important being *The Conflict between Federal and States Decisions*, in *American Law Review*, Mar., 1880; *Is Codification of the Law Expedient?* (address before the American Social Science Association, Sept. 6, 1888); and *The Lawful Status of the Indians* (address before the American Bar Association, Aug., 1891). C. H. Thurber.

Hornbook: a written or printed tablet of parchment or paper, covered with a thin transparent layer of horn, and framed in wood, containing the alphabet in Roman or black letter, with some other simple lessons, often followed by the Lord's Prayer. Hornbooks appear to have been chiefly English. Their use originated before the invention of printing, and continued till about the middle of the eighteenth century. There are few existing specimens.

Horn, Cape: See Cape Horn.

Horn Corals: a name applied to the group of Antipatharian corals (see Hexacorallia), in allusion to the horny skeleton which they produce.

Horne, George: ecclesiastic; b. at Otham, Kent, England, Nov. 1, 1730; educated at Oxford; took orders in 1753; became chaplain to the king in 1771; Dean of Canterbury in 1781; Bishop of Norwich in 1790. He was a follower of John Hutchinson (*q. v.*). His principal work is his *Commentary on the Psalms* (London, 1776); he also published several volumes of sermons; *Letters on Infidelity* (1784), letters to Priestley (1787); and one to Adam Smith on David Hume (1777). See his collected works, with *Memoir* by William Jones (6 vols., 1799, and 4 vols., 1831). D. at Bath, Jan. 17, 1792. Revised by S. M. Jackson.

Horne, Richard Hengist: author; b. in London, Jan. 1, 1803; studied in the college at Sandhurst, and became a midshipman in the Mexican navy; was in Australia 1852–69, where he held local magistracies. He returned to England in 1869. He wrote several tragedies (*The Death of Marlow*, *Gregory VII.*, *Cosmo dei Medici*, etc.) and a number of poems and miscellaneous works, among which are a *Life of Napoleon* (2 vols., 1841); *Orion, an Epic* (1843); *Australian Facts and Figures* (1859). D. Mar. 13, 1884.

Horne, Thomas Hartwell, D. D.: biblical critic; b. in London, Oct. 20, 1780; studied at Christ's Hospital 1789–95, and read law; was sub-librarian of the Surrey Institution 1809–23; took orders in the Church of England 1819; was senior assistant librarian in the British Museum 1824–60; became rector of St. Edmund's and St. Nicholas's 1833; was made a prebendary of St. Paul's 1841. In early life he was a Methodist. His principal work is the *Introduction to the Critical Study of the Scriptures* (1818, 3 vols.; 11th edition, London, 1860, 4 vols.); also author of a *Brief View of the Necessity and Truth of the Christian Revelation* (1800); *Lakes of Lancashire, Westmoreland, and Cumberland* (1816); *Deism Refuted* (1819); *Romanism Contrary to the Bible* (1827); *Manual for the Afflicted* (1832); *Protestant Memorial* (1835); *Manual of Biblical Bibliography* (1839); and *Mariolatry* (1840). D. in London, June 27, 1862. See *Reminiscences of T. H. Horne*, by his daughter, S. A. Cheyne (London, 1862).

Horned Snake: See Cerastes.

Horned Toads: popular name of lizards belonging to the genus *Phrynosoma*, of which several species are found in Texas, Mexico, California, Utah, etc. They live in the fields among cactus and weeds, lying close to the ground, and are

sluggish in their movements. They feed upon ants and other insects, and have the singular power, when irritated,

Phrynosoma douglassii.

of ejecting blood from the eye with considerable force. *P. douglassii* and *P. cornutum* are the best-known species.

Revised by F. A. Lucas.

Hornellsville: city (incorporated 1888); Steuben co., N. Y. (for location of county, see map of New York, ref. 6–E); on the Canisteo river and the Cent. N. Y. and W. and the N. Y., L. E. and W. Railways; 58 miles S. of Rochester. It is regularly laid out; has 9 churches, 5 school-houses, public library of 10,000 volumes, electric lights, new public park, and 8 periodicals; and manufactures doors, sash and blinds, wire-fencing, boots and shoes, furniture, dynamos and electric motors, tanned leather, etc. The N. Y., L. E. and W. Railway has extensive shops here. Pop. (1880) 8,195; (1890) 10,996. Editor of "Tribune."

Horner, Francis: statesman; b. in Edinburgh, Scotland, Aug. 12, 1778; studied law at Edinburgh University; removed to London in 1803, and entered Parliament in 1806. He soon acquired a conspicuous position in the House of Commons by his business capacity, his insight into political economy, and the nobleness of his character. He was prominent in debates on financial measures, and especially in the discussion of the bullion question, on which he drew up the first report. Having injured his health by excessive labor, he was obliged to travel, and died at Pisa, Feb. 8, 1817. A marble statue by Chantrey was erected to his memory in Westminster Abbey, and his *Memoirs and Correspondence* were edited by his brother (London, 1843).

Horner, William Edmonds, M. D.: physician; b. at Warrenton, Va., June 3, 1793; graduated at the University of Pennsylvania 1814; served in the navy as a medical officer 1813–15; became a distinguished practitioner of Philadelphia; was prosector and demonstrator of Anatomy in the University of Pennsylvania; became Adjunct Professor of Anatomy in the same 1819; full professor 1831; announced the discovery of the so-called Horner's muscle 1824; founded St. Joseph's (R. C.) Hospital 1847. D. in Philadelphia, Mar. 12, 1853. He published a treatise on *Pathological Anatomy* (1826); *Practical Anatomy, Special Anatomy, and Histology* (2 vols., 1851); *United States Dissector*, and an *Anatomical Atlas*.

Horner's Method of Solving Numerical Algebraic Equations: a method of finding the roots of equations one figure at a time. It was communicated to the Royal Society in 1819, and consists, in principle, in repeatedly transforming the equation into another whose roots are the figures still to be found, and in a direct and reliable method of discovering these figures; while the operation itself is performed by means of detached coefficients. The process is then merely an extension of the ordinary method of extracting the cube-root of a number, as explained in arithmetical text-books. It is developed and illustrated in most treatises on algebra intended for advanced students.

Revised by S. Newcomb.

Hornet [O. Eng. *hyrnet*: O. H. Germ. *hornaz* > Mod. Germ. *hornisse*, influenced by supposed connection with *horn*, but orig. a distinct word; cf. Lat. *crā'bro*, Lith. *szirszone*]: a name applied to several large stinging insects of the wasp family. The most common in the U. S. is the *Vespa maculata*, which builds a great nest of brown or grayish paper, hanging from the branches of a tree. Its paper is made from the fiber of wood. Its sting is very severe. The hornet is omnivorous, devouring fruits, honey, and insects of many kinds. Some of the non-American species build nests of paper, and some of clay. Some make only the cells of paper, housing the cells in a hollow tree. This is the case with *Vespa crabro*, the most common European hornet, now naturalized to some extent in the U. S.

Revised by F. A. Lucas.

Hornpipe: an English dance, probably so called from an obsolete instrument of which only the name is known. This lively dance, of jig-like character, appears to date back to 1700 at least. The earlier ones are in triple measure, the later in double or quadruple. Dudley Buck.

Hornstone: See Chert.

Horol'ogy [from Lat. *horolo'gium* = Gr. ὡρολόγιον, *horologe*, liter., time-teller; ὥρα, season, time, hour (whence Lat. *hora*, whence Eng. *hour*) + λέγειν, say, tell]: the science of the divisions and measurements of time by means of clocks, watches, sun-dials, and other devices. See Clocks and Watches.

Horopter: See Vision.

Hor'oscope [from Fr. *horoscope*: Ital. *oroscopo* < Lat. *horosco'pium* = Gr. ὡροσκοπεῖον, horoscope, nativity, deriv. of ὡροσκόπος, horoscoper, liter., one who observes the time (of a birth); ὥρα, season, time, hour + σκοπεῖν, observe, view]: in astrology, a diagram of the position of the heavenly bodies, especially of the planets and the twelve imaginary signs of the zodiac, at the time of a person's birth, from which was derived an augury of his career and fortunes. The most important thing was the sign of the zodiac which rose at the moment of the child's birth. Arbitrary significations were given to the different heavenly bodies according as they appeared singly or in conjunction, or as they were in opposition. As a rule, one born under Jupiter would be powerful; one under Mars, warlike; one under Venus, successful in love; one under the Pleiades, exposed to storms at sea, etc. Horoscopes were also calculated upon the same general principles to foretell the issue of any important undertaking.

Hor'rocks, or **Horrox**, Jeremiah: astronomer; b. at Toxteth, Lancashire, England, about 1619; studied as a sizar in Emmanuel College, Cambridge; took holy orders and became curate of Hoole, Lancashire, where in 1639 he made an observation of the transit of Venus (Nov. 24). William Crabtree was apprised by Horrocks of the calculations which led him to expect this transit (which not even Kepler had predicted), and accordingly Crabtree and Horrocks both made observations (the first on record) of the transit of Venus. The transit occurred on a Sunday, and Horrocks felt compelled to attend divine service, and thus lost a part of the observation. This transit of Venus is remarkable as the first one ever observed, as that of 1631, which had been predicted by Kepler, was invisible in Europe. All the great expectations, however, produced by the brilliant achievements of the young astronomer were blasted by his sudden death at Hoole, Jan. 3, 1641. He was author of *Venus in Sole visa*, and of *Letters* to Crabtree in Latin, and other papers published in *Jeremiæ Horroccii Angli Opera Posthuma* (1672). It is possible that he was the inventor of the micrometer.

Horsa: See Hengest.

Horse [O. Eng. *hors*: O. H. Germ. *ros* > Mod. Germ. *ross*, steed, whence Fr. *rosse*, jade]: (*Equus caballus* of Linnæus) a well-known domestic animal, non-ruminating and simple-hoofed, belonging to the soliped family of Cuvier's order *Pachydermata* (thick-skinned); but, according to the modern classification, the genus *Equus* belongs to the family

Equidæ, sub-order *Perissodactyla* (odd-toed), order *Ungulata* (hoofed), class *Mammalia*. The horse, with the ass, zebra, quagga, and a few other similar animals, constitutes a natural family of hoofed quadrupeds, the forms now living being closely related to each other, and widely separated from all other existing mammals. The horse differs from the other species of this family in having the tail covered with long hairs from the base, instead of tufted at the end, and in the presence of horny callosities on the inner side of the hind legs below the "hock," as well as on the fore legs above the "knee," where they are also found in the other species. The pattern of coloration in the horse is, moreover, not striped, but in most respects he closely resembles the other living representatives of the family. Nearly all these animals may breed together, producing hybrids, which are, however, usually sterile. The period of gestation is about 340 days, and the horse often lives to thirty years or more. Its perception is quick, its memory very retentive, and it is surpassed in docility by no animal except the dog and possibly the elephant. Its flesh is sometimes used as food. Its original habitat is unknown. Its remains are very rare in the Stone Age, but a few bones have been found in the Swiss lake-villages, enough to indicate its presence. In the Bronze Period, however, its bones become more numerous. Upon Egyptian monuments it is not represented earlier than the eighteenth dynasty, but the horse appears to have been abundant in Egypt after that time.

Types and Breeds.—The horse family embraces three types, widely dissimilar in some respects, but all possessing the characteristics of the family to which they belong. The *first* is typically represented by the horse of the Orient—the Arab, the Barb, and the Turk—distinguished for speed, docility, beauty of form, and gracefulness of motion: the *second* includes all the modern breeds of heavy draft or cart horses, and are chiefly descended from the great black horses that, in a wild state, roamed over the vast expanse of marsh and forest which then stretched across Europe from the mouth of the Rhine eastward to the Euxine Sea; and the *third* is seen in the tough shaggy ponies that were originally found in that inhospitable, mountainous region which forms the source of the Ganges, the Indus, and the Brahmaputra, to the very crest of the great Himalaya range. From these the more modern Shetland, Welsh, and Norwegian ponies are probably descended.

The horse is found wild in Central Asia, and also until very recently on the plains of North and South America; but those of America are clearly descended from the horses abandoned by the Spanish invaders in the early attempts at the conquest of the New World. Horses were probably first domesticated in Northern Africa or Central Asia. Those of Arabia were perhaps the first to attract the attention of European nations, although it is well known that Arabia was one of the latest of the Oriental countries to engage in the raising of horses; and that prior to the time of Mohammed they were scarcely recognized as a part of the possession of the Arab, his riches consisting chiefly in camels, oxen, sheep, and goats. But Mohammed was an enthusiastic lover of the horse; and while he succeeded in engrafting upon so large a portion of the Orient his own religious tenets, he also imbued his followers with a large amount of his enthusiastic admiration for the horse. Kindness to and love for this noble animal were made part of the religion of all true Mussulmans; and from the days of Mohammed the Arab has held his steed, especially his mares, in a sort of superstitious reverence. Mohammed selected for himself a magnificent stud, and the Arabian to this day seeks to trace the genealogy of his favorite horse to the mares supposed to have been Mohammed's favorites. But Arabian pedigrees, divested of all their high-sounding phrases, amount to but little, and are wholly unreliable.

But whatever there may be of truth or error in the tradition which ascribes the excellence of the Arabian horse to the fostering care of Mohammed, it is undoubtedly true that it was from the horses of the Orient, and largely from those of Arabia, that Europeans drew at a later date for improvement, especially in the matter of speed. Great Britain was the first country to make an attempt at breeding horses with anything like a definite purpose. At a very early period the attention of her rulers appears to have been directed to the work of improving the quality of the horses of the islands, which were notoriously deficient in size, and their first efforts were directed to remedying this defect. The era of improvement began with the conquest of the island by the Saxons, by the importation of large horses from Normandy, Flanders, and Germany, the original habitat of the great Black race. Later on they sought to infuse more of speed, beauty of form, and gracefulness of action by the introduction of the blood of the Arab, the Turk, and the Barb. Many years prior to the reign of Charles II. horse-racing had become a popular amusement and recreation among the English people, and from that time it has held first place as an out-of-doors amusement in that country. It is therefore to the long-continued and persistent passion of the English people for horse-racing that the world is indebted for that course of breeding which has resulted in evolving a race of horses that, on account of the great care bestowed upon their breeding and their consequent purity of lineage, was the first race of domesticated animals to which the term *thoroughbred* was applied.

The foundation upon which this the oldest and best established of all the breeds of horses was built was a promiscuous mingling of the horses of the island of Great Britain—first with the larger races of Europe, especially those of Normandy, Flanders, and Germany, and subsequently with the lighter, more agile, and graceful horses of Spain, the latter being almost identical with the Barbs on the other side of the Mediterranean. Frequent importations were also made direct from Egypt, Morocco, Tunis, Arabia, and various parts of Turkey until this Oriental blood to a considerable extent permeated all the horse stock of Great Britain. So thoroughly had the passion for turf sports taken possession of the English people as early as the beginning of the reign of Charles I., that ability to run and win in a race was regarded as the principal test of merit in horses; and those most successful on the turf were most highly prized for breeding purposes. Breeding for speed and endurance on the race-course began to be conducted on something like a definite plan; the records of turf performances were carefully kept; especial attention was paid to the pedigrees of horses designed for the turf; and an aristocracy of blood came to be recognized in the horses of England. Charles II. sent his master of the horse to the Levant to procure horses with which to found a breeding stud. His purchase comprised three very famous Turkish stallions and some mares that, in the equine literature of the day, were called the "royal mares;" and these "royal mares" are by many supposed to be the foundation of the strict thoroughbred. This is, however, only approximately correct; for it is well known that several other mares were from time to time introduced from the Orient, and that the produce of many mares not descended from nor related to these royal mares have been distinguished upon the turf and recognized as thoroughbreds.

About the middle of the eighteenth century the publication of the English *Racing Calendar* was begun. In this the names of all the horses that participated in the regular races were published, and in a very few years it became the custom to give also the name of the sire and dam in each case. This publication has been continued with very little change in form or matter, and the records of performances and names of performers therein contained furnished the basis for the *Stud-book* of thoroughbred horses. A collection embracing all the pedigrees of distinguished horses that could be obtained was published as early as 1786. Subsequent to this several attempts at a compilation of pedigrees from *The Racing Calendar* and other sources was made, but it was not until 1791 that the English *Stud-book* took its present form.

The standard of admission to the first volume of this book appears to have been simply creditable performance upon the turf, as shown by *The Racing Calendar*, it being taken for granted that no horse could be a creditable performer that was not well bred—an assumption that has never yet been found at fault. The first volume compiled upon this basis furnished the foundation for all subsequent ones; and few names have been admitted to registry that do not trace, without admixture on both sides, to an ancestry that is recorded in this first volume or to subsequent importations of Oriental blood. In the matter of speed, courage, and endurance, the horses of this breed confessedly surpass all others, and there is scarcely a race of horses in existence that may not be improved by an infusion of this blood. So generally is this superiority recognized that nearly all countries have resorted to it as the basis of substantial improvement.

Of the Oriental sires imported, it is generally admitted that the Godolphin Arabian (really a Barb), imported in 1730, was the last that has proved of any benefit to the English stock; and while this blending of the blood of the Orient

with the old races of England furnished the foundation, there can not be the slightest doubt that the care and skill of British breeders in selecting and coupling with the stoutest, best, and fleetest for successive generations, has been a more potent factor in the formation of the breed, as it now exists, than the Arabian and Barb blood to which history and tradition has ascribed its superiority. Many importations of the choicest blood of the Orient have been made in Great Britain and the U. S. since 1850, and yet scarcely a name among them can be found in the pedigree of a horse that has distinguished himself upon the turf. Arabian horses possess undoubted beauty of form and grace of motion, but they are notoriously inferior in point of size to the average thoroughbred, being rarely over 14 hands high; and their produce from the best of mares have been failures, both in the stud and on the race-course. In every instance in which the speed and stoutness of the thoroughbred have been tested side by side with the Arabian, the former has proven superior to its Eastern competitor. Hence recent crosses of Oriental blood, while they do not warrant exclusion from the stud-book, are not looked upon with favor by the best breeders of England or the U. S.

For more than 150 years great attention has been paid to this breed in the U. S. Importations of the choicest stallions and mares from Great Britain have been of frequent occurrence, a stud-book has been established, in which the pedigrees of horses bred in the U. S. are recorded, and the purity of the blood is guarded with the most jealous care. Stallions of this breed have been much used as a cross upon the miscellaneously bred horse stock of the U. S., and the influence of the breed is everywhere seen.

Next to the thoroughbred the *American trotting-horse*, or *roadster*, is the best-known and most widely disseminated derivative from the Oriental type. As the English thoroughbred was the result of an inherent love of the English people for the sports of the turf and the chase, so the American trotter is the product of a fashion in the U. S. that has demanded the fastest and stoutest trotting-horses in the world for driving on the road; and to this end horses have been bred in the U. S. until they clearly surpass those of all other countries in this quality. The various families of trotters are all more or less closely related, all clearly possessing much of the Oriental type in their general form, which is derived chiefly through the thoroughbred. Unquestionably the most famous of these trotting families is the *Hambletonian*—so called from a noted horse of that name, owned by William M. Rysdyk, of Orange co., N. Y. This horse was foaled in 1849 and died in 1876, and from him an overwhelmingly large per cent. of the very fastest trotting-horses are descended. Hambletonian's sire was Abdallah, son of Mambrino (a thoroughbred), and he a son of Messenger, an imported thoroughbred. Hambletonian's dam was got by Bellfounder, an imported Norfolk trotter (a strain which at that time had attained a considerable degree of local popularity in England), and further back in his maternal ancestry the thoroughbred largely predominated. The *Mambrinos*, another popular trotting family, take their name from Mambrino Chief, a horse foaled in 1844, died in 1861; owned for a time in New York, and subsequently in Kentucky. He was a grandson of the thoroughbred Mambrino mentioned above as the grandsire of Hambletonian, but the pedigree of his dam is not known. His descendants have been largely crossed with those of Hambletonian, and the cross has been a very popular one among breeders. The *Clays* have also attained great celebrity as a family distinguished for trotting speed. The original of the family, Henry Clay, foaled in 1837, died in 1867, owned in New York, was a famous trotting-horse, as was also his sire, Andrew Jackson (a grandson of Bashaw, an imported Barb) and his dam, Surrey, a mare of great speed but of unknown blood. The *Bashaws* come from the same paternal stock as the Clays—the imported Barb Bashaw. The *Pilots* are of French-Canadian extraction, through a black pacing-stallion called Pilot that was taken from the province of Quebec to Kentucky. The *Morgans* take their name from Justin Morgan, a horse bred in Vermont, foaled in 1793, died in 1821. His pedigree has never been positively known, but he was unquestionably mainly of thoroughbred origin. The Morgan is the oldest of the trotting families, and was for many years the most popular, the most widely diffused, and the most highly prized, not so much for exceptional speed as for hardiness and docility, qualities which gave them exceptional value as road horses. The Vermont Black Hawks, the Morrills, the Ethan Allens and the Golddusts are branches of this family. Two or more, and sometimes all, of the above-mentioned families may be found represented in the pedigrees of trotters that have distinguished themselves by great performances.

In no branch of live-stock breeding is the influence of heredity and of patient persevering selection with a view to the perpetuation and improvement of a desired quality more apparent than in the breeding of the trotting-horse. In the first half of the nineteenth century no one thought of the trotting-horse *as a breed*, and a mile in three minutes was considered a creditable performance at that gait. In 1859 a mare called Flora Temple trotted a mile in 2:19¾, a performance so remarkable that it attracted the attention of horsemen throughout the world; but during the season of 1892 there were hundreds of horses trotting in races in the U. S. that could beat Flora Temple's phenomenal time; and now a horse to be ranked as even a fairly creditable trotter must be able to trot a mile in 2:30, or better. While much of this wonderful increase of speed at the trotting gait may be justly attributed to better tracks, better vehicles, and superior skill on the part of trainers and drivers, yet the fact remains incontrovertible that it is mainly the result of increased capacity in the horses, which for four or five generations have been bred with especial reference to this quality.

The *pacing-horses* of the U. S. are almost identical in pedigree as well as in conformation with the trotter, and great capacity for speed at both gaits is not unfrequently found in the same horse. Indeed, the two gaits are to some extent interchangeable, and most trotters can be taught to adopt the pacing gait and *vice versa*. A noted instance of this is found in the famous horse Jay-Eye-See, that after having made a record of 2:10 as a trotter, took to pacing, and at the latter gait made a mile in 2:06¼. See GAITS.

Another derivation from the Oriental type, known as the *Orloff* trotting-horse, has attained great celebrity in Russia (where it originated) and elsewhere in Europe, and to some extent in the U. S. This breed possesses much of the beauty of form of its Oriental ancestry, but is not equal to the trotting-horse of the U. S. either in speed or endurance. Other European countries, notably Great Britain, France, and Germany, have developed from the same original, but mainly through the English thoroughbred, breeds of horses specially designed for use on the road. England has produced *Cleveland Bays* and *Hackneys*, the former closely approximating the thoroughbred, and used especially as coach-horses, and the latter rather further removed from the thoroughbred in form, not so tall as the Cleveland Bay, but heavier-bodied in proportion to height, and prized for light, quick work in harness. France has also developed, largely through the fostering care and supervision of her Government, a breed of coach-horses called *demi-sang* (literally half-blood), derived originally from crosses with the thoroughbred and fortified by careful subsequent selection and breeding. The *German coach-horses*, bred chiefly in Oldenburg, have a similar origin, and, like the Cleveland Bays and French coach-horses, bear a close resemblance to thoroughbred ancestry, modified, however, in each case by the difference in the quality of the mares used for breeding purposes, and the especial characteristics of the stallions selected by these several countries. All of these coach-horse breeds, and also the Hackneys, have been imported into the U. S. in considerable numbers. The Cleveland Bays and French coach-horses have been more widely disseminated, the importations of Hackneys and German coach-horses being of a more recent date.

Many breeds of horses especially adapted to the drawing of heavy loads have been evolved, chiefly from the original large Black Horse family of Europe, heretofore mentioned. As early as the eleventh century immense numbers of these large horses were imported into England from Normandy, Flanders, Holland, and Germany. King John imported at one time 100 choice stallions from Flanders. Edward II. continued in like manner the work of improvement, and the characteristic skill of the British breeders of horses, working with the new blood thus infused into the already existing horse stock of the island, evolved the large breeds known in England as the *Suffolk Punch* and the *Shire*, or *cart-horse* (the latter approximating much more closely than the former to the original black horse type), and in Scotland the *Clydesdale*, closely allied in size and form to the cart-horse of England. The great Black race naturally and by an easy process was diffused throughout Western and Southwestern France, until in what was formerly known as La Perche it met a countercurrent of Oriental blood, brought

in by the Saracen invaders in 732, with which it became mingled; and from this origin was developed the French breed of large horses known as the *Percheron*, famous for capacity to travel at a comparatively rapid pace while drawing a heavy load. Infusions of Oriental blood into La Perche were frequent down to as late as 1820, and, in consequence, the Percheron is found to resemble the horse of the Orient in form and disposition more closely than any other of the large breeds. The gray color, also so prevalent among the Percherons, is evidently a part of their Arabian inheritance, this being the predominant color of the horses of Arabia. Further north in France this Oriental blood was not so largely introduced, and here has been evolved a breed known as the Boulonnais, the gray color preponderating, but in other respects showing a decided leaning toward its ancient Black Horse origin. Still farther northward, in Belgium, in the home of the original Great Horse, is found the modern breed of *Belgian* draft-horses, not so rugged, strong, and heavy-boned as their ancestors, but retaining much of the ancient character.

All of these draft breeds—the Percheron, the Clydesdale, the Shire, or English cart-horse, the Boulonnais, the Belgian, and the Suffolk Punch—have been introduced into the U. S. and Canada, the numbers imported decreasing in the order here indicated. The Percheron, the Clydesdale, and the Shire, having been quite generally disseminated, form, with their grade and cross-bred descendants, the bulk of the draft-horse stock of the U. S. and Canada.

The pony type, of which the *Shetland* is the best-known representative, is now found in all parts of Europe and America, but clings persistently to high latitudes and bleak mountainous countries. They are employed more as playthings for children than for any of the more practical uses for which the horse is adapted. The horses that until a very recent period were found wild in North and South America—mustangs, bronchos, and ponies—are degenerate descendants of the Barb horses brought over and abandoned by the early invaders of Mexico and South America. In the more northern regions and mountainous countries they have degenerated into a close approximation to the pony type; while many of those in the more temperate regions and grassy plains possess much of the excellence for which their Barb ancestors were distinguished.

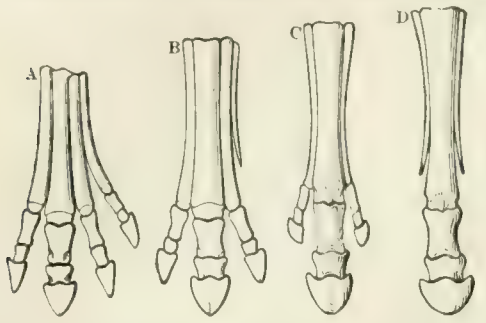
Care and Feeding.—A mature male of the horse kind is called a stallion, the female a mare, and the young of either sex a foal. The male foals are called colts, and the females fillies. A large proportion of the foals in most countries are castrated at about the age of two years, and are thenceforth known as geldings. Most of the horses used for ordinary work in the U. S. and Great Britain are either geldings or mares. The stallions, except in France and a few other European countries, are not used for ordinary business purposes. The food of the domesticated horse consists chiefly of the various grains, oats being more largely used for that purpose than any of the others, although the Indian corn (maize) is largely used in many parts of the U. S. On account of its high percentage of fat-producing elements, however, the use of maize is not generally recommended, except in cold climates, or when the animal is in a low state of flesh. Its use tends to increase the temperature, and promotes the formation of fat rather than of muscle. On this account oats are generally preferred, especially for foals and immature horses. A general diet, which finds great favor with most horse-feeders, is composed of a mixture of maize and oats, about two parts in weight of the latter to one of the former in warm weather, with the proportions reversed for use in winter. Barley, wheat, peas, beans, and rice are also used as food for the horse in various countries. Its natural food, however, is grass; and without this in some form the horse can not long be kept in a healthy condition. This demand of nature is met largely by the use of hay or fodder, prepared from some of the many grasses, cut when matured and properly dried and preserved. The foal is sustained mainly by the milk of the dam until it is about six months old, when it is separated from the dam and taught to subsist on other foods. At about two years of age foals are usually "broken"—that is, the process of training to the various uses to which horses are subjected is begun. They do not usually mature fully until from four to six years of age, but in this particular the various breeds differ greatly, the smaller breeds maturing much earlier than the larger ones. All the various types may begin to reproduce at about two years of age. The pony is at his best when from four to six years old; the thoroughbred, the trotter, and the various coach and roadster breeds at from five to eight, and the large breeds at from six to twelve years of age. Thoroughbreds are most highly prized for racing purposes at two and three years old, but the greatest turf performances have been made by matured horses. Trotters seem to have a longer period of matured powers, some of them having held a conspicuous place in contests of speed for twelve or thirteen consecutive years. The great trotting-mare Goldsmith Maid began her racing career when she was eight years old. Her best record (a mile in 2:14) was made when she was seventeen years old, and this mark was again reached by her when in her nineteenth year. See HORSE-RACING.

JAMES H. SANDERS.

Horse, Fossil: The existing species of the horse family are so closely related to each other as not to be distinguished generically by any characters derived from the skeleton, but remains of a large number of genera have been found in Quaternary and Tertiary strata, especially in those of North America. At the time of the first voyage of Columbus no species of horse or ass existed in either North or South America. This complete absence of indigenous species is the more remarkable in view of the fact that more than a dozen species of *Equus* have been described from Quaternary deposits, and forty or more other related forms from the Tertiary of America. In the Pliocene Tertiary the horse was represented by several extinct genera, the best known being *Hipparion*, in which the body was supported, as in *Equus*, on the extremity of the middle toe of each foot, which was also provided at the fetlock-joint with an additional pair of small toes, not reaching the ground. The species are small, as the name implies, *Hipparion* being a diminutive from the Greek *hippos*, a horse. *Protohippus* and *Pliohippus* of the Pliocene are genera nearly related to *Hipparion* and *Equus*. *Anchippus*, also from the Pliocene, resembled in its teeth *Anchitherium* of the Miocene, a genus now considered as typical of a family distinct from that of the horse. In *Anchitherium* the shaft of the ulna is complete, moderately developed, and more or less separate from the radius. The fibula is ankylosed with the tibia. The orbit is not closed behind, and there is a deep anti-orbital fossa. The molars have short crowns devoid of cement, and are inserted by distinct roots. There are three digits in each foot, the middle being much the largest, but all appear to have reached the ground. *Miohippus*, also from the Miocene, was closely related to *Anchitherium*. In this genus the radius and ulna are free or only loosely united. The tibia and fibula are co-ossified at the distal end. There were three digits in each foot, all of which reached the ground, and they are more nearly equal in size than in *Anchitherium*. Another closely related Miocene genus, *Mesohippus*, had, besides the three toes of the fore foot, a splint-bone representing the outer toe, or little finger of the human hand. The Miocene species were not larger than a sheep. The Eocene representatives of the group were still smaller. The oldest known is *Eohippus*, about as large as a rabbit. In the Middle Eocene is found the genus *Orohippus*, about as large as a fox, which had four functional digits in the fore foot, and no antorbital fossa. The orbit is open behind. The dentition is somewhat similar to that of *Anchitherium*. The diastema, or "place for the bit," is distinct. The canines are large, and near the incisors. The crowns of the molars are short and destitute of cement. The skeleton is decidedly equine in its general features. The radius and ulna are distinct. All the digits of the fore foot except the first are well developed. The third is the largest, and its resemblance to that of the horse is clearly marked. The terminal phalanx, or coffin-bone, has a shallow median groove in front, as in many species of this group from the Later Tertiary. The fourth digit exceeds the second in size, and the fifth or outer toe is much the smallest of all, and has its metacarpal bone considerably curved outward. There are but three digits in the hind foot. The tibia and fibula are distinct. The genus *Epihippus* is known only from the Upper Eocene.

This large number of equine mammals and their regular distribution in geological time afford a good opportunity to ascertain the probable lineal descent of the modern horse. The American representative of the latter is *Equus fraternus*, a species almost, if not entirely, identical with *Equus caballus*, to which the recent horse belongs. Huxley has traced the later genealogy of the horse through European extinct forms, but the line in America was a more direct one, and the record is more complete. Taking, then, as extremes of the series, *Eohippus pernix*, from the Eocene, and

Equus fraternus, from the Quaternary, the natural line of descent, as indicated by over thirty intermediate forms, would seem to be through the following genera: *Eohippus*, *Orohippus*, and *Epihippus* of the Eocene, *Miohippus* and *Mesohippus* of the Miocene, *Protohippus* and *Pliohippus* of the Pliocene, and *Equus*, Quaternary and Recent. The most marked changes undergone by these successive genera are the following: 1, increase in size, from *Eohippus*, as



A, *Orohippus* (Eocene); B, *Mesohippus* (Miocene); C, *Protohippus* (Pliocene); D, *Equus* (Quaternary and Recent).

large as a rabbit, to the modern horse; 2, increase in speed through concentration of the limb-bones; 3, elongation of the head and neck and modification of the skull. The increase of speed was a direct result of a gradual and striking modification of the limbs. These were slowly concentrated by the reduction of their lateral elements and enlargement of the axial one, until the force exerted by each limb came to act directly through its axis in the line of motion. This concentration is well shown in the fore limb. There was, 1, a change in the scapula and humerus, especially in the latter, which facilitated motion in one plane only; 2, an expansion of the radius and reduction of the ulna, until the former alone remained entire and effective; 3, a shortening of all the carpal bones and enlargement of the median ones, insuring a firm wrist; 4, an increase in size of the third digit at the expense of those on each side, until the former alone supported the limb. The latter change is clearly seen in the above diagram, which represents the fore feet of four typical genera in the equine series, taken in succession from each of the geological periods in which this group of mammals is known to have lived. The ancient *Orohippus* had all four digits of the fore feet well developed. In *Mesohippus*, of the next period, the fifth toe is only represented by a rudiment, and the limb is supported by the second, third, and fourth, the middle one being the largest. *Hipparion* of the Later Tertiary still has three digits, but the third is much stouter, and the outer toes have ceased to be of use, as they do not touch the ground. In *Equus*, the last of the series, the lateral hoofs are gone, and the digits themselves are represented only by the rudimentary splint-bones. The middle or third digit supports the limb, and its size has increased accordingly. The corresponding changes in the posterior limb of these genera are very similar, but not so striking, as *Orohippus* had but three toes behind. An earlier ancestor of the group, *Eohippus* in the lowest Eocene, had a splint-bone of one more toe on this foot and another one in front. A still older ancestor, possibly in the Cretaceous, doubtless had five toes on each foot, the typical number in mammals. This reduction in the number of toes may perhaps have been due to elevation of the region inhabited, which gradually led the animals to live on higher ground, instead of the soft lowlands where a many-toed foot would be most useful.

The gradual elongation of the head and neck may be said to have already begun in *Orohippus*, if we compare that form with other most nearly allied mammals. The diastema, or "place for the bit," was well developed in both jaws even then, but increased materially in succeeding genera. The number of the teeth remained the same until the Pliocene, when the front lower premolar was lost, and subsequently the corresponding upper tooth ceased to be functionally developed. The next upper premolar, which in *Orohippus* was the smallest of the six posterior teeth, rapidly increased in size, and finally became in the horse the largest of the series. The grinding teeth had at first very short crowns, without cement, and were inserted by distinct roots. In Pliocene species the molars became longer, and were more or less coated with cement. The modern horse has extremely long grinders, without true roots, covered with a thick external layer of cement. The large canines of *Orohippus* become gradually reduced in the later genera, and the characteristic "mark" upon the incisors is found only in the later forms. The bridge of bone bounding the orbit behind first appears in the Pliocene genera. It is an interesting fact that the peculiarly equine features acquired by *Orohippus* are retained persistently throughout the entire series of succeeding forms.

Such is, in brief, a general outline of the more marked changes that seem to have produced in America the highly specialized modern *Equus* from its diminutive four-toed predecessor, the Eocene *Eohippus*. The line of descent appears to have been direct, and the remains now known supply every important intermediate form. Considering the remarkable development of the group throughout the entire Tertiary period, and its existence even later, it seems very strange that none of the species should have survived.

O. C. Marsh.

Horse-chestnut [i. e. large or coarse chestnut, the word *horse* being sometimes used thus in compounds to signify large, coarse. Cf. *horse-laugh, horse-radish, horse-sorrel*]: an ornamental tree, esteemed on account of its rich foliage and beautiful flowers, cultivated everywhere in Europe and America where the climate is suitable. It is one of the species of *Æsculus* (*Æ. hippocastanum*), a genus containing also the buckeyes of the U. S., and belonging to the family *Sapindaceæ*. Revised by Charles E. Bessey.

Horse Distemper: a species of catarrh. As the disease is contagious, an animal having it should be kept apart from the others, and after a thorough purge should be fed on light bran mashes and kept warm until recovery.

Horse-flies: popular name of many dipterous insects (the females) of the family *Tabanidæ*. Their bite causes horses great annoyance. Among the most common are *Tabanus lineola*, the green-headed fly, which in hot weather has been known to worry horses and cattle to death. The bite is severe, and even venomous, always drawing blood. *Tabanus atratus* and *cinctus*, the orange-belted fly, are also common. Their larvæ are very destructive of snails and of other larvæ. The horse-fly of Great Britain is *Hippobosca equina*. See Forest-fly.

Horse Guards: mounted guards, who were formerly the most magnificent and costly of all the royal following. The Royal Horse Guards of the British army were instituted in 1550 under Edward VI., and revived by Charles II. in 1661. The first troop of Horse Grenadier Guards was raised in 1693, and the second in 1702, but there was a reduction of the Horse and Grenadier Guards, and Life Guards, as at present, were established in 1788. The duty of the Royal Horse Guards consists in guarding and escorting the person of the sovereign. The term Horse Guards is also used to denote the headquarters of the staff of the British army in Whitehall, London, which is guarded by a squadron of Horse Guards, and in consequence of the martial appearance of the mounted and unmounted sentinels. This building was formerly the headquarters of the commander-in-chief of the army, whose office is now in Pall Mall, but papers emanating from the offices therein are headed "Horse Guards," War Office, Pall Mall, being added. The term is used to signify the military, as distinct, from the civil authority at the head of army affairs.

Horse-gentian: See Feverwort.

Horseheads: village; Chemung co., N. Y. (for location of county, see map of New York, ref. 6–F); on the Del., Lack. and W., the Elmira, Cort. and N., the Erie, and the N. Cen. Railways; 6 miles N. of Elmira. It is widely known for its extensive manufactures of brick. Pop. (1880) 1,684; (1890) 1,716.

Horse-mackerel: a name given in Great Britain to the Scad (*q. v.*) but applied in the U. S. to various large fishes of the mackerel family, especially to the tunny (*Albacora thynnus*). See Tunny.

Horsemanship: the art of mounting, riding, and managing horses. Horseback riding has been practiced from early times, and has always been with sturdy races a favorite means of locomotion. It requires and develops courage, self-possession, and well-trained nerves and muscles. In horsemanship the intelligence and strength of the rider and of the horse are combined to accomplish feats of speed, strength, skill, and endurance impossible for either alone. Riding can be learned only by practice, but some principles

may be stated for the assistance of learners. The subject may be divided into two parts, *The Mount* and *The Rider*. The term *mount* is used technically to mean the horse and its trappings, while under the title *The Rider* the details of mounting, riding, etc., are discussed.

The Mount.—The qualities which constitute a good saddle-horse are strength, which enables the horse to carry weight; endurance, which enables it to continue its work for hours and under various influences and circumstances; and gentleness, which facilitates the breaking, training, and management. The variety of demands which the several branches of horsemanship make upon the horse calls for an equal variety of breeds and types of horses. The English thoroughbred is unsurpassed for speed and endurance, and is the perfect type of race-horse. Heavier specimens of the same breed, chiefly the English half-bred, are the mounts used for hunting and cross-country riding.

In racing, hunting, or riding to hounds, cross-country riding, which includes park and road riding in general, and military riding, speed and endurance are essential. In high-school riding, the field of which is limited to the *manège*, pliability and grace of motion take the place of extreme speed, and horses of predominatingly Arabian blood are those best fitted for the purpose.

The simple and natural gaits of the horse are the walk, the trot, and the gallop. The walk requires the least, the gallop the most, exertion; the trot is the gait which can be continued the longest in covering the greatest distance in the least possible time. The walk consists of four distinct motions, the body of the horse being propelled by the hind legs and the weight being taken up and carried forward by the fore legs; the trotting motion is diagonal, the diagonally opposite feet moving simultaneously; the gallop consists of a series of leaps with either two, three, or four motions. Race-horses of great strength leap by setting down the two front and the two hind legs alternately. Three motions are distinguishable in the gallop of the hunter and the cross-country horse, while the high-school horse in its collected gallop shows four distinct motions. The pace, single-foot, fox-trot, etc., are combinations and mixtures of gaits not recognized in the perfect saddle-horse. See GAITS.

The saddle, a strong seat fitted to the horse's back and held firmly by girths, is calculated to give comfort and security to the rider; it consists of the tree or frame, over which leather is stretched between pommel and cantle; the flaps with knee-puffs, which are padded elevations on the front of the saddle-flap, calculated to increase the security of the rider's seat, and stirrups; the pads with billets and girths. Every country has a military saddle of its own, to which the various equipments and arms are attached. The English saddle is almost universally adopted for general use as racing, hunting, and cross-country saddle, and varies in weight and construction for the different purposes. The woman's saddle is provided with a pommel and a leaping-horn, to give security and firmness to the rider in her side-wise position. For detailed description of the saddle in its various forms, see SADDLE.

The bit serves to guide and control the horse. The simplest and easiest bit in use is the snaffle, which consists of two pieces of steel linked in the center, with rings on each end. It acts on the corners of the horse's mouth directly from the rider's hand. The curb-bit has a stiff mouthpiece with the port (which is an arch dividing the mouthpiece into right and left parts, and is meant to give freedom and circulation to the tongue) in the center, and on each side is a lever; to the lower ends of these the reins are attached; the curb-chain, joining the upper ends of the levers, serves as a fulcrum, and a pull of the curb-reins brings the lever-power to bear on the lower jaw an inch and a half above the bridle teeth, or their position. The curb is far more severe than the snaffle, and has a downward and backward effect, while the snaffle tends to elevate the head and neck of the horse. A combination of both in one is called the "Pelham," and is used chiefly in hunting. For ordinary riding the full bridle is generally used; it consists of the head-stall with forehead band, throat-latch, two bits (curb and snaffle), and reins.

The Rider.—In mounting the rider stands by the horse's left shoulder, and securing the animal by passing his left arm through the snaffle-rein, proceeds to adjust the length of the stirrups, measuring them from the attachment of the stirrup-strap to the saddle with his finger-tips, and letting the foot-plate reach the arm-pit. Being convinced that the stirrups are alike in length, he resumes the position by the nigh shoulder and takes up the reins in the following manner: The snaffle-rein is grasped near the horse's mouth and the hand slid back along the rein to the withers. The curb-rein is now taken up on the inside, that is, from between the snaffle-reins, and handled in the same way, the ends, which are sewed together, being held up above the middle of the saddle by the forefinger of the right hand. The ring-finger of the left hand is then inserted between the curb-reins from above, and the left hand being closed slides forward and rests on the ridge of the horse's neck. The end of the curb-reins is thrown over the forefinger to the right of the horse's neck. The right hand now draws the left snaffle-rein through the entire left hand, and places the right one between the fore and middle fingers of the same hand; the ends of the four reins are lying one upon the other between the left forefinger and thumb, and the hand rests on the neck vertically. The right hand places a strand of mane from beneath through the palm and around the thumb of the left hand. If a whip is used it is placed into the left hand before the mane is taken up.

The rider steps toward the horse's head, according to the length of his limbs; the left foot is put into the stirrup from the outside, and the rider swings himself to the right sufficiently to have his left thigh at a right angle with the horse, the knee resting against the saddle-flap and the right hand holding the cantle of the saddle; he swings himself into a standing position in the left stirrup, both by springing from the right foot and by pulling himself up with his hands; in this position he pauses for a moment, standing erect, then the right hand is placed on the right saddle-puff, or on the pommel of the saddle, and, the right leg swinging high and straight over the horse's back, the rider gently seats himself and takes his right stirrup. The mane is now released. It is dangerous to attempt to mount unless the horse is made to stand quietly and the foregoing instructions are followed.

Ladies should always be assisted in mounting, and in the adjustment of their habit and stirrup. To mount, the lady places the right hand, which holds the crop, firmly upon the pommel with the crop projecting to the right of the leaping-horn; her left elbow is bent to a right angle and held firmly to her side, while she places her left foot into the left hand of the assistant, who supports with his right hand the left arm of the lady at the elbow. At the word she springs from her right foot and straightens her left leg, thus enabling the assistant to raise her to the saddle. The right leg is then lifted into position to the right of the pommel, and the left foot is placed in the stirrup, which should be long enough to leave a space of several inches between the leaping-horn and her knee.

The conditions of the seat are: the correct position in the saddle, that is, where one has the feeling of being in the middle; the grip or embracing of the saddle with the limbs from the knee up; the free and unconstrained position of the body; the erect carriage and natural attitude of head, shoulders, and arms; the balance, the steadying of one's center of gravity in the saddle and the precise distribution of the weight in conformity with the horse's motion. The legs, from the knee down, are not calculated to be used as a means of maintaining the seat, but only to make impressions on the horse's flank. The foot, of which the ball rests in the stirrup, should be carried parallel with the horse, and the heel depressed.

The reins are held according to the degree of proficiency of the rider, and the amount of training the horse has received. Beginners should first be taught to carry the snaffle-reins in both hands, in order to learn the functions of both right and left reins; subsequently curb and snaffle should be used in the same manner, and finally one hand may be used, holding the reins as directed for mounting. A whip should be carried in the right hand, the end pointing toward the horse's hock and resting on the right limb above the knee. The spur is attached to the heel of the rider's boot, and used both as an aid and as a punishment. The horse is guided by a pull on either rein or pressure against the neck, or both; this applies to the forehand of the horse, the hindhand being controlled by pressures of the leg on the flank, the horse moving forward if both legs are used simultaneously, or sidewise if pressure is exercised on the one side only. The forehand is the part of the horse in front of the withers; the hindhand is the part behind the withers.

In a walk and a gallop, horse and rider should be as one, while in a trot, and particularly for outdoor and distance

riding, the so-called English trot is generally adopted. In this instance the body of the rider is slightly raised above the saddle by an upward and forward motion of the body with the knees as pivots, and lowered again in rhythm with the motion of the horse.

Kinds of Riding.—School riding is the fundamental basis for horsemanship in all branches. The term school in connection with the art of riding means a lesson, or the execution of a feat. *High-school riding* is the highest development of the rider's skill in managing his horse, and in training his horse to perform feats requiring great flexibility, perfect balance, great strength, and perfect obedience.

The school above ground is a series of leaps, the execution of which brings the four legs of the horse in different positions while above the ground. These can be executed only by horses with a natural inclination for rearing, plunging, and kicking. These show to what height of perfection the education of horse and rider can be raised, and how much the natural faculties of the horse can be improved and developed.

Military riding comprises the theories and practice necessary to fit horse and soldier for active service.

Cross-country riding and hunting are the branches which are most useful, and give the most pleasure to the followers of horseback riding, while racing was originally instituted for the competition of representative specimens of various breeds, to test their ability and to stimulate horse-breeding.

The training of the horse means the physical development of the horse, the generation of strength, flexibility, and endurance, the development of grace and beauty of form and motion, the creation of a perfect understanding between horse and rider, and the subsequent unhesitating obedience of the horse to the will and impressions of the rider.

References.—*System of Horsemanship in all its Branches*, by William Cavendish, Duke of Newcastle (1743); *Method of Horsemanship*, by F. Baucher (1856); *Seats and Saddles*, by Francis Dwyer (1869); *Riding for Ladies*, by Mrs. Power O'Donoghue (1881); *Modern Horsemanship*, by E. L. Anderson (1886). Charles W. Dickel.

Hor'sens: city of Denmark; at the end of Horsens fiord, Jutland; 30 miles S. W. of Aarhuus. It is a railway station and has iron-foundries and manufactories of calico and tobacco. It was founded in the twelfth century. Pop. (1890) 17,290.

Horse-power: See Dynamic Units.

Horse-racing: the practice of racing with horses. Though horse-racing has probably been coeval with the possession of the horse by man, it seems likely that the Persians were the first to elevate the sport to a great institution. Horses with them were identified with the sun or with the fiery chariot driven once a day over the heavens. From the Persians the Greeks perhaps derived the sacred races which were held at the Olympian, Pythian, Isthmian, and Nemean games. These races were all conducted with clumsily built chariots, without springs, exceedingly difficult to drive, the course involving as much danger as skill. Great as was the difficulty of driving, it was much increased by the fact that the horses were near the spectators, who crowded close to the twenty short turns of the ground, and maddened the animals by their cries, "while artifice was employed for the express purpose of frightening the horses when they approached the statue of the genius Taraxippus." The charm of Greek races, apart from the interest in the victor, consisted in the excitement of seeing the chariots strike and shatter each other, the horses trampling on and killing the fallen drivers, and the overturns, in which the whole population of refined Athens delighted. The Roman races were much like the Greek, but with this difference, that the Romans employed their slaves as charioteers, instead of driving themselves. In time, the Romans, however, introduced mounted races, and with the exception that the riders were often expected to perform circus tricks and acrobatic feats, they were in many respects strikingly like the modern. The horses were entered thirty days in advance, and were trained, the jockeys wearing four colors—green, red, white, and sea-color (*veneta*), to which Domitian added yellow and purple. Prizes were given. The Romans did not use saddles (which, according to Beckmann, were invented in the fourth century), but they and the Persians had thick saddle-cloths. The jockeys were called *sensores*, the trainers *agitatores*. Caligula once gave 2,000 sesterces to the jockey Eutychus.

An old French song describes a horse-race run in the sixth century, the winner receiving for a prize the hand of a Breton princess. From the twelfth to the fourteenth century there appears in feudal grants mention of sums awarded at annual and regularly established races, "but it is not until the reign of Louis XV. that the history of horse-racing in France, seriously considered, begins." There is good ground for believing that in England the ancient Britons, decidedly addicted to horsemanship, had races, and that the Mithraic courses established by the Romans were continued by the Saxons. It is certain that the latter had mounted races, since "running horses" were among the presents sent by Hugh Capet to Athelstan when suing for his sister Ethelsnitha. This king imported horses from the Continent, particularly from Spain, by which means a breed was produced, says Blaine, that flourished from the time of the crusades until the days of the Tudors—a period which has been called "the era of the great horse." Fitzstephen says that in the time of Henry II. there was a great deal of racing on the ground where Smithfield Market now stands. In the time of Henry VIII. turfed courses were laid out and prizes allotted. The chief of these was a silver bell, whence perhaps comes the phrase "to bear away the bell."

Modern horse-racing began strictly with James I., who was very fond of it. In his reign public and regular runnings were held in Yorkshire and Surrey. Attention was now paid to feeding and training horses and instructing jockeys. During the civil war and the Protectorate racing declined, but with the Restoration there was a revival of all field-sports, and especially of this. Charles II. was an enthusiastic admirer of the turf, even entering his horses in his own name. He established races at Datchet Mead, that he might more conveniently enjoy his favorite sport. He was also regular in his attendance at Newmarket, now boasting every accommodation for the training of horses, with an excellent race-course, which, as the system progressed, was apportioned into distances corresponding with the several ages and supposed powers of the horses. By this arrangement, as well as by a judicious appropriation of the weights to be carried, according to similar circumstances, a scale of equality was kept up highly to the credit of the turf regulations. Indeed, much of the arrangement and most of the rules and regulations since in force were formed about this time and under the auspices of this prince. William III. encouraged the turf, and George, consort of Queen Anne, greatly aided it in every way. During his reign Curwen Bay Barb and the Darley Arabian were imported. Charles II. introduced the silver prize cup, value 100 guineas. "George I.," says "Nimrod," "was no racer, but he discontinued silver plates as prizes, and instituted the king's plates, being 100 guineas in cash." During the reign of George II. the Godolphin Arabian appeared, the founder of the best English "blooded" horses. George III. gave the turf some encouragement. His brother, the Duke of Cumberland, was passionately addicted to racing. From his stud came the famous horses Herod and Marak, who sired the famous Eclipse, born in the fourth year of George IV. O'Kelley, the great turfman of these times, owned Eclipse, and was the breeder of Volunteer and Dungannon by Eclipse, who became the sire of 160 winning horses. The Earl of Grosvenor is also held in honor as one of the great racing magnates of this reign. He raised the two famous mares Meteor and Violante, and lost his entire fortune in the end, though he won £200,000 by betting. "Honesty," says Blaine, "which insures riches in most other pursuits, is almost certain to occasion loss in racing." The king, George IV., bred the famous horses Whiskey, Manfred, and Maria. This monarch, according to Blaine, was very shrewd in turf-matters, and "surrounded himself with men deeply versed in the 'mysteries' of racing. The turf abounded in rascals, and the prince found it necessary to meet the manœuvers of such men by proper caution." By the exercise of this proper caution, he at last, in the affair of the notorious Escape against Grey Diomed, "succeeded in getting the accusation of foul play affixed to his name." His brother, the Duke of York, was, however, a heavy loser, being less suspicious. Cowper had long before said of England,

> We justly boast
> At least superior jockeyship, and claim
> The honors of the turf as all our own.

There are numerous provincial race-meetings in England, Scotland, and Wales, and some of these are held twice in the year. Those of Newmarket, Epsom, Ascot, York, Doncaster, and Goodwood stand first in all respects. The annual Derby (Epsom) is the great London holiday, where 350,000 people

often assemble. The Goodwood is called the "ladies' meet," because it is specially visited by ladies, many of the highest rank, in splendid toilette. The better class of visitors sit and lunch in their carriages, while a stream of female gypsies, clamorous to tell fortunes or beg, itinerant musicians and peddlers, go from one to the other, and the background is filled in with booths for eating, exhibitions, and similar rude games, usually managed by gypsy men.

Steeple-chasing, so called either from the *steep-hill* riding which it involves, or from a steeple in the distance having been originally the goal, consists of headlong riding over a ground abounding in ditches, hedges, gullies, and all kinds of impediments. It is of Irish origin. *Hurdle-racing* was originally invented by George IV. on Brighton Downs. Hurdles are sections of light fences partly covered with green boughs to give them the appearance of natural jumps.

In 1865 steeple-chasing and hurdle-racing became features of sport in the U. S. These races are very exciting, owing to the great danger and frequent accidents in making the jumps. In steeple-chases the weights carried range from about 125 lb. to 180 lb., in most of them the impost being assigned to the various horses according to their supposed or demonstrated capacity to carry it (which is termed "handicapping"), and a winning horse is generally penalized with extra weight in subsequent contests. In all racing much depends upon the skill of the jockey—so much, in fact, that a very good rider is sometimes able to win with any horse entered. Such riders were constantly in demand before interest declined in the sport.

In Great Britain the courses are usually straight, or nearly so, and consist of thickly sodded turf elastic to the tread. In the U. S. the regular course is a mile, made of two semicircles, each a quarter of a mile long, joined by two straight quarters, the one at the outcome being termed the "homestretch." For running, the dirt track, which is inclosed by fences, is made loose and yielding by harrowing, but for trotting it is rolled and scraped and kept somewhat hard, so that the wheels may pass over it without obstruction.

Racing in North America dates back to colonial times, when it was principally, and for a long time after the Revolution, confined to Virginia and the Carolinas; but as population increased, the sport spread through the other Southern States, and finally gained a foothold in the North, many exciting sectional contests for large amounts of money being run in New Jersey and on Long Island subsequent to the year 1822. For a period antedating the civil war and during its continuance the sport languished, but the restoration of tranquillity, the establishment of Jerome Park near New York city, and the revival of racing at Saratoga gave it a new impetus. By liberal expenditure of money and wise selection the running stock was improved by importations from England, several winners of the English Derby having been transported across the Atlantic. Richard Ten Broeck in 1856 took his horses to England, and met with fair success with Prioress, Starke, and Umpire. Messrs. Sanford, Lorillard, and Keene followed his example subsequent to 1874, and demonstrated that a first-class race-horse bred in the U. S. is equal to his English cousin. Iroquois, bred in Pennsylvania, won the Derby and St. Leger in 1881 for Mr. Lorillard, and Foxhall captured the Cesarewitch and Cambridgeshire stakes for Mr. Keene. Many other American-bred horses have distinguished themselves, quite a number of them in steeple-chases. In Australia racing has assumed great prominence, and 50,000 spectators are sometimes gathered on gala-days at the large meetings. In France the sport is on a firm footing, receiving encouragement and financial aid from the Government. Racing is also carried on in Canada, Austria, and Hungary, and to some extent in Mexico and British Guiana. Very successful horses win from $10,000 to over $100,000 in a year in the U. S., and do better still in England. The French horse Gladiateur, of whom it was said that he "avenged Waterloo" by defeating the best English three-year-old in 1865 in the rich Two Thousand Guineas, Derby, and St. Leger stakes, won upward of $125,000 in that year. The richest stakes in the U. S. are for two-year-olds. In 1891 His Highness (2) won $107,000; in 1892, Tammany (2) won $72,410; and in 1893 the winnings of Domino (2) footed up $181,000.

In racing there is a classification as to age, the youngest horses carrying the least weight in cases where horses of different ages are engaged. In May the horses carry less than in subsequent months, the weights gradually increasing as the year progresses and the animals attain age; and in short-distance races they are required to carry more than in long ones. There is no official timing at English races, where little attention to time is paid, while in the U. S. it is considered very essential, every fraction of a second by which a record is beaten being hailed with enthusiasm. In 1865 the fastest mile on record in the U. S. was 1:44, made by Legal Tender. Now that time is almost an everyday occurrence. In 1887 Ten Broeck ran a mile on the oval course at Louisville in 1:39¾. Aug. 28, 1890, Salvator, then four years old, ran, with 110 lb., a mile on the straight course of Monmouth Park in 1:35½. Previous to the trial the carefully prepared course was marked by the wheels of a sulky driven in an absolutely straight line from point of start to point of finish. This enabled the jockey so to guide the horse that there was deviation neither to the right nor the left. The best 4-mile time for many years was that of Lexington in 1855, in 7:19¾; it was not beaten until 1874, when Fellowcraft (a son of a daughter of Lexington) made the distance in 7:19½, which was still further reduced to 7:15¾ by Ten Broeck in 1876. The 4-mile time of Ten Broeck has not been beaten, because no persistent effort has been made to equal or excel it. A horse can win so much money in races under 1½ miles, a task which does not drain his vital force, that owners decline, as a rule, to start in races of 4 miles.

Trotting is essentially a North American sport, and there is hardly a town of any pretensions in the North or the West that does not have exhibitions of speed of this character. The prizes range from $50 to $20,000. During the summer several of the large cities, like Chicago, Detroit, Cleveland, Buffalo, Pittsburg, Rochester, Hartford, Springfield, Providence, Boston, and New York, form a circuit or chain of meetings of four or five days each, giving from three to five races a day for purses and stakes. Time is the basis of the handicap, and the classes range from 2:10 to 2:30. When a horse acquires a record of 2:29, he is compelled to start in a faster class, where he meets horses of equal speed.

The tracks for trotting are not harrowed, but kept smooth and even, and the horses are harnessed to sulkies which weigh from 38 to 52 lb.; and if the driver's bodily weight is not 150 lb., he is required to carry blankets, lead pads, shot, or anything else sufficient to make up that weight, which is the minimum allowed in a race. A mile in three minutes was once considered very good, and in 1843 a mile in 2:30 was first scored. In 1859 Flora Temple was the first to beat 2:20, making a mile in 2:19¾; and this stood as the best on record until Dexter made one in 2:17¼ in 1865. Since then Goldsmith Maid, Rarus, St. Julien, Maud S., Sunol, and Nancy Hanks have been respective champions. The first kite-shaped track to which general attention was attracted was built at Independence, Ia., in 1890. The one long turn proved faster than the two short turns of an oval or regulation track, and breeders and critics promptly drew a distinguishing line between what were designated as regulation and kite records. A kite record was not valued as highly as a record on an oval or regulation track. The two great governing organizations are the National Trotting Association and the American Trotting Association. The latter is an offshoot from the National. Under the discipline enforced by these two associations breeding-farms and tracks have multiplied, and at the close of the season of 1892 the horses which had trotted to records of 2:30 and better numbered 7,494, while those which had paced to records of 2:30 and better footed up 1,309, making an aggregate of 8,803 horses with records of standard value. During the season of 1893 this list was increased by nearly 3,000. As only a small part of the horses had acquired records as fast as 2:30, it is easy to form from these figures some idea of the vastness of the light-harness horse industry in the U. S.

In July, 1892, the 28-inch wheel, pneumatic tire, of the bicycle was applied to the sulky, and the result was so satisfactory that in the course of a few weeks it came into general use. It reduces friction, especially around the turns, and contributes from three to five seconds to the speed-rate of a horse for a mile. Nancy Hanks, 2:04, tried in 1892 at Cleveland to beat, hooked to high wheel, the 2:08¾ of Maud S. on the same track, and failed, and in July, 1893, Directum, 2:05¼, made a similar attempt, and did not succeed. The 2:08¾ of Maud S. on a regulation track with an old-fashioned or high-wheel sulky, made in July, 1885, was still the best record for that way of going on an oval track at the close of the season of 1893.

Pacing races are conducted in the same manner as, and generally in conjunction with, trotting races. The pacers are very largely outnumbered by the trotters, but are gain-

ing in popularity. The fastest record of this style of locomotion is a mile in 2:04 by Mascot and Flying Jib.

Double teams are composed of two trotters or two pacers, sometimes one of each, harnessed together to a four-wheeled buggy or wagon. There are not many public races of this description, but it is a common practice in the U. S. to keep horses in training and drive them, or have them driven, against time. W. H. Vanderbilt drove Maud S. and Aldine thus rigged in 2:15½, and Frank Work's Edward and Dick Swiveller have gone in 2:16¾. C. J. Hamlin's team, Belle Hamlin and Honest George, held the team record, 2:12¼, at the close of the season of 1893. Mr. Hamlin, in 1891, hooked Belle Hamlin, Globe, and Justina (all by his own stallion, Almont, Jr.) abreast, and E. F. Geers drove them to skeleton wagon at Cleveland in 2:14, a wonderful performance. The highest prices paid for horses in the U. S. are for trotters. Axtell, with a three-year-old record of 2:12, sold for $105,000, and Arion, with a two-year-old record of 2:10¾, was sold by Senator Leland Stanford, of California, to J. Malcolm Forbes, of Boston, for $125,000. W. O. B. MacDonough paid $150,000 for the thoroughbred stallion Ormonde, and imported him to the U. S. in 1893.

TROTTERS.

For many years 2:10 was thought to be the limit of speed in harness. In Jan., 1894, the following horses had records of 2:10, or better, at the trot:

Nancy Hanks, b. r	2:04	Happy Medium.
Directum, b. r	2:05¼	Director.
Stamboul, b. k	2:07½	Sultan.
Kremlin, b. r	2:07¾	Lord Russell.
Arion, b. r	2:07¾	Electioneer.
Alix, b. r	2:07¾	Patronage.
Martha Wilkes, b. r	2:08	Alcyone.
Sunol, h. w. k	2:08¼	Electioneer.
Pixley, b. r	2:08¼	Jay Gould.
Hulda, b. r	2:08½	Guy Wilkes.
Maud S., h. w. r	2:08¾	Harold.
Fantasy (3), b. r	2:08¾	Chimes.
Palo Alto, h. w. k	2:08¾	Electioneer.
Belle Vara, b. r	2:08¾	Vatican.
Nelson, b. r	2:09	Tom Rolfe.
Allerton, h. w. k	2:09¼	Jay Bird.
Guy, b. r	2:09¾	Kentucky Prince.
Harrietta, b. r	2:09¾	Alcyone.
Jay-Eye-See, h. w. r	2:10	Dictator.
Little Albert, b. r	2:10	Albert W.
Moquette, b. r	2:10	Wilton.
Magnolia, b. r	2:10	Hawpatch.
Walter E., b. r	2:10	Patchen Mambrino.

NOTE.—b., bicycle; r., regulation (oval); k., kite; h. w., high wheel.

PACERS.

Mascot	2:04	Deceive.
Flying Jib	2:04	Algona.
Hal Pointer	2:04½	Tom Hall, Jr.
Direct	2:05½	Director.
Robert J	2:05¾	Hartford.
Saladin	2:05¾	Sultan.
Johnston	2:06¼	Joe Bassett.
Jay-Eye-See	2:06¼	Dictator.
Roy Wilkes	2:06½	Adrian Wilkes
Guy	2:06¾	Shiloh.
Manager	2:06½	Nutwood.
W. Wood	2:07	Steinway.
Ontonian	2:07¼	Shadeland Onward.
Silkwood	2:07¼	Blackwood Mambrino.
Will Kerr	2:07¼	Ethan Wilkes.
Hal Dillard	2:07¾	Brown Hal.
Blue Sign	2:08¼	Ensign.
Hal Braden	2:08¼	Brown Hal.
May Marshall	2:08¼	Billy Wilkes.
Storm	2:08¼	Brown Hal.
J. H. L	2:08¼	Idol Wilkes.
Coastman	2:08¼	Bourbon Wilkes.
Barney	2:08¾	Barney Wilkes.
Crawford	2:09	Favorite Wilkes.
Vinette	2:09¼	Ethan Wilkes.
Diablo	2:09¼	Charles Derby.
Prima Dona	2:09¼	Betterton.
Paul	2:09½	Untraced.
Atlantic King	2:09¾	Atlantic.
Laura T	2:09¾	Al. West.
Cricket	2:10	Steinway.

BEST RECORDS.

Yearling—Pansy McGregor (against time), 2:23¾, Fergus McGregor. Princess Clara (in a race), 2:26½, Prince George.
Two-year-old—Arion (against time), 2:10¾, Electioneer.
Three-year-old—Fantasy (in a race), 2:08¾, Chimes.
Four-year-old—Directum (in a race), 2:05¼, Director.
Fastest mare—Nancy Hanks, 2:04, Happy Medium.
Fastest gelding—Guy, 2:09¾, Kentucky Prince.
Fastest stallion—Directum, 2:05¼, Director.
Two miles—Greenlander, 4:32, Princeps.
Three miles—Nightingale, 6:55½, Mambrino King.
Five miles—Bishop Hero, 12:30½, Bishop.
Double harness—Belle Hamlin and Honest George, 2:12¼.
Triple harness—Belle Hamlin, Globe, and Justina, 2:14.

HAMILTON BUSBEY.

Horseradish [i. e. large or coarse radish. See HORSE-CHESTNUT]: popular name of *Nasturtium armoracia*, a perennial herb of the order *Cruciferæ*, whose large white roots furnish a well-known pungent condiment for the table. The roots yield a volatile oil which contains sulphur. The plant is a native of Europe, and is half naturalized in the U. S. Horseradish leaves and roots are used in medicine as local stimulants. They have also antiscorbutic properties. The plant is extensively cultivated in some parts of the U. S. It is treated as an annual, being planted with bits of roots, or "sets," in late spring. In October or November the roots are plowed out and prepared for sale, the trimmings being used for "sets" the following spring.

Revised by L. H. BAILEY.

Horseradish-tree: the *Moringa pterygosperma*; a tree of the family *Moringeæ*, so called from the acrid quality of its leaves. Its trunk yields a gum like that of the acacias, and the leaf has medicinal qualities; but its seeds, with those of *M. aptera*, are important as furnishing the commercial oil of ben. These trees grow in the East and West Indies, Arabia, Africa, and Southern Europe. The expressed oil is used for oiling watches and as a basis for perfumes.

Horseshoe Crabs: the popular name of the species of *Limulus*, a problematical genus found upon the eastern coasts of both hemispheres. The body consists of three regions, an anterior portion (carapax), resembling in a striking manner the foot of a horse, a middle piece (abdomen), and a terminal spine (telson). On the upper surface of the carapax are four eyes, two compound ones on the sides and two simple ones side by side in front. Beneath, the carapax supports six pairs of walking feet, while beneath the abdomen are six broad, leaf-like appendages, the posterior five being the gills, arranged like the leaves of a book. The mouth occurs between the bases of the legs, the vent is beneath the base of the telson. During most of the year the horseshoe crab lies in deeper water, burrowing in the mud of the bottom, where the sharp edge of the carapax enables it to go with ease. During the months of May and June it comes to the shores in great numbers, and there lays its eggs in the sand, near high-water mark. Fossil forms strikingly like the horseshoe crab of to-day occur in the Carboniferous rocks, showing that the form has suffered slight change for an enormous length of time.

Horseshoe crab.

It has recently been pretty clearly shown that the horseshoe crabs are not true crabs (i. e. *Crustacea*), but have far more affinities with the spiders (see ARACHNIDA), and especially with the scorpions, with which they agree in a large number of important points. The single genus *Limulus* is the sole living member of the order *Xiphosura*. The only economic use the animals have is as a fertilizer and as food for hogs.

J. S. KINGSLEY.

Horseshoeing: See FARRIERY.

Horsetail, Joint-rush, or **Scouring-rush**: common names of species of the genus *Equisetum*, in the family *Equisetaceæ* of the Fernworts. Of the twenty species now existing, thirteen are found in North America. They have little economic value. Cattle eat the stems of some of the species, and in Holland *E. hiemale* is used in polishing cutlery. See EQUISETUM.

CHARLES E. BESSEY.

Horsford, EBEN NORTON, M. A., M. D.: chemist; b. at Genesee, N. Y., July 27, 1818; became principal of the Albany Female Academy; studied chemistry in Germany un-

der Baron Liebig: was Rumford professor in Harvard University 1847–63, one of the founders of the Lawrence Scientific School, and endowed the library and laboratory of Wellesley College. From 1863 until his death he engaged in chemical manufactures. He was the author of many scientific papers and of a work asserting that the Norsemen colonized Massachusetts, and gave much attention to improved methods of making bread. D. at Cambridge, Mass., Jan. 1, 1893.

Horsley, CHARLES EDWARD: organist and composer; b. in London, Dec. 16, 1822; educated under his father, William Horsley, Moscheles, Hauptmann, and Mendelssohn. On his return to England from his studies in Germany he became successively organist of several churches, during which he composed several fine anthems, *David* and *Joseph*, oratorios, for the Liverpool Philharmonic Society, and *Gideon*, oratorio, for the Glasgow Musical festival of 1860, besides a cantata, *Comus*, the text being an abridgment of Milton's poem of that name. In 1868 he went to Australia, and composed his cantata *Euterpe* for the opening of the Town Hall, Melbourne, in 1870. Then he went to New York and was appointed organist of St. John's chapel, Varick Street, and conductor of the Church Music Association. D. in New York, Feb. 28, 1876. D. E. HERVEY.

Horsley, JOHN CALLCOTT, R. A.: painter; b. in London, Jan. 29, 1816. His great and early love for drawing was observed and fostered by the celebrated painter (Horsley's great-uncle), Sir A. W. Callcott, R. A., and at the age of fourteen the young student entered the drawing academy of Mr. Sorsse, and subsequently was elected a student of the Royal Academy of Arts. Here he gained many prizes for drawing, etc., and on the competition for cartoons for the new Houses of Parliament he received a premium of £300 and two commissions for large frescoes in the same building. His works, generally of popular character, command large prices. Mr. Horsley became a Royal Academician in 1865. Among his works are *The Spirit of Religion* and *Satan Touched by Ithuriel's Spear*, both in the Houses of Parliament, and *The Pride of the Village* in the National Gallery. Revised by RUSSELL STURGIS.

Horsley, SAMUEL: bishop; b. at St. Martin's-in-the-Fields, London, Sept. 15, 1773; studied at the University of Cambridge; was appointed rector of Newington in 1759 and rector of Aldbury 1774, of Thorley 1780, of South Weald 1782; Bishop of St. David's in 1788, of Rochester in 1793, and of St. Asaph in 1802. He published new editions of Apollonius Pergæus (1770) and Newton (5 vols., 1779–85); published *Critical Disquisitions of the Eighteenth Chapter of Isaiah* (1799); translated Hosea (1801); and wrote essays on mathematics and the prosody of the Greek and Latin languages. But his controversy with Dr. Priestley concerning the divinity of Christ, which lasted for several years, attracted most attention. His theological works were collected in six volumes in 1845 and published in London. D. at Brighton, Oct. 4, 1806.

Horsley, WILLIAM: composer; b. at Whitehaven, in Cumberland, England, Nov. 15, 1774. Shortly after his birth the parents removed to London, and at a very early age the boy developed great talents for musical composition. The distinguished composer, Dr. J. W. Callcott, perceiving his talents, took the lad under his protection, and finally gave him his daughter in marriage, Jan. 12, 1813. For learning, his six *Books of Canons* are unrivaled by any similar specimens since Sebastian Bach; as a glee-writer, *By Celia's Arbor*, *See the Chariot at Hand*, *Blow, Wind, thou Balmy Air*, and many others testify to the greatness of this master of the English school of music. Mr. Horsley took the degree of Mus. Bac. Oxon. early in the nineteenth century; was organist of the Female Orphan Asylum for fifty years, also of the Charterhouse and Belgrade chapels. His house at Kensington was the favorite resort of Mendelssohn, Spohr, Thalberg, and all the great musicians of his day. His eldest daughter married I. K. Brunel, the distinguished engineer. D. June, 1859.

Hort, FENTON JOHN ANTHONY, D. D., LL. D. (Hon. Trinity College, Dublin, 1888): theologian; b. in Dublin, Apr. 23, 1828; graduated in 1850 at Cambridge; was presented to the college living of St. Ippolyts with Great Wymondley in 1857; returned to Cambridge in 1872 as a fellow of Emmanuel College, was elected Hulsean Professor of Divinity in 1878, and Margaret Professor of Divinity in 1887. He was a member of the committee for the revision of the New Testament, and of the board of theological studies and of the council of the senate of the University of Cambridge. D. in Cambridge, Nov. 30, 1892. He published two dissertations, i., *On Monogenes Theos in Scripture and Tradition*, and ii., *On the Constantinopolitan and other Eastern Creeds of the Fourth Century*. Joint editor with Dr. (now Bishop) Westcott, *The New Testament in the Original Greek, A Revised Text with Introduction and Appendix* (2 vols., London, 1881); *The Text*, in a smaller volume (1885).
Revised by W. S. PERRY.

Hor'ta: the largest town of Fayal, one of the Azore islands, itself sometimes incorrectly called *Fayal*; situated on a beautiful bay; contains several remarkable edifices. It has a good trade. Pop. about 7,500.

Hortense, EUGÉNIE DE BEAUHARNAIS: queen; b. in Paris, Apr. 10, 1783; daughter of the French general Alexandre de Beauharnais and of Joséphine Tascher de la Pagerie, who became the wife of Napoleon I. In 1802 she married Louis Bonaparte, afterward King of Holland, and brother of Napoleon I. She bore him three sons, of whom the youngest, afterward Napoleon III., alone survived her. After the fall of the First Empire, Queen Hortense resided usually in her château of Arenenberg, Switzerland, where she died Oct. 5, 1837. She was the author of the song *Partant pour la Syrie*.

Horten'sius, QUINTUS: the most famous of Roman orators next to Cicero. He was born in 114 B. C., and at the early age of nineteen made his first public speech, soon after which he came into prominence by his successful defense of a petty King of Bithynia. He passed through the various stages of public life leading up to the consulship, and held this office in the year 69 B. C. He died in 50 B. C. In political sympathies he was of the party of the aristocracy, although after his consulship he seems to have taken no very active part in political life. As an orator he was, as Quintilian says, for a long time the first at Rome, for a time he was held to be the peer of Cicero, while down to his death he was esteemed as only second to him. His oratory was of a florid, brilliant character, of the Asiatic type, best suited to produce striking effects in oral presentation. His manner of speaking was vivacious and full of action; his motions and gestures, however, betrayed a little more of studied art than was necessary; his voice was pleasing and musical. In his relations to Cicero he always bore himself free from envy and ready to recognize the talent of the younger man, even in the face of a rivalry that was usually successful and not always considerate. Better evidence of a kindly and ingenuous nature could scarcely exist. In addition to orations, Hortensius wrote some rhetorical treatises and poems, the character of which is not known. The character of Hortensius was not altogether admirable. He was unscrupulous as to the means by which his successes were attained, and his private life was exceedingly luxurious, if not immoral.
G. L. HENDRICKSON.

Horticulture [Lat. *hortus*, garden (: Eng. *yard*) + *cultu'ra*, cultivation, deriv. of *co'lere*, cultivate, till]: the art and science of the cultivation of garden plants. A garden is understood to be that part of an estate or homestead which is devoted to fruits, vegetables, and ornamental plants, in distinction to those areas used for cereals or general field crops, forage plants, forestry, and the care of domestic animals. The term *garden*, as also *hortus*, originally related to an inclosure which commonly surrounded the house or lay close to it. It was the private and more carefully cultivated part of an estate. Gardening and horticulture are synonymous terms. Horticulture, as understood in the U. S., includes three great divisions: pomology, olericulture, floriculture, and a fourth may be added under the name of landscape horticulture. Pomology is the art and science of growing fruits, and olericulture concerns itself with those plants commonly denominated "vegetables." Floriculture deals with ornamental plants for their own or individual uses, while landscape horticulture considers ornamental plants with reference to their uses in the landscape, and is therefore closely related to landscape-gardening. Landscape-gardening, however, is properly a fine art, and the horticultural practices bear much the same relation to it that the manipulation of an instrument bears to music, or the various arts of building bear to architecture. See FLORICULTURE, LANDSCAPE-GARDENING, OLERICULTURE, and POMOLOGY.

Horticulture is usually a late or secondary development of general agriculture in any country. It therefore thrives best in the older countries, as a rule, especially in its æsthetic features. There are a few cases in which it has become an im-

portant industry very early in the development of a region, as in California, but these are countries in which special adaptations exist for the cultivation of horticultural products. The successful prosecution of horticulture, especially upon a commercial scale, demands minute knowledge of very many conditions of soil and cultivation, of the peculiarities of varieties, and the demands of the market. Horticultural products are usually perishable, and they must be put upon the market with great discrimination, and every care must be exercised in packing and handling them. These are conditions which are not met by the majority of farmers, and therefore horticulture always finds its greatest extension near cities and villages.

Horticulture is probably the most varied of all arts. Several thousand species of plants are in cultivation, and many of them, as the apple, melon, and rose, are so variable among themselves that their enumerated varieties are counted by the thousands. The greater part of the species demand the nicest cultivation. As a science, horticulture is the extension of botany into rural industries, and it demands many and exact researches in plant life for its own uses. The study of the origin and variation of garden plants is capable of throwing much light upon organic evolution. Both as a science and an art, horticulture is capable of becoming a distinct educational force in college and university instruction, and the time can not be far distant when its merits will be recognized. Its economic interests in the U. S. are large and are rapidly extending. The reader is referred to the various cultivated plants, under their appropriate heads, for more specific information concerning methods of treatment and cultivation. L. H. Bailey.

Horton: city (founded 1886): Brown co., Kan. (for location of county, see map of Kansas, ref. 4–J); on the Chi., Rock Is. and Pac. Railway; 13 miles S. of Hiawatha. It is in an agricultural and stock-raising region; contains the manufacturing and repair shops for the entire system of the Chi., Rock Is. and Pac. Railway W. of the Missouri river (plant cost over $600,000); and has gas and electric light plants, high school and 2 ward schools, 7 churches, a national and a State bank, and 2 weekly newspapers. Pop. (1890) 3,316; (1895) 3,157.

Horton, Samuel Dana, LL. B.: publicist; b. at Pomeroy, O., Jan. 16, 1844; graduated at Harvard College 1864 and at Harvard Law School 1868; afterward studied at Berlin. In 1871 he began the practice of law at Cincinnati, and three years later removed to Pomeroy. A great deal of his time, however, was spent in Europe in the investigation and discussion of monetary questions. Beginning in 1876, Mr. Horton made a special study of the coinage of gold and silver. He was one of the earliest, and one of the ablest, advocates of the establishment and maintenance of an international ratio between gold and silver. To this end he labored in the several European capitals. Mr. Horton was secretary of the international monetary conference at Paris in 1878, and a delegate from the U. S. to the conference of 1881. His chief works are *Silver and Gold and their Relation to the Problem of Resumption* (1876); *The Silver Pound and England's Monetary Policy since the Restoration*, together with the *History of the Guinea, Illustrated by Contemporary Documents* (London, 1887), a work that has attained the highest authority in Great Britain; and *Silver in Europe* (1890; 2d ed. enlarged, 1892). D. in Washington, D. C., Feb. 23, 1895.

Ho'rus [= Lat. *Ho'rus* = Gr Ὧρος, from Egypt. *Hor*, Horus, Day]: the name of two Egyptian deities, originally distinct, which became gradually identified. One was a solar deity, identified by the Greeks with Apollo, which appears under various forms: *Hor-ur*, Greek Aroëris, the "old Horus," worshiped in Letopolis and Ombos; *Hor-mer-ti*, "Horus of the two eyes," sun and moon; *Hor-em-khu-ti*, "Horus of both horizons," rising and setting sun; *Hor-em-khu*, Greek, Harmachis, "Horus of the horizon," rising sun; *Hor-nub*, "Golden Horus," a favorite title used by the kings. The second Horus was the son of Osiris and Isis, brother of Set (Typhon) and Nephthys. He is often called "Avenger of his father," on account of his pursuit of Set for the murder of Osiris. According to Diodorus, this conflict occurred at Antæopolis (modern Kau el-Kebir), but the mythological texts of Ombos represent the whole Nile valley as its scene. This conflict was confused with that between light and darkness, and thus the deities themselves became identified. Horus is represented as a hawk-headed man, wearing the crown of Upper and Lower Egypt, and bearing the symbols of life and power. He is also pictured as a hawk with the scourge. On funerary objects he is represented as late as the fourth century A. D. on a Græco-Roman mummy. His figure has also been found on a Phœnician scarab.

Charles R. Gillett.

Horvath', Mihaly: ecclesiastic and historian; b. at Szentes, Hungary, Oct. 20, 1809. He studied theology at the Seminary of Waitzen 1825; took orders in 1830, and was in 1844 appointed Professor in Vienna of the Hungarian Language and Literature. During the Hungarian revolution in 1848 he was made Bishop of Csanàd and Minister of Public Education and Worship. After the revolution he lived alternately in France, Italy, and Switzerland until 1866, when he was permitted to return to Hungary. D. at Carlsbad, Aug. 19, 1878. His most important work is a general *History of Hungary* (8 vols., 1842–46; 3d ed. Pesth, 1873), but he also treated several periods of Hungarian history separately, especially the revolution of 1848. His works have been translated into German.

Hos'ack, David, M. D., LL. D., F. R. S.: scientist; b. in New York, Aug. 31, 1769; graduated at New Jersey College in 1789, and in 1791 received his medical degree at Philadelphia; studied in Europe until 1794; became in 1795 Professor of Botany in Columbia College; was (1797–1807) Professor of Materia Medica; Professor of Materia Medica and Midwifery in the College of Physicians and Surgeons 1807–11, after which he held other professorships there until 1826. After this he was until 1830 connected with Rutgers Medical College. He was one of the first mineralogists and botanists of his time, founded the first botanic garden in America, and was the author of several medical treatises which long had a standard value. He also wrote a *Life* of Dr. Hugh Williamson (1820) and one of DeWitt Clinton (1829). D. in New York, Dec. 23, 1835.

Hosan'na [Gr. *ὡσαννά* = Heb., save, I pray]: a Hebrew term of blessing, congratulation, or well-wishing, adopted into use by the Christian Church. The name is also given to one of the subdivisions of musical masses, "Holy, holy, holy, Lord God of Sabaoth; heaven and earth are full of thy glory. *Hosanna* in the highest."

Hose'a, or **Ose'e** [*Hosea* is from Heb., deliverance; *Osee* is from Ὡσηέ], of the LXX., followed in the Vulgate and New Testament: the first in order of arrangement, but third or later in order of time, of the twelve minor prophets. His prophetic activity covers perhaps sixty years, ending in Hezekiah's time, after 723 B. C. He belonged to the northern kingdom of Israel, and set himself against the idolatrous apostasy which had seemed almost essential in order to political independence. In style he is the obscurest of all the Hebrew prophets. In the Roman martyrology he is commemorated with Haggai on July 4.

Revised by W. J. Beecher.

Hoshangabad', or **Hoshungabad**: a district and town in the northwestern part of the Central Provinces in British India. The district lies between the Nerbudda river and Satpura Mountains, between the meridians of 76° 38′ and 78° 45′ E. Area, 4,437 sq. miles. It is a picturesque district, but only about half of it is cultivable. Wheat is the staple crop. The Great Indian Peninsula Railway traverses the district from E. to W. The population (about 500,000) is Hindu and aboriginal, the latter forming 18 per cent. The capital is of the same name, and is on the south bank of the Narbada river, in lat. 22° 45′ N., lon. 77° 46′ E. (see map of North India, ref. 8–E). It is a center for trade in foreign goods. Pop. 16,000. Mark W. Harrington.

Hoshe'a (another form of *Hosea*): the last king of Israel; son of Elah. The Bible says that he slew his predecessor, Pekah; the Assyrian records add that he was placed in power by Tiglathpileser, King of Assyria. The Bible dates his accession nine years before the downfall of Samaria—that is, 727 B. C.—but dates the death of Pekah nine years earlier (2 Kings xvii. 1; xv. 30). Possibly he was for nine years Assyrian governor, and assumed the style of king only at the death of Tiglathpileser. His reign was disturbed by civil commotions and by Assyrian invasions, and he probably perished at the destruction of Samaria.

Revised by W. J. Beecher.

Hoshiarpur: a district and town of the Punjaub. See Hushiarpur.

Ho'sius [Gr. Ὅσιος, liter., holy, sacred]: b. about 257 A. D., perhaps in Spain or in Egypt; became Bishop of Cordova about 296; took part in the Council of Illiberis (Elvira) (300–

305 A. D.); was persecuted under Diocletian and Maximian; was highly honored for integrity and faithfulness; was sent by Constantine the Great to Alexandria to conciliate the contending parties of Alexander the bishop and of Arius; was present at the Council of Nice (325 A. D.), and was, according to some writers, its president; induced Constantine to ratify the Nicene Creed 325; was at the Council of Sardica (343–44), and perhaps its president; was directed by Constantius in 355 to write against Athanasius, but refused; was compelled by the emperor to attend the Council of Sirmium, and after wearisome persecution the aged Hosius felt compelled to submit in part to the imperial will, and to take the communion with Arians, but he would not condemn Athanasius. In 357 he was permitted to return to Cordova, where he died in 359 A. D. See Gams, *Kirchengeschichte Spaniens* (Regensburg, 1864, vol. ii., pp. 137–309), for the best account of all questions connected with Hosius.

Revised by J. J. KEANE.

Hos'mer, HARRIET: sculptor; b. at Watertown, Mass., Oct. 6, 1830. She became expert in rowing, riding, and skating; had the spirit of adventure; traveled alone in the West as far as the Falls of St. Anthony, and visited the Dakota Indians. In 1852 she went to Rome with her father and Miss Charlotte Cushman; was received into Gibson's studio, and soon won her way to public favor. Her statue of *Puck*, sent to Boston in 1856, made her reputation in her own country, and was frequently copied. Her *Beatrice Cenci* and *Zenobia*, both full-length statues, the latter of colossal size, were more ambitious works. She exhibited at the Paris Exposition in 1867 a statue called *The Sleeping Faun*. The Legislature of Missouri gave Miss Hosmer a commission to make a statue of Thomas H. Benton. Miss Hosmer has resided in Rome almost continuously since her first visit.

Revised by RUSSELL STURGIS.

Hosmer, JAMES KENDALL: author; b. at Northfield, Mass., Jan. 29, 1834; was educated at Harvard College; was professor in Antioch College from 1866 to 1872; in the University of Missouri (English and German literature) from 1872 to 1874; and since 1874 in Washington University, St. Louis, Mo. Among his books are *The Color Guard* (1864); *A Short History of German Literature* (1879); and *The Life of Sir Henry Vane* (1888). H. A. BEERS.

Hospice, hŏs'pis [Fr. *hospice* < Lat. *hospi'tium*, hospitality, deriv. of *hos'pes*, host, guest]: any one of the houses maintained by ecclesiastics for the relief of travelers passing over the Alps in stormy weather. That of the Great St. Bernard, founded in 962 and inhabited by Augustinian monks, is the most celebrated. Others are kept up at the principal passes of the Alps. The name is also applied to other charitable institutions, such as the former asylum upon the Abendberg, Switzerland, for the treatment of cretins, and various establishments for those suffering with mental disease.

Hospin'ian, RUDOLPH: theologian; b. at Altdorf, Switzerland, Nov. 7, 1547; studied at Marburg and Heidelberg; held different positions in the Reformed Church of his native country, and died at Zurich, Mar. 11, 1626. The most prominent of his works are *De Monachis* (Zurich, 1588); *De Festis Christianorum* (1593); *De Festis Judæorum et Ethnicorum* (1592); *Concordia Discors* (1609), which occasioned much controversy with the German Lutherans; and *Historia Sacramentaria* (1598–1602). His *Historia Jesuitica* (1619) was partly translated under the title *The Jesuits' Manner of Consecrating Persons and Weapons Employed for the Murdering Kings and Princes, by them Accounted Hereticks* (London, 1678). A collected edition of his works was published in 7 vols. fol. at Geneva in 1681. Revised by S. M. JACKSON.

Hospital [M. Eng. *hospital*, from O. Fr. *hospital* > Fr. *hôpital* < Late Lat. *hospita'le*, hospital, inn, neut. sing. of Lat. *hospita'lis*, hospitable, deriv. of *hospes*, guest, host, liter., guest, master, for older **hos(t)ipes*; *hostis*, stranger, guest + *potis*, master (root appearing in Gr. δεσ-πότ-ης, master). *Hostis* < Indo-Eur. *ghost-*, *ghest-* > Eng. *guest*]: institutions intended primarily for the care of the sick and wounded; secondarily, to furnish means of instruction to students of medicine and of nursing, to serve as monuments or memorials of their founders, or as a means of support for their owners. Hospitals for the sick poor appear to have been established in India, through the influence of Bûddhist priests, about 220 B. C. They are, however, more especially characteristic of Christianity, and were recognized institutions in the fourth century. For account of the first hospitals, properly so called, consult H. Häser, *Dissertatio de cura ægrotorum publica a Christianis Oriunda* (Greifswald, 1856).

The general principles of hospital location, arrangement, and construction, with reference to the requirements of the sick and to facility of administration, may be considered as fairly established; but while, theoretically, these requirements outweigh all others, it will usually be found in practice that for any proposed hospital there will be something in the site, limit of cost, or purpose of the builder which will require a modification of what may be termed the standard plan; and that in many cases the so-called secondary objects will be really, though not perhaps avowedly, of primary importance. Hospitals may be designed to receive patients of both sexes and all ages, or may be more or less specialized, as for women, for the insane, for contagious diseases, etc.

In some respects the simplest form of hospital is that intended for adult males only, as in the military and naval serv-

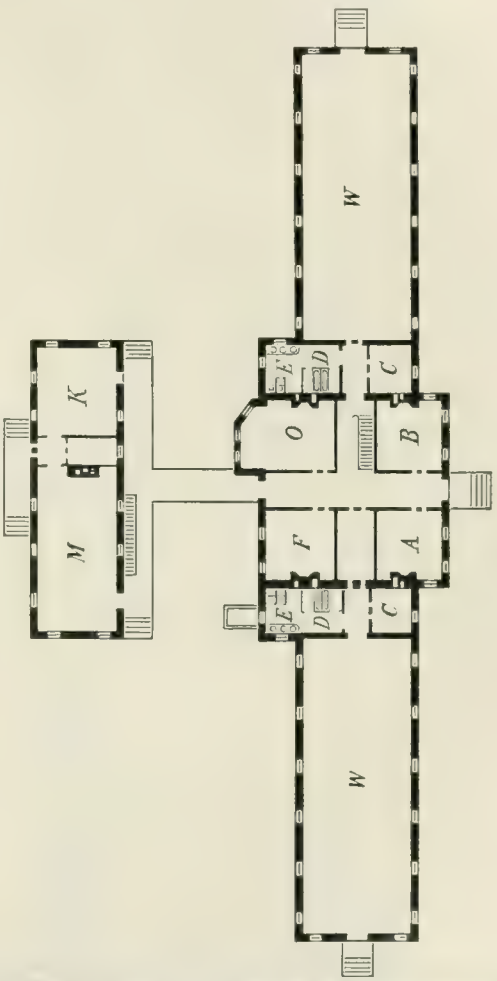


FIG. 1.—First floor plan of a U. S. post hospital for forty beds: A, dispensary; B, office; C, smoking-room; D, bath; E, water closets; F, waiting-room; K, kitchen; M, dining-room; O, operating room; W, ward. The wards are one story in height, the central building is two stories, and the kitchen building is also two stories, having an isolation ward and attendants' rooms on the second floor.

ice. It was at one time thought that in these, in which the secondary objects above referred to need not be considered, the buildings should be temporary in character—that is, not intended to last more than ten or twelve years, the idea being that they would be less liable to become infected than the much more ornamental, pretentious, and costly structures which are usually desired by societies, municipalities, or private donors, and that if infected they could be destroyed with comparatively small loss. It was also claimed that in a financial point of view the temporary hospitals were the most economical, for, if the money required to construct a

stone or elaborately ornamented brick hospital were divided into two equal parts, one half being used to put up frame buildings of the same capacity, and the other half being in-

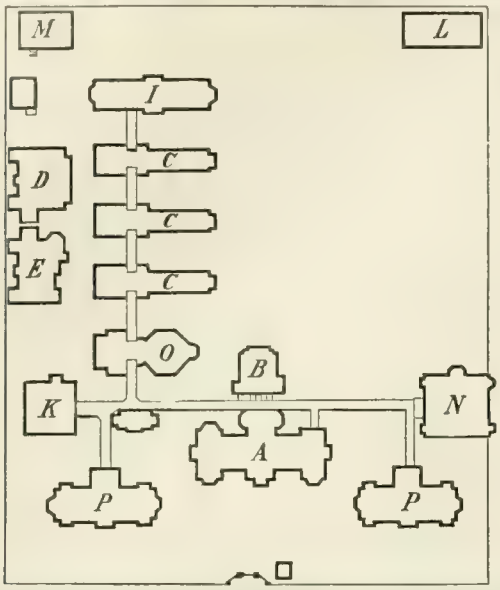


Fig. 2.—Block plan of the Johns Hopkins Hospital, Baltimore, Md.: A, administration building; B, apothecaries' building and servants' quarters; C, common wards; D, dispensary; E, amphitheater and surgical operating-rooms; I, isolating ward; K, kitchen; L, laundry; M, mortuary and pathological laboratory; N, nurses' home; O, octagon ward; P, pay wards.

vested at 6 per cent., the income from the latter sum would suffice to furnish a new hospital every twelve years for succeeding generations.

Discoveries as to the bacterial origin of suppuration, erysipelas, and septicæmia, with their practical applications in the details of antiseptic and aseptic surgery and obstetrics, have largely done away with the dangers of infection in hospitals, and the idea of building temporary hospitals is now considered solely from the financial point of view.

The true principles of hospital construction, as first established by a commission of the French Academy of Sciences in 1778, and subsequently elaborated as to details by Nightingale, Galton, Oppert, and others, may be briefly stated as follows: The important part of the hospital is the ward, which should be separated from the administrative part of the institution, and should be arranged in pavilions, preferably of one story in height. These pavilion wards should be from 25 to 28 feet wide, 14 feet high, and of sufficient length to allow not less than 100 sq. feet per bed. In warm climates the height should be 15 feet and the floor-space per bed 120 sq. feet. Not more than thirty-two beds should be placed in each ward. The windows should be opposite each other, and reach from within 3 feet of the floor to a foot from the ceiling; they should occupy one-third of the wall-space, have a nearly E. and W. exposure, and in cold cli-

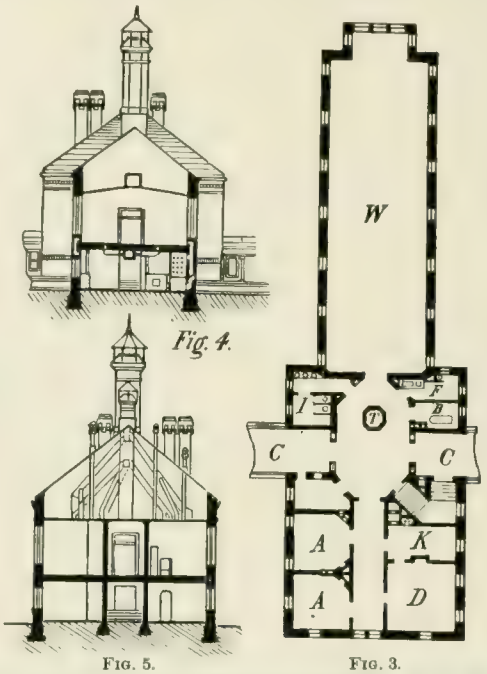


Fig. 4. Fig. 5. Fig. 3.

Figs. 3, 4, and 5.—Johns Hopkins common ward. Floor plan and transverse sections: A, private wards; B, bath; C, corridor; D, dining-room; F, nurses' closet; I, water-closets; K, kitchen; T, ventilating chimney; W, ward.

mates should be double sashed or of plate-glass. The floors and other woodwork should be of hard pine or oak, with impervious joints, waxed, oiled, or permeated with paraffin, and polished. It is usually stated that the walls should be made as smooth and non-absorptive as possible by the use of parian cement, paraffin, silicates, oil-paint, etc. It has been even proposed to make them of glass. The advantage of this from a sanitary point of view is doubtful. An ordinary plastered wall absorbs gases and organic compounds to a very considerable extent, and they are then oxidized and reduced to more stable compounds, much as sewage is affected in a running stream, and the depurative and quasi-respiratory powers of such walls should not be overlooked. Making them impermeable is somewhat like varnishing an animal's skin, and there is no satisfactory evidence as to its good effects. But in permanent hospitals, for the sake of

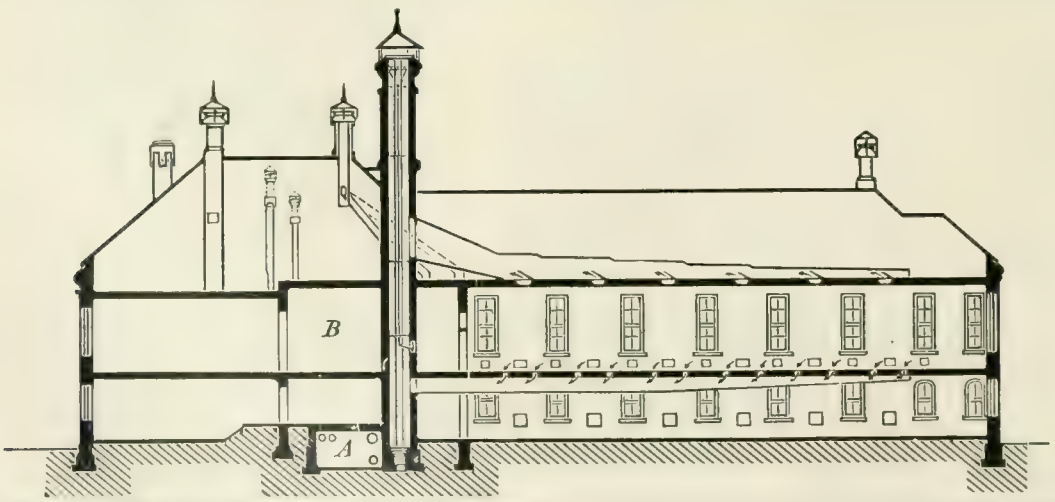


Fig. 6.—Longitudinal section of common ward, Johns Hopkins Hospital: A, tunnel beneath corridor, B, showing position of hot-water and steam pipes.

appearances if for no other reason, it is usually best to have the walls constructed with a soapstone, adamant, or other hard finish, with the expectation that they will be painted in oil after five or six years.

The great object is to have the ward supplied with plenty of light and fresh air, and to keep it at a proper temperature.

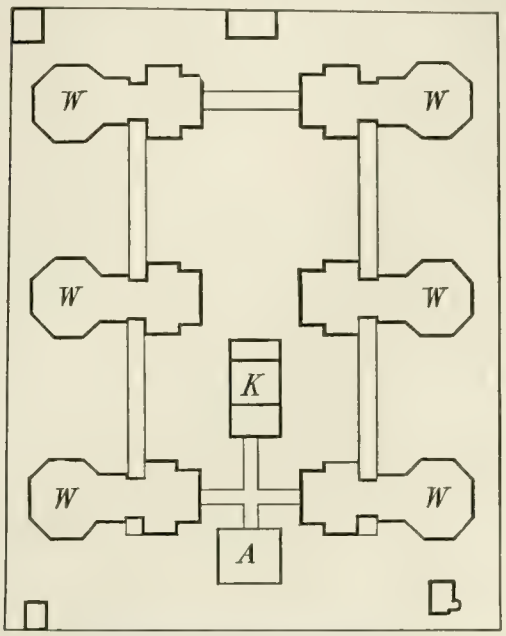


FIG. 7.—Block plan of Methodist Hospital in Philadelphia: A, administration; K, kitchen; W, wards.

The minimum amount of fresh air to be furnished is 3,000 cubic feet of air per hour per man, and under some circumstances it may be desirable to double this amount. The ventilation of each ward, water-closet, bath-room, and kitchen should be entirely independent of all other rooms, halls, or parts of the building. The wards may be rectangular, as in Figs. 1 and 2, or octagonal, as in Fig. 7, or circular, as in Fig. 8. The kitchen and laundry should be either in a separate building, or in the upper story of the administrative building; they should never be put beneath the wards or offices. The various offices required for the administrative departments are necessarily much alike, whether the institution be

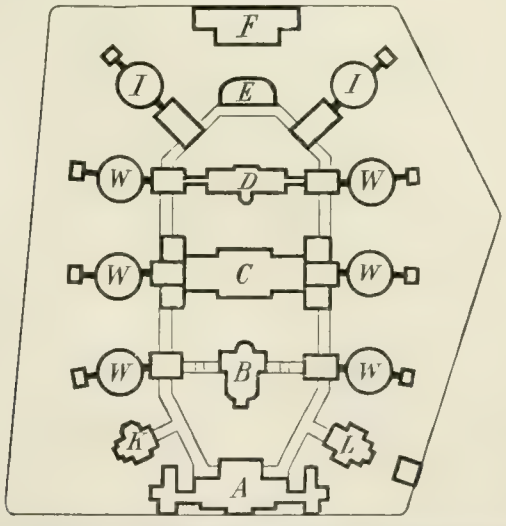


FIG. 8.—Block plan of City Hospital at Antwerp: A, administration; B, chapel; C, kitchen; D, nurses; E, baths; F, laundry; I W, wards; K, operating-room; L, mortuary.

large or small; hence for small hospitals, such as those for military posts in the U. S. army, the ward becomes a comparatively small part of the building (Fig. 1).

When a large number of patients are to be provided for, the pavilions may be arranged to radiate from a common center, or from corridors in various ways, as shown in Figs. 2, 7, and 8.

Many other ways of arranging the pavilions can be easily devised to suit locality, direction of prevailing winds, etc.

Besides the care of the sick, it is necessary in many hospitals to provide for the supervision and restraint of the vicious. A considerable portion of the applicants for hospital relief in large cities are suffering from the effects of lust and drink, and if opportunity be allowed will perpetuate or aggravate their maladies by repeating the original cause. The proper restraint of patients without giving the building a gloomy and prison-like aspect is best secured by placing the hospital in such a location that access to means of dissipation shall be as difficult as possible. On this account a small island is a very desirable locality, and especially so in seaport-towns and for marine hospitals. Floating temporary hospitals also have many advantages at such points. Whatever be the plan of the hospital, the most important thing is that it shall be under the constant hygienic supervision and management of a competent man, who should be a physician. A hospital which is under non-professional superintendence, or which is to rely on the occasional advice of its attending physicians, who have other interests, will almost surely deteriorate, and the temporary barrack plan is specially useful in such cases, as making the evil results less permanent and costly.

For details on this subject, consult Husson, *Étude sur les Hôpitaux* (Paris, 1862); Nightingale, *Notes on Hospitals* London, 1868, 3d ed.); Esse, *Die Krankenhäuser* (2d ed.) Berlin, 1868); Demoget, *Étude sur la construction des ambulances temporaires, sous forme de baraquements, suivie d'un essai sur les hôpitaux civils permanents* (Paris, 1871); *Report of the Royal Commission* (Sutherland and Galton) *Appointed for Improving the Condition of Hospitals and Barracks* (London, 1863); Smith, *Principles of Hospital Construction* (New York, 1866); *Hospital Plans*, five essays for Johns Hopkins Hospital (8vo, New York, 1875); Mouat and Snell, *Hospital Construction and Management* (4th ed. London, 1883); Billings, *Description of the Johns Hopkins Hospital* (4to, Baltimore, 1890); Burdett, *Hospitals and Asylums of the World* (4 vols., royal 8vo and atlas folio, London, 1891–93); Tollet, *Les édifices hospitaliers* (4to, Paris, 1892).

J. S. BILLINGS.

Hospital Gangrene: a peculiarly rapid and usually fatal form of gangrene, which was met with, for the most part, in old and infected hospitals, in which no attempts were made to isolate infectious surgical cases; or in military hospitals where, owing to the exigencies of war, no proper care could be given to the injured, who were huddled together, and whose wounds had received no proper attention, perhaps for days. The condition is now rarely if ever met with, since with improved facilities and augmented knowledge of the causes of infection the conditions which favored it are never allowed to obtain. It has been known also as *hospital phagedæna, gangræna nosocomialis*, etc.

It appears not to have been a specific variety of gangrene, but to have been due to the conspiring influences of previous overwork, hardship, exposure, starvation, or previous ill-health, combined with injury more or less severe, aggravated by subsequent unhygienic surroundings, bad ventilation, and overcrowding in hospitals, or insufficient care, warmth, and food. It was first adequately described and named by Poteau in 1783, and in many historic campaigns was as fatal as the missiles of the enemy.

The condition is characterized by exceedingly rapid tissue death, accompanied commonly by severe pain. The muscular and joint structures succumb first, while nerves and arteries are most resistant. So rapid is the destruction that an entire limb may become putrid in forty-eight hours. Death results either from septic intoxication, the system absorbing the poisonous products of the putrefactive process, or from hæmorrhage from an eroded blood-vessel.

Previous to the civil war in the U. S. hospital gangrene was the dread alike of soldiers and of military surgeons. During the war it was found that many cases, if seen early, could be checked by the free use of bromine, with which wounds showing its early signs were to be freely cauterized, after all sloughs had been trimmed away. In fact bromine has proved itself by all means the most efficacious agent with which to combat the disease when present, it being of course understood that when any extensive mutilation had

been produced by its ravages, amputation or other severe operations were sooner or later necessitated.

All probability of hospital gangrene producing any such disasters in the future as in the past has been done away with by the widespread introduction of what is everywhere known as *antiseptic surgery*, by proper practice of which such infectious processes are made well-nigh impossible.

ROSWELL PARK.

Hos'pitallers [M. Eng. *hospitaler*, from O. Fr. *hospitalier* < Late Lat. *hospitala'rius*, pertaining to a hospital, deriv. of *hospita'le*, hospital. See HOSPITAL]: a name given to the members of various fraternities and sisterhoods of the Roman Catholic Church, who join to the vows of perpetual poverty, chastity, and obedience another which binds them to serve the poor and sick in hospitals. Some knightly orders took the monastic and hospital vows also—such as the Knights of St. John of Jerusalem, Knights of the Holy Sepulcher, and the Teutonic Knights; but in the case of the first-mentioned order, at least, the *hospitals* they founded were rather in the nature of *hostels* or public inns. There have been twelve or more monastic congregations whose members were popularly called Hospitallers, but the term more generally denotes the Knights of St. John of Jerusalem. See ST. JOHN OF JERUSALEM, KNIGHTS OF.

Hos'podar [from Slavic *gospodar*, master, lord]: title of the governors of Moldavia and Wallachia while those countries were provinces of the Ottomans. These rulers were also called voïvodes. Being chosen almost invariably from the Phanariotes of Constantinople, they were obnoxious to their subjects as being of a different race and language, though members of the same Church (Orthodox Greek). They were constantly engaged in political intrigue, and were often mainly desirous of amassing enormous fortunes. The last hospodar was Prince Couza, a despotic but enlightened ruler, under whom in 1861 was accomplished the union of the two provinces, now the independent kingdom of Roumania. The Czar of Russia is often called gospodar, and an equivalent title was employed by the Lithuanian princes and Polish kings. EDWIN A. GROSVENOR.

Host [M. Eng. *hoste*, from O. Fr. *hostie* < Lat. *hos'tia*, sacrificial animal, victim]: in the Roman Catholic Church, the consecrated Eucharistic bread, believed by that Church to be the veritable body of the Lord Jesus Christ. As such, it is elevated by the priest at the mass for the adoration of the people. It is a circular wafer or cake of unleavened bread, having various emblematic figures, and is made of the finest wheaten flour. It is borne upon a plate called the paten, broken by the priest over the chalice, and received by him at the communion. The host consumed by the priest, or used in the public adoration of the blessed sacrament, is much larger than those distributed to the communicants.

Revised by J. J. KEANE.

Hostages [from O. Fr. *hostage* > Fr. *ôtage* < Lat. **hospita'ticum*, deriv. of *hospes*]: persons placed under the control of the government of a state as pledges of the faithful fulfillment of a treaty. The same custom has taken place when a captured vessel is allowed to go on its way upon what is called a ransom contract, and also in other stipulations between parties at war. But in no case was the life of a hostage at stake in case of violation. The practice has gone out of use in the first-mentioned case, the last instance known to the writer of this article having been the detention of two British noblemen on parole at Paris after the peace of Aix-la-Chapelle in 1748, who were, in fact, to remain in this condition until Cape Breton should be restored to France. Revised by T. S. WOOLSEY.

Hostius: an obscure Latin epic poet of the latter half of the second century B. C., who wrote a *Bellum Histricum*, of which some half-dozen fragments quoted by grammarians are preserved. See Baehrens, *Frag. Poet. Rom.* (Leipzig, 1886), p. 138. M. W.

Ho'strup, JENS CHRISTIAN: poet; b. in Copenhagen, May 20, 1818; entered the university in 1837, and while there composed many student songs. Soon after passing the theological examination he wrote his first comedy *Gjenboerne* (Opposite Neighbors), which was produced by his fellow students. It achieved such a success that it was later accepted by the Royal theater, where it still retains its early popularity. In 1845 he wrote the vaudeville *Intrigerne* (Intrigues); in 1846 *En Spurv i Tranedans* (A Sparrow in the Stork Dance); 1848, *Eventyr paa Fodreisen* (Adventures of a Journey on Foot); 1849, *Soldaterlöjer* (Soldier Larks); 1850, the music drama *En Nat mellem Fjeldene* (A Night in the Mountains); 1852, *Mester og Lærling* (Master and Apprentice). In 1855 he took orders and had charge of a parish until in 1881, when he moved to Copenhagen, where he lived quietly until his death. In 1880 he published a drama *Eva* (Eve), which is in striking contrast to his earlier works. In 1872 appeared *Sange og Digte* (Songs and Poems). During the latter part of his life he wrote very little. His early songs and comedies are full of a rollicking fun, without, however, a trace of coarseness or vulgarity. Like Holberg and Heiberg, he is thoroughly national, and to this is largely due his great popularity. D. in Copenhagen, Nov. 21, 1892. See his *Samlede Skrifter* (Collected Works, 4 vols., Copenhagen, 1865). D. K. DODGE.

Hot-air Engine: a prime mover in which the motive-power is derived from the expansion of air by heat. Numerous inventions of this kind have been produced, of which the earliest to excite interest was that of Dr. Stirling, a Scotch clergyman, patented in 1816, though earlier air-engines which were very simple and were unsuccessful were constructed by Sir George Cayley and others. An improvement on Stirling's engine was suggested, later, by his brother, James Stirling, and this was patented in 1827, and again, with further improvements, in 1840. Among other inventions of this class which have been more or less successful may be mentioned those of Ericsson, Wilcox, Roper, Shaw, Rider, and Merrill, all of the U. S., and those of Laubereau and Belou of France. It would be impossible within the limits of this article to give a detailed description of these various forms of mechanism. In what follows it is proposed to give only their characteristic differences, and to set forth certain general principles relating to this mode of generating motive-power.

All forms of the hot-air engine have certain advantages in common, and all are subject to certain disadvantages which are inseparable from the system. It is an advantage that they require no boiler, and are exempt from the dangers which arise from that source. Could air be employed at a pressure equal to that of steam, it would be an important advantage to be free from the great weight which the use of the boiler necessitates, and unembarrassed by its bulk. As yet, however, this condition has not been realized, and hence the dimensions of the working parts of air-engines are necessarily so far more considerable than those of steam-engines of corresponding power as to render the gain in this direction, if there is any, unimportant. It is, however, an advantage that air-engines are cheaper of construction than those driven by steam, and that their management is easier, and requires less constant watchfulness. It has generally been claimed for them that they economize fuel. Theory might seem to justify this claim, but in practice it has not been generally sustained. The disadvantages of air-engines consist in the difficulty of heating and cooling the air employed with the rapidity necessary to secure the best performance, and in the fact that the supply of the cylinder consumes more than half the power developed. To this it may be added that, while the efficiency of the machine depends upon the difference between the maximum and minimum temperatures, there are certain practical limits which neither of these temperatures can transcend.

Air-engines may be arranged in two classes, of which the first embraces those which draw their supplies directly from the atmosphere, and discharge them into the atmosphere again after they have produced their effect; and the second, those which employ continually the same air, which is alternately heated and cooled but is not allowed to escape. Stirling's first engine belonged to the first of these classes; his later forms to the second. To the first also belong Ericsson's, Wilcox's, Roper's, Shaw's, and Belou's; to the second, Rider's, Merrill's, and Laubereau's. The second class have the advantage that they admit the use of high pressures; but this is attended with the disadvantage that they require refrigerating appliances, which with the first are wholly unnecessary.

In each of these classes a subordinate classification may be made, according as the air is heated in the cylinder in which it performs its work, or in a separate chamber. The plan of the Ericsson engine is the first of these. That of Roper's, Shaw's, and Belou's, the second. In Laubereau's, which does not discharge the air, the heat is applied in one cylinder, and the work is done in another. In this class of engines the arrangements admit of a variety of modifications. The heater and the refrigerator, for example, may

be both independent of the working cylinder, and of each other; presenting an analogy to the boiler and condenser of the steam-engine; or the refrigerator only may be separate; or finally, as in the engine of Laubereau, the heating and refrigeration may take place at the opposite extremities of the same vessel, the air being driven from one end to the other alternately by means of a plunger.

It is true of these, as of all engines operated by heat, that there is a theoretic limit to the economy of which they are capable—that is to say, whatever be the amount of heat received from the source, a fraction only of this can under any circumstances be converted into mechanical force; and theory enables us to state definitely the maximum value which this fraction can have. This maximum depends on the extreme temperatures at the command of the engineer. Suppose the highest of these temperatures, as referred to the absolute zero (a point 273° C. below the freezing-point of water) to be represented by T, and the lowest, referred to the same zero, by T'; then if Q be the entire quantity of heat imparted to the air, steam, or vapor operating any thermo-dynamic engine; and U the portion of that quantity capable of being converted into usual effect, it is true in all cases that

$$\frac{U}{Q} = \frac{T - T'}{T}.$$

This principle we take at present for granted. For the demonstration of its truth, see THERMODYNAMICS. It follows that in proportion as the interval between T and T' is increased, the machine will work with correspondingly greater economy. This interval can be increased by increasing T, or by diminishing T', or by doing both at once. It is impracticable, however, to employ a refrigerator having a temperature below that of the atmosphere. We must therefore take for a mean lower limit about 17° C., or 62·5° F., a temperature which, referred to the absolute zero, is equal to 290° C. On the other hand, a practical upper limit is imposed by the consideration that a red heat is reached for solids at about 650° C., which is 923° C. above the absolute zero. This limit could not be safely approached; but supposing it to be actually attained, the economical coefficient would be

$$\frac{923 - 290}{923} = 0{\cdot}684,$$

or a little more than two-thirds of the heat taken up by the air. Probably no hot-air engine has yet been actually employed in which the temperature has been carried much above 300° C. With a maximum temperature of 307° C. = 580° C. above the absolute zero, the economical coefficient would be

$$\frac{580 - 290}{580} = 0{\cdot}50,$$

which would show a utilization of one-half the heat taken up. The first Ericsson engine was designed to work at a maximum temperature of about 450° F. = 232° C. = 505° above the absolute zero. The limit of economy realizable by it, had it been successful, and provided the air could have been made to pass through the complete cycle of changes of temperature and pressure embraced in the theory, would have been

$$\frac{505 - 290}{505} = 0{\cdot}426.$$

But in point of fact no hot-air engine fulfills, or can fulfill completely, the theoretic conditions. In order to do so it would be necessary that the air should leave the working cylinder at a minimum temperature; that is to say, at a temperature as low as that of the supply; or else that, by some contrivance, the excess of heat which it retains should be transferred to the supply on its way to the working cylinder. As the first of these conditions—that is to say, the expansion of the air, in working, sufficiently to reduce the temperature to the minimum—is practically unrealizable, it is the second which inventors have in many instances sought to secure. In order to accomplish this the emergent air has, in some cases, been made to pass through successive sheets of wire gauze, or between thin sheets of metal, or has been in some other manner brought into contact with metallic surfaces of large extent in proportion to the weight of the mass, in order that the excess of heat being transferred to these might be afterward taken up by the cold air of the supply as it enters. The first of the expedients here mentioned was employed by Ericsson, and the second in the successive inventions of Stirling. In Shaw's engine the hot air escapes through a cluster of thin tubes, while the cold air circulates between them. The term "regenerator" was applied by Ericsson to this contrivance, as applied to his original engine, and this term has come into general use. The regenerator is applicable to any form of engine, but it is not employed in all. The theoretic advantage is considerable, but in practice is not fully realized; and it is attended with the disadvantage of sensibly increasing the amount of the passive resistances of the machine. In fact, in order that the regenerator, suppose it for instance to be a succession of wire gauze sheets, should entirely absorb the excess of heat of the escaping air, the number of sheets should be very considerable. It is easily seen that if this number were quite unlimited there would be somewhere a point at which the air would have no longer any heat to impart, its temperature being sensibly reduced to that of the metal. From this point backward to the cylinder from which it was discharged the successive sheets of wire gauze would rise in temperature, and the last one would have sensibly the same temperature as that with which the air emerged. The number of sheets which would be required effectually to absorb the heat would depend for a given excess of temperature upon the closeness of the meshes, and in any case must be considerable. The obstruction which every such contrivance necessarily presents to the free passage of the air creates a resistance which makes its presence objectionable, and which may go far to neutralize the advantage which it is designed to secure. By diminishing the number of the sheets and the closeness of the meshes, the resistance is reduced, but the absorption of the heat is proportionately less complete. Practically, where the regenerator continues to be used, a middle course is taken; the economy is not wholly realized, and the obstruction to circulation is not very serious. This is the case in the engine of Shaw, in which the regenerator consists, as above remarked, of a series of tubes. It is to be considered however, that the loss of heat suffered in operating engines driven by heated air or steam is by no means limited to the fraction, large as it is, of the heat which, after being actually imparted to the medium, is unavailable for work. If this were true, the cost of working such engines would fall to a very small proportion of what it actually is. It is unfortunately the case that by far the largest source of loss is to be found in the escape of a great part of the heat which the combustible develops, in other ways than in raising the temperature of the elastic medium which does the work. And the improvement of all these engines, so far as economy is concerned, is to be sought in such forms of furnace and such modes of applying heat as may reduce what is now the sheer waste of the chimneys or of the radiating surfaces, rather than in the endeavor to push to extremes the temperatures employed in the working cylinder. It is to be observed that the difficulty of guarding against losses by conduction and radiation is enormously increased when excessive temperatures are employed; and also that such temperatures decompose lubricants, destroy packing, and, by the large expansion which they give to metals, loosen joints, and impair the strength of the whole structure. Since the largest room for economy is evidently in the direction of preventing the useless waste at present occurring, the effort should be to keep the maximum temperature as low, and not to push it as high, as possible.

In passing to particular forms of hot-air engines, a few words only can be given to each.

Ericsson's Engine.—This engine is more generally known in the U. S. than any other of its class. In its present form it differs essentially from that which it had when constructed on a large scale, about the year 1855, to be employed as the motive-power of a sea-going vessel; or, more properly, the one now used is a different machine. In the original model a working cylinder was placed immediately over the fire of the furnace, and a cylinder of supply of about two-thirds the capacity was placed immediately over that. The engine was single acting, the working cylinders were quite open, and the working pistons were of great bulk and formed of non-conducting substances, being designed to fill the cylinders when at the point of the lowest depression, so as to prevent their cooling by contact with the air of the atmosphere. The bottom of each cylinder was arched, forming a dome for a furnace, and the piston received at its lower surface a corresponding figure. The pistons of the supply cylinder and working cylinder were firmly connected, and had therefore an equal length of

stroke. At the descent of the piston, the supply cylinder was filled by aspiration from the atmosphere; and in the ascent, the charge, after undergoing compression, was driven into a reservoir, from which it passed subsequently into the working cylinder. The upward stroke being completed, the heated air escaped through a regenerator formed of wire gauze, depositing there its excess of heat; and the new charge from the reservoir, passing to the working cylinder through the same regenerator, reabsorbed this heat, and thus entered the heating-chamber already at an elevated temperature. This engine performed very well in practice, so far as its performance was merely a question of mechanics. But it failed practically, because the heating arrangements were inadequate to the demand made upon them. Mr. Ericsson did not expect to be dependent on his furnaces for the supply of more than a moderate fraction of the heat which each successive charge of air was to receive. He supposed that the regenerators would serve to transfer so large a quantity from each charge to the next that it would be necessary to provide for little more than the inevitable loss by mere radiation; but this anticipation was not realized. There was, moreover, a further cause of failure, arising from the difficulty of heating air at all by means of a furnace. Radiant head produces scarcely any impression upon air. The inventors of all the air-engines which have been to any degree successful have recognized the necessity of applying their heat as much as possible by conduction and actual contact. Mr. Ericsson himself was no exception, as his later and successful invention shows. This machine possesses a special interest, from the fact that it was the first of its class to secure for itself a recognized place in the industrial world as a valuable aid to productive power.

The engine for some time known as the Ericsson is far less simple to appearance than the one above described. It had a horizontal cylinder within which at one end, and occupying about two-fifths of its length, was the furnace, also cylindrical, between which and the surrounding cylinder was an annular space. In its modern form the cylinder and its furnace extension are vertical. Within the cylinder there were two pistons, the inner, or that nearest the furnace, acting as a supply piston, and the other as the driving piston. The rods of the supply piston pass through the driving piston. When, by the action of the mechanism, the distance between the two pistons is increased, the supply is received by inspiration through valves opening inward in the driving piston. When this distance is diminished, the charge is driven by compression through valves in the supply piston opening toward the furnace. But these valves open on the outside of a sheet-iron cylindrical bell, carried by the supply piston, which enters into the annular space above mentioned between the furnace wall and the external cylinder, and therefore the air in passing them is obliged to pass down outside this bell to the extremity of the annular space, and to return inside the bell, in a thin annular sheet in close contact with the furnace wall. The working power is derived from the heat thus imparted. This power is effective through not quite half the revolution. Through the remainder it is zero, or the resistances predominate. Hence a heavy fly-wheel is necessary.

As to the economy of this type of engine, tests were made by Mr. Tresca, sub-director of the Conservatoire des Arts et Métiers, of Paris, in 1861, upon a specimen engine of 2 horse-power, in which the consumption of coal amounted to $4\frac{1.3}{1.0}$ kilog. (about 9 lb.) per horse-power per hour—two or three times that of a good steam-engine. The mean maximum temperature of the heated air did not exceed 270°, and the expansion of volume was hardly 50 per cent. $(1\frac{4.8}{1.0})$.

Shaw's Engine.—Of this the principal parts are a furnace, cylindrical in form, of boiler iron, lined with refractory brick; two single-acting cylinders working alternately; and a regenerator, which consists of a chamber filled with tubes similar to those of a tubular boiler, through which the exhaust air escapes. The air is heated in the furnace immediately in contact with the fuel, of which it at the same time supports the combustion. This furnace is accordingly closed air-tight, fuel being supplied when necessary by means of a box or receiver on the top, between which and the interior of the furnace communication can be opened; the box itself being, in the meantime, tightly closed. From the furnace, the air, along with the gaseous products of combustion, is admitted beneath the pistons of the working cylinders alternately, and after it has performed its function, it is discharged through the tubes of the regenerator into the chimney. The upper portions of the working cylinders are employed to furnish the supply of cold air from the atmosphere. For this purpose each piston is provided with a trunk considerably smaller in diameter than the cylinder; and the annular space between the trunk and the cylinder, being closed in at the top, forms an air-pump. As the piston descends, the air of the atmosphere enters this annular space through valves opening inward; and on its ascent this air is forced into the regenerator, where it becomes partially heated by contact with the tubes through which the dilated air is escaping, and thence passes into the furnace. The brick lining of the furnace is double, with a space between the walls; and this space the entering air from the regenerator is obliged to traverse before it reaches the fire. Its temperature, which is already somewhat raised by compression and by contact with the tubes of the regenerator, becomes still more elevated in its passage through this space; and the additional heat which is wanted to bring up the pressure to the point required is supplied by the fuel. In this engine, the difficulty which impeded the success of most earlier inventions of the kind, viz., that of adequately heating the air, is ingeniously overcome. The heat developed by combustion is necessarily taken up by the air which supports the combustion, and by the gaseous products at the same time generated. Hence it has been found practicable to maintain a pressure under the pistons averaging about an atmosphere. But it must be observed that such a pressure can only be secured by carrying the temperature to a point destructive of lubricants and packing, and liable to cause leaks by unequal expansion.

Roper's Engine.—This is very compact and well adapted to small industrial operations. The furnace is a cast-iron cylinder lined with fire-brick. Immediately over the furnace, and formed in the same casting, is the working cylinder, smaller in diameter than the furnace, and open above. The piston-rod is kept vertical by means of a guide; and two connecting rods, one on each side of the proper piston-rod, operate balance levers united at their opposite ends by a cross-bar, to the middle of which is attached the connecting rod which turns the crank of the main shaft. The balance levers are pivoted in supports secured to the working cylinder itself, and they carry, also, a pair of rods which operate the piston of the supply cylinder. The supply cylinder is immediately under the working shaft, and is as conveniently near the furnace as practicable, standing upon the same base with it. The furnace is air-tight, and the air supply is forced into it beneath the grate, passing through the fuel, and so upward into the working cylinder. Provision is made to divide the air current so as to allow a part, at pleasure, to enter the furnace above the fuel, for the purpose of regulating the rapidity of combustion and the temperature of the charge. No provision is made for introducing the fuel while the engine is in operation. Occasional interruptions will therefore occur in order to replenish the fire. In starting the machine it is necessary to turn the fly-wheel for a few revolutions by hand. It is also necessary to have the fire well lighted before the door of the ash-pit is closed.

Wilcox's Engine.—A hot-air engine under this name was exhibited at the International Exposition of London in 1862. The distinctive peculiarity of this consists in the employment of two working cylinders through which the air successively passes. The furnace is in the lower portion of one of these cylinders, and the supply-pump is in the upper chamber of the same cylinder. The engine is further provided with a regenerator of thin metal plates. The air, after being compressed in the supply-pump passes through the regenerator, taking up the heat left there by the last charge of escaping air, and thence into the second working cylinder. In this it produces a partial effect, due to the heat already absorbed, and then enters the first or principal working cylinder, where it receives the heat of the furnace. The advantage of admitting the supply air to the cylinder which contains the furnace is very considerable, as it tends to prevent that cylinder from being overheated, while it utilizes the heat which would otherwise be injurious.

Laubereau's Engine.—In this a certain volume of air is inclosed in a cylinder of metal, in which there is also a large moving plunger, which, by occupying alternately one end and the other of the cylinder, displaces the air and drives it in the opposite direction. The upper portion of the cylinder is surrounded by a jacket, between which and the cylinder itself there is a constant circulation of cold water. As the plunger itself is but slightly less in diameter than the interior

of the cylinder, the air during the transfer is reduced to a thin cylindrical stratum, and is brought into close contact with the cold walls. The effect of the engine depends as much upon the efficiency of this cooling process as upon the subsequent heating, and therefore it is desirable that the water of refrigeration should be as cold as possible. But as this water must necessarily be drawn from natural sources, it is obvious that the engine will be more efficient in winter than in summer. The lower portion of the cylinder is occupied by a furnace resembling the furnace of the Ericsson engine—viz., a cylinder smaller than the air cylinder, with an annular space between the walls of the two. The plunger also, like that of the Ericsson engine, is provided with a bell-shaped continuation, which enters the annular space around the furnace.

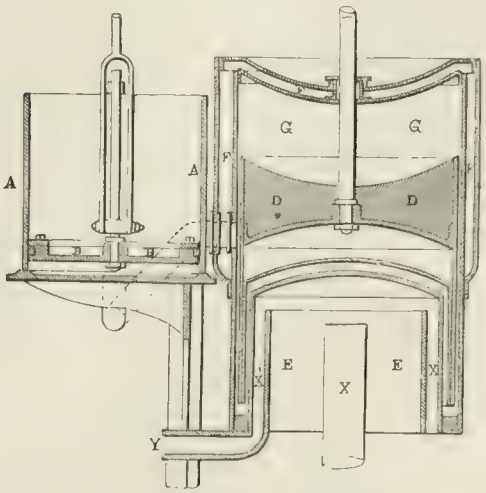


FIG. 1.—Laubereau's engine, small model.

Fig. 1 shows a section of one of these engines of small model, in which E is the furnace-room; but here the heat is applied by means of a powerful gas-lamp, X. The flame, reverberating, passes down the narrow annular space X′ X′, and the products of combustion are conducted off at Y. D is the plunger, with its attached bell. For lightness it is partially hollow. F is the space filled by the refrigerating water. A A on the left is the working cylinder, and B the working piston. A communicating tube shown in dotted lines admits the heated air to the space in A A beneath the piston when the plunger rises, and allows it to return to G G when the plunger descends. The plunger of course receives its motion from the working piston. As the engine is but single-acting, a fly-wheel is necessary. Provision must be made by a force-pump to maintain the flow of the refrigerating water. If the confined air employed is under more than the atmospheric pressure, there must also be some contrivance to make good the gradual waste by leakage through the packings. If no superior pressure is employed, a small shifting valve on the cold side will suffice for this purpose.

The main advantage, however, of using a confined body of air in these engines, rather than to draw the successive charges directly from the atmosphere, is that we may thus obtain a higher pressure, and consequently a greater power within the same bulk. But this advantage brings with it the attendant necessity of employing refrigerators, which with the other class of engines are wholly unnecessary.

In the larger forms of Laubereau engines, the cylinders are horizontal. A test made by Mr. Tresca of the performance of one of these, having a horse-power of about four-fifths, showed a consumption of $4\frac{6}{100}$th kilog. (about 10 lb.) of coal per horse-power per hour; while the refrigeration required 700 kiloliters (180 gal.) of water per hour also. It can not, therefore, be called an economical source of power; but for many uses in which but a small power is required it may be practically such.

Belou's Engine.—The only hot-air engine which has been employed on a large scale as the motive-power of an important industry is that patented by Belou, in France, in 1860. This was introduced into a large paper manufactory at Cusset. Belou's engine in some respects resembles Shaw's, but differs from it in employing but one cylinder, double-acting, and in having an independent supply-pump and no regenerator. The cylinder, however, is surrounded by a jacket, between which and the cylinder itself the air circulates in passing from the supply-pump to the furnace. The engine is represented in Figs. 2 and 3. The first is a general plan;

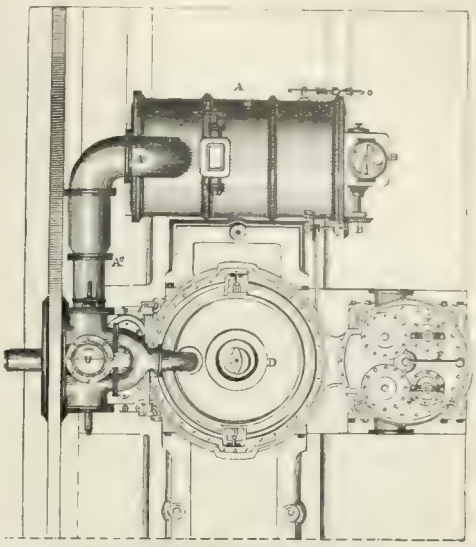


FIG. 2.—Belou's hot-air engine—plan.

and the second, a vertical section passing through the axis of the cylinder and of the supply-pump. The furnace is at A, and the hopper for fuel at B. D is the cylinder and F the supply-pump. The air, in passing from F to the furnace, is driven through the space *d* between the working cylinder and its enveloping jacket. A portion of the air, larger or smaller as occasion may require, may be made to pass into the furnace over the fuel, and not through it. By this means the intensity of the heat may be varied, and the working pressure increased or diminished. M is the main shaft, N

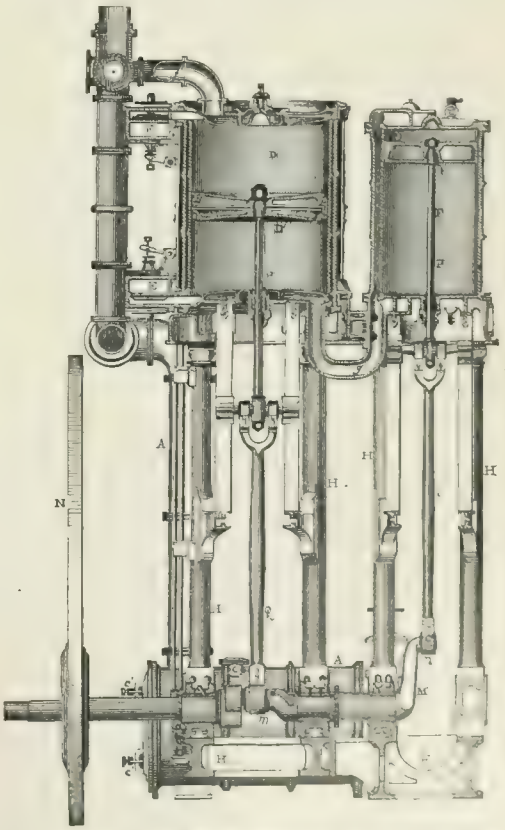


FIG. 3.—Belou's hot-air engine—elevation and partial section.

the fly-wheel, and Q Q connecting rods which explain themselves. The fly-wheel on the large engine at Cusset weighs about 15 tons. The fuel introduced into B is spread over the grate by a mechanical contrivance operated by the arbor B', connected with an eccentric on the main shaft.

Two Belou engines were tested by Mr. Tresca; one of about 4 horse-power, and the other (which is the engine at Cusset) of nearly 30. In the smaller the consumption of coal per horse-power per hour amounted to $2\frac{64}{100}$ kilog. (nearly 6 lbs.); in the larger only $1\frac{48}{100}$ kilog. (3 lbs.). The working cylinder of this latter had a capacity of about 80 cubic feet; that of the supply-cylinder was about half as great. In this case the amount of force developed, as measured by the indications of the manometer, was equal to 120 horse-power, but of this the supply absorbed 80 horse-power, or two-thirds of the whole; and more than 10 horse-power was estimated to be necessary to overcome the passive resistances. Less than 30 horse-power therefore, or one-quarter of the whole, was actually utilized. It is of course upon the horse-power actually utilized, and not upon the aggregate energy developed, that the foregoing statement of consumption is founded. The performance is therefore about equal to that of an economical steam-engine.

It is to be observed, however, that the heat was carried to a height which could not but tend to deteriorate rapidly the parts of the engine exposed to it; and especially the interior of the working cylinder. In order to protect this surface it was constantly lubricated with a solution of soap in water, of which about 5 gal. were consumed per hour. There was also a large final loss; the escaping air in the chimney having a temperature of not less than 250° C. = 450° F. above that of the atmosphere. Mr. Tresca computed that fully seven-eighths of the heat produced by the furnace was expended unproductively.

To the class of hot-air engines belongs properly the inflammable gas or oil engine. See GAS-ENGINE.

Revised by F. R. HUTTON.

Hotbed: a frame for forcing the early growth of plants. Its top is a glazed or cloth-covered sash, sloping toward the S. The glass permits the sun's rays to enter and heat the air, and at the same time prevents the escape of the warm air. The heat of the sun is re-enforced by that of fermenting animal and vegetable matter—horse-dung, wool-waste, leaves, chopped straw, and the like—which fill a trench beneath the soil of the hotbed. These are very necessary to prevent freezing at night and in cloudy weather. When the sun shines brightly it is often necessary to admit some cold air, or partly to cover the hotbed with lath screens or thin cloth, otherwise the sun's heat may injure the plants. In very cold weather matting of bast or straw, or rolls of carpet, are spread over the glass to prevent freezing. Hotbeds have given place more or less to forcing-houses. (See GREENHOUSE.) They are also sometimes heated by steam or hot water in pipes, or by hot-air flues.

Revised by L. H. BAILEY.

Hotchkiss Gun: See MACHINE AND RAPID-FIRE GUNS.

Hothouse: See GREENHOUSE.

Hotman, ōt'măăn', FRANÇOIS: jurist; b. in Paris, Aug. 23, 1524. He began to lecture on Roman law at the university in 1546; but having embraced the Reformed religion, he was compelled to leave his native city in 1547, and retired to Lyons. From this time his life was wandering and adventurous, though generally brilliant, and his participation in the political intrigues of his time was very active, though not very honorable. By his lectures on law at Lyons, Geneva, Strassburg, Valence, Bourges, and Paris, and especially by his work, *Franco-Gallia* (Geneva, 1573), he made a revolution in the political and social views of his time. D. at Basel, Feb. 12, 1590.

Hot Springs: city; capital of Garland co., Ark. (for location of county, see map of Arkansas, ref. 4–C); on Hot Spring creek and the Hot Springs Railroad; 55 miles S. W. of Little Rock. It derives its name from the thermal springs, seventy-two in number, which issue from the west slope of the mountain and are much frequented by invalids, particularly those having rheumatic or cutaneous affections. Some of the springs have a temperature of 150° F. In the vicinity are valuable mines of gold, silver, and lead. The city contains the U. S. Army and Navy General Hospital, the academy and convent of Our Lady of the Springs, numerous hotels and boarding-houses, and 3 daily, 5 weekly, and 3 monthly periodicals. Pop. (1880) 3,554; (1890) 8,086.

Hot Springs: town: Madison co., N. C. (for location of county, see map of North Carolina, ref. 5–E); on the French Broad river and the W. N. C. branch of the Rich. and Danv. Railroad; 38 miles N. W. of Asheville. It is picturesquely situated in the Smoky Mountains, 1,800 feet above sea-level, and near Bold Mountain, Painted Rocks, and the Chimneys. Its springs are among the most noted mineral waters in the Southern States. It is a popular resort at all seasons, and has excellent hotel accommodations. Pop. (1890) 695.

Hot Springs: village; capital of Fall River co., S. D. (for location of county, see map of South Dakota, ref. 7–A); on Fall river, which here supplies excellent power for manufacturing purposes, and on the Burl. and Mo. Riv. and the Fr., Elk. and Mo. Val. railways; 75 miles N. of Deadwood, 513 N. W. of Omaha. It has 7 churches, public high-school building, cost $22,000, Black Hills College, a number of hot medicinal mineral springs, and 1 daily and 3 weekly newspapers. It is the trading-point for a large mining region, and the center of an extensive live-stock industry. It also has important lumber interests, and manufactures stucco. Pop. (1890) 1,423; (1895) 1,642.

EDITOR OF "STAR."

Hottentots, or **Nama** [Hottentot is from Dutch *Hottentot*, liter., *hot* and *tot*, an imitative word describing stammering, applied by the Dutch to the Hottentots in reference to the clicks or suction stop-sounds of the Hottentot languages]: aboriginal people of Africa, chiefly inhabiting the southwestern part of the continent as far N. as Damaraland. The first aborigines whom the whites met in what is now Cape Colony, they survived many persecutions, and number in that colony (census 1891) 50,388. They have merged with the Europeans, are useful as laborers, fishermen, and farmers, and many of them are voters. Large numbers of them, however, fled before the influx of the whites, and their descendants, greatly reduced by wars, lead the lives of nomads and hunters in Great Namaland (not Namaqualand). Their internal quarrels and wars with the Damara have reduced their number to less than 10,000. In war they are guilty of the most atrocious cruelties and the missionaries who have sought since the beginning of the nineteenth century to improve their condition have met with poor success. The origin of the Hottentots, in spite of much research, is still unknown. Light in color, they call themselves the Yellow People, and are disposed to look down upon all their black neighbors; but the Damara of the hills, a black and quite different people, speak their language with variations. The language includes a number of peculiar clicks, some of which the Kaffir or Bantu tribes of South Africa have adopted. The Bushmen dwarfs are sometimes erroneously included with the Hottentots. About 2,000 natives known as Bastards living in Great Namaland are descendants of Europeans and Hottentots. See Theal's *History of South Africa*; Olpp's *Angra Pequeña und Gross-Namaland* (1884) and *Erlebnisse im Hinterlande von Angra Pequeña* (1886); Schinz's *Deutsch-Südwest-Afrika* (1891); and Greswell's *Geography of Africa South of the Zambesi* (1892).

C. C. ADAMS.

Hottentot's Bread: a kind of yam (*Testudinaria elephantipes*, family *Dioscoreaceæ*) growing in South Africa. It is a beautiful vine, springing from the back of a large, rough, tortoise-like tuberous rhizoma, which grows half uncovered. The rhizoma affords starchy food.

Hottinger, hot'ting-er: the name of a family of Swiss scholars, the most prominent of whom were JOHANN HEINRICH, b. at Zurich, Mar. 10, 1620; studied at Groningen and Leyden; became Professor in Church History and Oriental Languages at Zurich 1642–55, and 1661–66, and Heidelberg 1655–61; and was drowned near the former city June 5, 1667. By his writings—*Thesaurus philologicus* (mainly archæological; Zurich, 1649; 3d ed., 1669); *Etymologicum Orientale* (Frankfort, 1661), etc.—he contributed very much to a better understanding and a more general study of the Semitic languages, and his numerous essays on the text of the Old Testament procured him a European celebrity. He also wrote *Historia Ecclesiastica* (Zurich, 9 vols., 1651–67).—JOHANN JAKOB, a son of the preceding, b. at Zurich Dec. 1, 1652; d. there Dec. 18, 1735, was Professor of Theology at the university of his native city from 1698. He wrote *Helvetische Kirchengeschichte* (Zurich, 4 vols., 1708–20), a work still appreciated.—JOHANN JAKOB, grandson of the preceding, b. at Zurich in 1750; d. there Feb. 4, 1819. He was Professor in Latin and Greek 1789–96, of Sacred Philology from 1796, and took part very actively in the great literary movement

in German Switzerland under the leadership of Bodner.—Johann Jakob, a nephew of the preceding; b. at Zurich, May 18, 1783; d. there May 18, 1860; wrote *Geschichte der Schweizer Kirchentrennung* (Zurich, 1825–29); *Huldreich Zwingli und seine Zeit* (1842; Eng. trans. by T. C. Porter, Harrisburg, Pa., 1856). Revised by C. H. Toy.

Hottonia: See Feather-foil.

Houdin, oo'dăn', Robert: conjurer; b. at Blois, France, in 1805; was apprenticed to a watchmaker at Paris; studied mechanics, and won a medal for his toys and automata at the Paris Exhibition of 1844. In 1845 he opened in the Palais Royal a series of *soirées fantastiques*, which he continued for ten years. In 1855 he retired to Blois with a large fortune; but in 1856 he went to Algeria on the invitation of the French Government, and entered into a competition in making miracles with the marabouts or priests. His success was complete, and he contributed much to the breaking down of the bad influence of these impostors on their superstitious countrymen. After his return he published his *Life* (1857) and his *Confidences* (1859). D. at Blois in 1871.

Houdon, oo'dōn, Jean Antoine: sculptor; b. at Versailles in 1740. He was the pupil of Pigalle and Stoldtz, and gained the great prize at the School of Fine Arts in Paris, which enabled him to remain in Rome from his twentieth to his twenty-seventh year. While a student in Rome he executed the *Statue of St. Bruno*, which stands in the vestibule or outer rotunda of Sta. Maria degli Angeli. His first important exhibited work was the *Morpheus* in the Salon of 1771. Benjamin Franklin invited him to go to the U. S., where he made the portrait-statue of Washington now in the State-house at Richmond, and probably also the bust of Lafayette. After his return to France, he was constantly employed upon important work until the Revolution, and was made a member of the French Institute in 1788. Bonaparte when first consul made him a member of the Legion of Honor, then newly established. D. in Paris, July 16, 1828. Besides the *Morpheus* and the *Washington* named above, Houdon was the author of the well-known seated *Statue of Voltaire*, now in the corridor of the Théâtre Français at Paris, the bronze *Diana* now in the Louvre, *Summer* and *La Frileuse* at the Montpellier Museum, and portrait-statues or busts of Louis XVI., the Comte de Provence, afterward Louis XVIII., the naturalist Buffon, d'Alembert, Mirabeau, Franklin, Napoleon, the Empress Josephine, and others. Russell Sturgis.

Houghton, hō'tăn: village; capital of Houghton co., Mich. (for location, see map of Michigan, ref. 1–E); on Lake Portage, an arm of Lake Superior, and on the Duluth, S. Shore and Atlantic and the Mineral Range railways; 90 miles N. W. of Marquette. It is the center of the greatest copper-producing region in the U. S., a region which in 1891 yielded 114,222,709 lb. out of a total of 284,119,764 lb., and a large part of the exports of copper is shipped from this port. Pop. (1880) 1,438; (1890) 2,062; (1894) 2,178.

Houghton, Henry Oscar: publisher; b. at Sutton, Vt., Apr. 30, 1823. After serving an apprenticeship in a printing-house at Burlington, Vt., he entered the University of Vermont, and graduated 1846; removed to Boston, where he worked as a compositor and as a newspaper reporter; in 1849 entered the firm of Bolles & Houghton, at Cambridge. After the retirement of Mr. Bolles in 1852 he removed the office to its present site, and established the Riverside Press. In 1864 he became a member of the firm of Hurd & Houghton, book publishers, now Houghton, Mifflin & Co. He has been mayor of Cambridge, and president of the Boston Master Printers' Club. D. at North Andover, Mass., Aug. 26, 1895.

Houghton, Richard Monckton Milnes, Baron: author; b. at Pontefract, Yorkshire, England, June 19, 1809; was educated at Cambridge, and was long an independent and moderately conservative member of the House of Commons; widely known as a poet and an elegant critic. In 1863 he was raised to the peerage. He published several volumes of poetry and travels, including *The Real Union of England and Ireland* (1845) and *Life of Keats* (1848). D. at Vichy, Aug. 11, 1885.

Houlton, hōl'tăn: town; capital of Aroostook co., Me. (for location of county, see map of Maine, ref 3–E); on the Canadian Pacific Railway; 190 miles N. E. of Augusta. It is in an agricultural and lumber region; has important manufactures; and contains the Ricker Classical Institute (Baptist, chartered 1847), Worden Hall, the gift of Judge William E. Worden, and a monthly and two weekly periodicals. Pop. (1880) 3,228; (1890) 4,015.

Houma, hoo'ma: town; capital of Terre Bonne parish, La. (for location of parish, see map of Louisiana, ref. 11–E); on the Terre Bonne bayou and the S. Pac. Railway; 70 miles W. S. W. of New Orleans. It is in an agricultural region, manufactures sugar and molasses, and besides those articles has an important trade in rice and corn. Pop. (1880) 1,084; (1890) 1,280.

Hound [O. Eng. *hund*: Germ. *hund*; cf. Sanskr. *ç ván-*, Gr. *κύων*, Lat. *canis*]: a term properly restricted to those dogs which hunt by following the track of the game by scent. This definition includes the bloodhound, staghound, foxhound, beagle, harrier, and a few others, but does not include the greyhound. Most hounds are muscular, strong, sagacious animals, with large pendulous ears. The more important varieties are described under their respective titles. See Dogs.

Hound-fish: a name given to some of the small species of sharks, such as the *Galeus mustelus*, or smooth hound-fish of European seas, 2 or 3 feet long, represented in American Atlantic waters by *G. canis*, a rather larger fish. These fishes have flat grinding teeth, adapted well to their food, which consists of crustaceans and mollusks. See Dog-fishes.

Hour [M. E. *houre* (with *h-* in imitation of Lat.), *oure*, from O. Fr. *ore*, *hore* (> Fr. *heure*), *ure* (whence Germ. *uhr*, watch, clock) < Lat. *hō'ra*, hour = Gr. *ὥρα*, hour, time, season: Goth. *jēr*, cogn. with Eng. *year*]: the twenty-fourth part of a day, or of the interval between two consecutive meridian passages of the mean sun (mean solar day), true sun (apparent solar day), or of a fixed star (sidereal day). As mean solar time is the legally recognized time according to which the affairs of business are regulated, and is the time kept by ordinary clocks and watches, the word *hour*, in its usual acceptance, is understood to signify a mean solar hour. As the mean solar meridian passage commonly divides the interval between sunrise and sunset unequally, clocks are sometimes, and for certain purposes, constructed to give apparent time. Such clocks are called equation clocks (see Equation of Time), and are designed to mark exactly twelve when the true sun is on the meridian. Astronomical clocks (so called), or the clocks of astronomical observatories, are regulated to sidereal time for convenience in recording right ascensions (which are measured in such time), or to facilitate the finding of celestial objects whose right ascensions are known. See Time.

Hour-glass: a contrivance much used before the invention and introduction into general use of clocks and watches, for the measurement of time. It consists of a hollow glass vessel blown into a form externally resembling the figure 8, or presenting the appearance of two spherico-conoidal bulbs united at their vertices. In the blowing, the contraction in the middle is such as almost to close communication between the bulbs. This passage is then smoothly drilled out, by passing the drill through the aperture left in the base in blowing; and a quantity of fine and dry sand is then introduced, sufficient to occupy an hour in running through this passage from one bulb to the other when the instrument is held in a vertical position. During the adjustment the external aperture is temporarily closed by a cork. After the adjustment this aperture should be sealed in such a manner as effectually to exclude moisture. The whole should then be protected by a surrounding frame. The hour-glass is by no means a very exact instrument. A perceptible difference will not unfrequently be observed between the times of running out, according as one or the other of the bulbs is uppermost. Temperature, moreover, affects its action; and in case of the absorption of moisture by the sand, in consequence of imperfect sealing, its irregularities are much increased. Half-hour glasses, minute-glasses, half-minute glasses, etc., are constructed on the same principle. The hour-glass is now rarely used, more accurate and convenient time-keepers having superseded it; but a glass running out in from fifteen to thirty seconds is still employed at sea to time the running of the log-line. Revised by S. Newcomb.

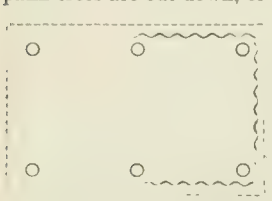
Houris, hoo'riz [Arabic, *huriya*, black-eyed "nymph of paradise"]: celestial and voluptuous beauties, whose never-palling companionship constitutes a part of the faithful Mussulman's reward and felicity in paradise. The person of each houri is composed of musk, saffron, incense, and amber. The radiance of her countenance would change the darkest

night into day, and her voice is the sweetest music. Each believer has as his portion seventy-two of these exquisite beings, always virgins, always young and free from any physical weakness or imperfection. The common Mussulmans accept these statements literally, but their more learned doctors often assert that the houris are but allegorical representations of the spiritual beatitude of the elect.

EDWIN A. GROSVENOR.

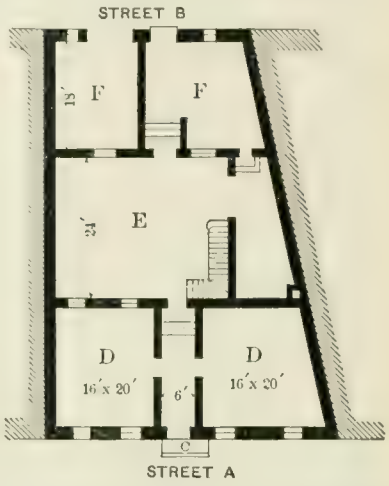
Housatonic (hoo'sa-tŏn-ik) **River**: a stream which rises by several head-streams in Berkshire co., Mass., flows S., and traverses the State of Connecticut, falling into Long Island Sound, in lat. 41 9 5 N., lon. 73 5 53 W. For 14 miles it is a tidal stream. It affords water-power for numerous manufactories, and its valley abounds in wild and beautiful scenery.

House: a dwelling; in a more extended sense, a building for some other purpose which is generally expressed, as a *banking-house*, a *house of prayer*. In its usual sense, as a *dwelling-place* for man, the word implies considerable size and permanence; thus an Eskimo *igloo* or a North American Indian *teepee* is not called a *house*, and even a small building with four walls and a roof is often called a *hut*, a *hovel*, or a *shanty* rather than a house. The large huts of the Kaffirs of South Africa and those of the Maoris of New Zealand often cover as much ground and are as high as most two-story six-roomed houses of towns in the U. S., but they are open within, and not divided except by low and movable screens; moreover, they are built of slight material, they have no windows and no chimneys in the modern sense, their only floor is the beaten earth, and for these reasons they are hardly called houses. Many families of Negroes in the West India islands, even in the close vicinity of the towns, have dwellings constructed in this way; six slender palm-trees are cut down, or a growing tree may replace one or another of these, the six trunks forming the main uprights of the structure. Other tree-trunks, or boards if obtainable, nailed or lashed together, or bamboos in one or two of the islands where these have been introduced from Asia, serve to span the spaces between the six uprights, and the whole parallelogram, perhaps 10 by 20 feet, is then roofed over with slender branches, or the like, and thatched with cocoanut-leaves, this roof having rather broad eaves, but of course no gutters. Then the spaces between four of the six uprights are inclosed with screen-work made of the stems of vines, etc., whatever the tropical vegetation offers most ready to the hand, and the dwelling is thus finished; for the cooking-place is a circle of stones entirely outside of and away from it, and there is no other floor than the pounded earth, or perhaps a bed of sand brought from the seashore. The hammocks are slung from one upright to another, either inside the screened part or in the open half, at pleasure; and in this way the typical primeval house of a warm climate is offered to the eyes of dwellers in modern towns. But, as has been said, it is generally the custom to call such a simple structure a *hut* or *cabin*. The requirements of men are always slow to pass beyond what this simple shelter affords. The *igloo* of the Eskimo differs from it only as the cold climate makes necessary; each dwelling in a communal house, as described below, affords about the same amount of convenience; the first step toward greater elaboration is generally in providing necessary huts for storage of provisions, or weapons and utensils, than in making the dwelling itself more convenient. Even when domestic animals have to be sheltered, it is usual to provide such shelter under the same roof with the family. The Scotch cottager of the time of Burns* divided the cow's room from the family's by a partition, while the French or German peasant of the same epoch kept his pigs or goats in a low cellar, and made his division by means of a floor. An obvious opportunity to use the space under the sloping roof caused another floor to be put in, resting upon the top of the walls, and the garret was created.



Many peoples in the condition of lower barbarism or of higher savagery have built their houses in closely connected masses, many dwellings forming one large structure. The term *communal dwellings* has been applied to these, and describes well enough the castle-like structures of Arizona, the long and narrow cabins, divided into compartments, of the Iroquois, whose collective title Knoshioni signifies *People of the long house*, or the houses on pillars of the Dyaks of Borneo, inhabited by scores of families. The common consent and the harmony needed for the building and maintenance of these form a very curious subject for the student of sociology.

But cellar and garret alike are the growth of a colder climate. In regions where men have little to fear from cold they live upon the surface of the ground. If we visit a town in the tropical region of South America, we find even large houses planned something as is this one, now existing in a city of Venezuela: Street B is on a higher level than street A, where the principal entrance C is, and the whole establishment conforms to the slope of the ground. The living-rooms D D are two or three steps above the street A, the open court E is two or three steps higher than D D, the stables and other offices, F F, are still higher, and finally you go up several steps more to the street B. The kitchen is a half-inclosed shed, and the eating-place is a corner of the court sheltered by an awning. There is a low upper story above D D. When the archæological student has become familiar with such houses as these, lived in by people of some means, he begins to understand better the house-plans of the ancients. These are to be studied in the books named below (see the bibliography), but they all have this peculiarity, that the principal rooms are directly on the ground. In the colder climate of parts of Italy, and especially in later times, the paved floor was sometimes supported above an air-space, but usually the pavement was laid, like that of a street, upon the soil itself.

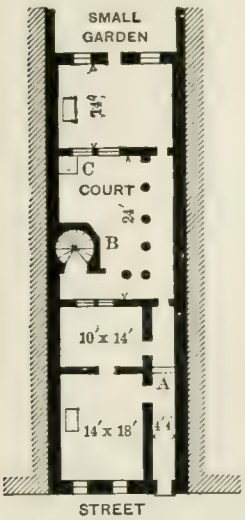


In the houses of Egyptians, Greeks, and Romans alike, light was admitted rather by means of a central roof opening than through windows in the outer walls. In the earliest buildings which we are able to study the living-room itself seems to have taken its light from the roof. In the small houses of early times this living-room was practically the house; in larger ones diminutive bedrooms and store-rooms opened into the large room; in still larger houses, and in later times, this sitting-room became a court, with the central roof opening enlarged, and the roofs in part pitched inward so as to throw rain-water into a cistern in the middle, while trees and flowering plants adorned its borders, and busts on pedestals and statues adorned this living-room become a handsome court. Again, in the villas of the rich, this *αὐλή* or *atrium*, with its adjoining rooms, was added to by a much larger open-air space, the *peristyle* with its garden; and summer-rooms freely opened upon this. Second-story rooms were very common, but they were not generally of great importance. Only in the crowded great cities, and notably in Rome, was the three or four story house in common use. There it took the place of the one-room and two and three room dwellings of which so many are found at Pompeii; space on the level street was lacking for these, and the apartment-house grew up to offer its rented tenements on higher levels. In these dwellings the window, as we understand it in modern times, must of course have been the usual means of receiving daylight; in better houses and in later times these were glazed, otherwise they were closed with shutters only, as so many windows in Italy, even in towns, were closed, down to the middle of the nineteenth century.

The houses of Damascus, Cairo, Algiers, Fez, and other towns of the warmer Mediterranean lands are not unlike the Roman country-house, except in the common adoption of the flat roof surrounded by parapets, and much used as a place for sleeping at night.

* See, for instance, Burns's poem, *The Cottar's Saturday Night*.

In spite of the example set by ancient Rome, however, the true modern European city-house, four or five stories high, many-windowed and steep-roofed, is the creature of the Middle Ages and of the populous walled cities of that stormy time. The admission of light at the roof was difficult in a rainy climate; accordingly, the central court became a mere yard, not used except as a yard, the windows of the rooms opening upon it being glazed and shuttered just like those in the street walls. But under these changed conditions the court continued in use. In a time of insufficient police and constant violence, even in the city streets, the doors and windows opening upon it might be much more freely used than those on the street front. Here is a plan of an unaltered German house of the fourteenth century in which the writer has lived. The only staircase is the spiral one B in a kind of tower on the court; this connects with an open corridor or cloister on each story, and the rooms all open upon that except the front room to which the passage A leads, this passage stopping at the dotted line on each of the upper floors, and the front room occupying the whole width of the house. The well is at C. The front room of the lowest story would have but a small window, and formidable iron bars to defend that, but for the stories above the windows could be generous. The exteriors of these houses were architectural efforts of a kind wholly unknown in antiquity; and this is one of many reasons why mediæval architecture is especially worthy of study by modern architects, as being that from which our own domestic and other exterior designers took their origin. The country-house of the Middle Ages was a very different thing from the city-house; indeed the country-house on the continent of Europe was fortified more or less, unless it were a very humble cottage. In England the country was more peaceful, except near the Scottish border, and the *manor-house* and the farm-house existed at least from the thirteenth century very much as they exist to-day. (See the bibliography below for examples.) The fortified dwelling, north or south, is a separate matter of study, and is treated under Castle, Fortress, and Military Architecture; but so much defense as is afforded by a moat filled with water and passed by a movable bridge is very common, even in English houses, and was not given up, even in the seventeenth century.



Modern house-architecture is a vast subject, and can not be treated properly in brief. This must be said, however, that the changed standard of comfort and the great advance in industrial resources have given to families who would have lived in huts or dark basements 100 years ago separate houses of four or six rooms, well lighted and easily warmed. This is a social advance of enormous importance, but with it has come inevitably a loss in architectural effect. It is impossible to design carefully and to build tastefully so vast a number of small houses run up together in the course of a few months. Moreover, the mechanical inventions that make such rapid house-building possible are opposed to all freedom of design, and are sufficient to prevent architectural effectiveness, in almost every instance.

Bibliography.—For ancient house architecture, see Maspero, *Archéologie Egyptienne*, and a translation by Miss A. B. Edwards; Murray, *Handbook of Greek Archæology*; Middleton, *The Remains of Ancient Rome* (2 vols.); Smith's *Dictionary of Greek and Roman Antiquities* (3d ed., 2 vols., article *Domus*); Moule, *Essay on the Roman Villas of the Augustan Age*. For the Middle Ages and later times, see Viollet-le-Duc, *Dictionnaire Raisonné de l'Architecture Française* (articles *Maison, Manoir, Château*); the same, *Histoire de l'Habitation humaine*; Verdier and Cattois, *Architecture Civile et Domestique* (2 vols. 4to); Scott, *Gothic Architecture, Secular and Domestic*; Niven, *Old Staffordshire Houses*; Adams, *Examples of Old English Houses and Furniture* (1888); Taylor, *Old Halls in Lancashire and Cheshire*; Corner, *Examples of Domestic Colonial Architecture in New England;* the same, *Examples of Domestic Colonial Architecture in Maryland and Virginia*; J. Parker and T. H. Turner, *Some Account of Domestic Architecture in England* (4 vols.). For the house architecture of non-European lands, see, beside books of travel, Lane, *Manners and Customs of the Modern Egyptians*; S. Lane-Poole, *The Art of the Saracens in Egypt*; Chamberlain, *Things Japanese*, s. v. *Architecture*; Morse, *Japanese Homes and their Surroundings*; Lockwood De Forest, *Indian Domestic Architecture*; and the *Dictionary of Architecture* of the Architectural Publication Society.

Russell Sturgis.

House-fly: the *Musca domestica* of Europe and probably of the U. S. (though it is not quite certain that house-flies of the two continents are identical in species); a very common household pest, breeding as a maggot in heaps of filth, upon which it feeds. It is regarded as a preventer of disease because it acts as a scavenger, and thus defers and distributes over much space and time the fermentation and destruction of organic substances. Flies are particularly abundant late in summer and early in autumn. They are generally most numerous near stables and ill-kept dairies, and their presence anywhere in numbers may be regarded as indicating possible danger to health from putrefying organic matter. Against the annoyance of flies cleanliness is the best preventive.

Household Suffrage: in Great Britain, the right of voting for members of Parliament granted to every male inhabitant of full age of a borough who has occupied for a year, either as owner or tenant, any dwelling-house within the borough or county and has paid the poor-rates. The same right is also extended to lodgers occupying lodgings of the clear yearly value, if let unfurnished, of £10 a year and upward.

House-leek: the *Sempervivum tectorum*, an herb of the order *Crassulaceæ*; a native of Europe, often cultivated in the U. S. It takes its trivial name from the fact that it is often set upon the roofs of cottages, where it grows well, propagating abundantly by offsets on short and thick runners, rarely flowering. As a remedy for bee-stings, slight burns, and the like, the bruised leaves are efficacious. The plant was once so highly esteemed as a cure for disease that Charlemagne by edict compelled his subjects to keep it in their houses and plant it on their roofs. The name house-leek is popularly applied to several other crassulaceous plants. In the U. S. the common kinds of house-leeks are called hen-and-chickens and Adam-and-Eve, from the habit of the parent plant of surrounding itself with offshoots. The plants are commonly used in carpet-bedding designs.

Revised by L. H. Bailey.

Housemaid's Knee [so called because it is said, though with little reason, to be most common among housemaids, who scrub stairs and floors upon their knees]: an acute or chronic dropsical effusion into the bursa before the knee-pan. It is easily diagnosticated, and does not communicate with the knee-joint proper. Acute cases may be cured by rest and the application of iodine, mercurials, and tight bandages; chronic ones by compression with suitable splints, or even by evacuation and injection of iodine solution into the sac.

Revised by William Pepper.

Houston: city (founded in 1836, became the capital of the republic of Texas in 1837); capital of Harris co., Tex. (for location, see map of Texas, ref. 5–J); on the Buffalo bayou, and the Gulf, Col. and S. Fé, the Hous. and Tex. Cent., the Hous. E. and W. Tex., the Int. and Gt. N.; the Mo., Kan. and Tex., the San Ant. and Aran. Pass, the S. Pac. and the Tex. W. railways; 55 miles N. W. of Galveston. By the bayou, which is navigable from the foot of Main Street and has been improved greatly by the U. S. Government, the city is directly connected with the Gulf of Mexico and the Atlantic Ocean. It thus has the double advantage of being an inland city with the commercial facilities of a seaport, and of being the center of railway systems aggregating nearly 7,000 miles in length. The bayou is here spanned by seven iron bridges. The direct commerce of the city by water in the year ending Sept. 30, 1892, was 396,473 bales of cotton and more than 20,000,000 lb. of miscellaneous freight. The city has gas and electric-light plants, 26 miles of electric street railway, 25 churches for white and 19 for colored people, 7 graded public schools for white and 6 for colored pupils, school property valued at $150,000 and additional buildings under construction to cost $64,000, and 4 daily, 7 weekly, and 4 quarterly periodicals. The system

of sewers has been extended to about 3 miles from the waterway, and vitrified brick paving has been introduced for street work. Three oil-mills, the machine and car shops of three railways, 4 cotton-compresses, 2 breweries, a car-wheel factory, a furniture-factory, and numerous smaller industries give employment to more than 5,000 persons. In 1893 the taxable property aggregated $25,000,000, and the municipal debt was $1,787,600. Pop. (1880) 16,513; (1890) 27,557; (1893) 58,513. EDITOR OF "POST."

Houston, DAVID CRAWFORD: engineer; b. in New York city, Dec. 5, 1835; graduated at the U. S. Military Academy 1856; was assigned to the Corps of Engineers with the rank of brevet second lieutenant, but retained at the Academy as Assistant Professor of Natural and Experimental Philosophy until Sept., 1857, when he was placed on construction duty at Hampton Roads, and subsequently at Sandy Hook. In the civil war he was engaged at Blackburn's Ford and Bull Run as engineer of Tyler's division; assistant engineer on defenses of Washington; chief engineer First Army-corps, department of the Rappahannock; of Third Army-corps at Cedar Mountain and second battle of Bull Run; of the First Army-corps at South Mountain and Antietam; of Department of the Gulf at the siege of Port Hudson, Red River campaign, etc.; brevet captain, major, lieutenant-colonel, and colonel for gallantry and meritorious conduct. From the close of the war he had charge of the defenses of Narragansett Bay, R. I., of Connecticut, and the inner harbor of New York, and of extensive river and harbor improvements in the Northwest, New England, and Southeastern New York. He became a member of the board of engineers for fortifications and river and harbor improvements in 1886, and colonel of engineers July 2, 1889. D. May 18, 1893.
Revised by JAMES MERCUR.

Houston, SAM: president of the republic of Texas; b. in Rockbridge co., Va., Mar. 2, 1793. On his father's death he went with his mother in destitute circumstances to Tennessee, then the verge of civilization. Here he received a scanty education, and spent most of his youth among the Cherokee Indians. During a portion of this period he served as clerk to one of the traders, and also taught a rustic school. In 1813 he enlisted as a private in the U. S. army, and served under Gen. Jackson in his famous campaign against the Creek Indians, winning the admiration and friendship of his chief by his gallantry in the engagement at Tohopeka, where he was dangerously wounded. At the conclusion of the war he had risen to the rank of lieutenant, but he resigned his commission in the army and took up the study of law at Nashville. His political career now began. After holding several minor offices he was sent to Congress from Tennessee in 1823, and continued a member of the House until 1827, when he was elected Governor of the State. In 1829 he married, but for reasons unknown to the public separated from his wife soon afterward. On account of the scandal which this occasioned he resigned his office, went to Arkansas and took up his abode among the Cherokees. He not long after became the agent of this tribe to represent their interests at Washington. On a first visit to Texas, just before the election of delegates to the convention called there to form a constitution preparatory to the admission of Texas into the Mexican union, he was unanimously chosen a delegate to that body. The constitution so formed was rejected by the Mexican authorities, and Texas was denied admission as a State into that union. Santa Anna, the president of the Mexican confederated republic, demanded of the Texans a surrender of their arms. Resistance to this demand was determined upon. A military force was organized, and Houston, under the title of general, was soon appointed commander-in-chief of it. He conducted the war which ensued with great vigor, and brought it to a successful termination by the battle of San Jacinto in Apr., 1836, in which Santa Anna was captured, and by which the independence of Texas as a separate republic was achieved. In Oct., 1836, Gen. Houston was inaugurated the first president of the new republic. On Dec. 29, 1845, Texas was admitted into the Union as one of the U. S., and Gen. Houston was elected as one of the two Texas members to the Senate of the U. S. This position he held for twelve years. In 1859 he was elected Governor of Texas, but being opposed to secession, which was favored by the majority, he resigned his office, and took no further part in public life. D. at Huntsville, Tex., July 25, 1863. See Williams, *Sam Houston and the War of Independence in Texas* (1893). A. H. STEPHENS.
Revised by F. M. COLBY.

Houtzdale: borough; Clearfield co., Pa. (for location of county, see map of Pennsylvania, ref. 4–D); on the Pennsylvania Railroad; 28 miles S. S. E. of Clearfield. It has large bituminous coal-mining interests and two weekly newspapers. Pop. (1880) 2,060; (1890) 2,231.

Hovedon, hŭv'dŭn, or hōv'dŭn, **Roger of:** an English chronicler who flourished in the twelfth century. The date of his birth and that of his death are not known, but he seems to have belonged at one time to the household of Henry II. His *Chronicle* begins where that of Bede ends, in 732, and breaks off abruptly at 1201; but only the last part, from 1192, has any original value. It was edited by Stubbs (4 vols., 1868–71).

Ho'venden, THOMAS: genre-painter; b. at Dunmanway, Ireland, 1840. He was a pupil of the Cork School of Art and National Academy, New York. He also studied in Paris; became National Academician 1882; a member of the Society of American Artists, 1881; and was a member of the American Water-color Society and of the Philadelphia Society of Artists. One of his most important works is *John Brown on the Morning of his Execution.* Killed near Norristown, Pa., Aug. 14, 1895. W. A. C.

Hovering Acts: legislative enactments by which a nation assumes a certain control over the operations of commerce for a greater distance than a marine league, which is the distance to which, by the generally accepted usage, the jurisdiction of a state extends over its coast sea. For revenue jurisdiction, however, Great Britain has extended this limit to 4 leagues, forbidding transshipment of foreign goods without payment of duty within that distance. This act was passed in 1736. A similar law was passed by Congress in the U. S. in 1797, the penalty for violation being forfeiture of cargo. These are both municipal statutes, claiming a more extensive jurisdiction than is customarily allowed, for revenue purposes only. From this point of view they have received judicial sanction. But their international basis rests upon the mere acquiescence of foreign states affected by them, upon the comity of nations rather than upon abstract right. T. S. WOOLSEY.

Hovey, hŭv'i, ALVAH, D.D., LL.D.: educator; b. at Greene, N. Y., Mar. 5, 1820; graduated at Dartmouth College, New Hampshire, 1844, and Newton (Massachusetts) Theological Institution 1848; was Baptist pastor at New Gloucester, Me., 1848–49; from 1849 to 1855 instructor in biblical literature at Newton Theological Seminary; from 1853 to 1855 Professor of Ecclesiastical History. Since 1855 he has been Professor of Christian Theology at same institution, and since 1868 president. He has published *Life and Times of Rev. Isaac Backus* (Boston, 1858); *State of the Impenitent Dead* (1859); *The Miracles of Christ* (1864); *Scriptural Law of Divorce* (1866); *God with Us* (1872); *Manual of Systematic Theology and Christian Ethics* (1877; Philadelphia, 1880); *Biblical Eschatology* (1888); *Studies in Ethics and Religion* (Boston, 1892); edited *The American Commentary on the New Testament* (7 vols., 1881–90; contributed the part on John's Gospel), etc. Revised by S. M. JACKSON.

Hovey, ALVIN PETERSON: soldier; b. at Mt. Vernon, Ind., May, 8, 1821; studied law and practiced his profession with success. During the civil war he was appointed major of Indiana volunteers, subsequently colonel, serving in the Southwest at Shiloh and Corinth; promoted to be brigadier-general of volunteers Apr. 28, 1862; commanded a division at the battle of Champion Hills, contributing largely to the success of that day; subsequently engaged in the Vicksburg campaign. He was breveted major-general of volunteers July, 1864; resigned Oct., 1865. In 1866 he became U. S. minister to Peru. He was elected member of Congress from Indiana in 1886, was nominated for its Governor by the Republicans Aug. 8, and elected Nov. 6, 1888. D. in Indianapolis, Ind., Nov. 23, 1891.

Hovey, CHARLES MASON: horticulturist; b. at Cambridge, Mass., Oct. 26, 1810. He was editor of Hovey's *Magazine of Horticulture,* which ran through thirty-four volumes, and was author of *Fruits of America,* a work issued in parts, reaching the third volume before it was finally discontinued. This work contains the best colored plates of American fruits which had been issued up to that time. Mr. Hovey was the originator of the Hovey strawberry, which marks the beginning of profitable strawberry culture in the U. S. D. at Cambridge, Sept. 2, 1887.—His brother, PHINEAS BROWN HOVEY (1803–85), also was prominent as a horticulturist. L. H. BAILEY.

Howard: city (founded in 1871); capital of Elk co., Kan. (for location of county, see map of Kansas, ref. 8–I); on the Elk river, and the Atchis., Top. and S. Fé Railroad; 76 miles S. of Emporia, 193 S. W. of Kansas City. It contains 6 churches, public-school buildings valued at $20,000, county buildings valued at $40,000, 2 national banks, and 2 weekly newspapers. It is in an agricultural, mineral, and stock-raising region. Pop. (1880) 683; (1890) 1,015; (1895) 1,063.

EDITOR OF "COURANT."

Howard, BLANCHE WILLIS: novelist; b. at Bangor, Me., July 16, 1847. She was educated in New York city, and in 1875 went to Stuttgart, Germany, and engaged in teaching and literary work. In 1890 she married Baron von Teuffel, a physician residing in Stuttgart. She has written *One Summer* (1875); *Aunt Serena* (1880); *Guenn* (1883); *Aulnay Tower* (1886); *The Open Door* (1889); and other works, chiefly novels, and in collaboration with William Sharp, the English author, *A Fellowe and his Wife* (1892).

H. A. BEERS.

Howard, BRONSON: dramatist; b. at Detroit, Mich., Oct. 7, 1842. He prepared for Yale at Russell's Military Academy in New Haven, Conn., but, owing to a failure of eyesight, gave up his college course and took up journalism. Between 1867 and 1872 he was connected with a number of newspapers in New York city, including *The Evening Mail*, *Tribune*, and *Post*. His plays, which have been popular both in the U. S. and in Great Britain, include *Saratoga* (1870); *The Banker's Daughter* (1878); *Young Mrs. Winthrop* (1882); *The Henrietta* (1887); *Shenandoah* (1889); and *Aristocracy* (1892).

H. A. BEERS.

Howard, CATHARINE: English queen; the fifth wife of Henry VIII.; b. in 1520; a daughter of Edmund Howard, third son of Thomas Howard, Duke of Norfolk. The king first saw her at a banquet given by the Bishop of Winchester in 1540. On July 9, 1540, he was divorced from Anne, and on Aug. 8 he married Catharine. The marriage at first was very happy. The queen understood how to dispel the gloom which gathered now and then in her husband's soul, and to manage the moroseness of his temper. But the happiness did not last more than a few months. Archbishop Cranmer communicated to the king the confessions of a certain Lascelles, according to which Derham and Mannock, two gentlemen in the service of the Duchess of Norfolk, had been Catharine's lovers before her marriage. The king at first refused to believe. Nevertheless, Derham and Mannock were seized and questioned. They confessed, and were executed. At last even the queen confessed. But as such a crime, committed before marriage, was not a sufficient reason of divorce, her conduct after marriage was subjected to a most rigorous scrutiny. Very suspicious circumstances came to light. She had taken Derham into her service after her marriage. Another of her former lovers, Thomas Culpepper, a relative of hers on her mother's side, she had admitted to her bed-chamber one night for several hours, no other being present than Lady Rochfort. After a full confession before the House of Lords she was convicted by attainder, and with Lady Rochfort was decapitated Feb. 13, 1542. See Froude, *History of England*, vol. iv.

Revised by C. K. ADAMS.

Howard, JOHN: philanthropist; a member of the Baptist denomination; b. at Hackney, near London, Sept. 2, 1726. From his father he inherited a considerable fortune, and he spent his youth in studying medicine and in traveling. Having settled at Cardington, Bedfordshire, in 1758, and having made himself conspicuous by his schools and model cottages for the peasantry, he was elected sheriff in 1773. On visiting the jails he became acquainted with the intolerable conditions under which prisoners lived; thus it often happened that a man spent several years in jail because he could not pay the jailer's fee for his deliverance, the jailer having no other salary than the fees he drew from the prisoners, but having a right to detain a prisoner until the fees due were paid. Howard then traveled through the whole kingdom, visited all its jails, and presented in 1774 a report to the House of Commons, the result of which was the passing of two reform bills. Next he went to the Continent, visited France, Germany, and Holland, examined their prisons, and published at Warrington, on his return in 1777, *State of the Prisons in England and Wales, with Preliminary Observations, and an Account of some Foreign Prisons*, to which he afterward added supplements, having made new travels and new researches (4th ed. London, 1792). The immediate result was the adoption, on trial, of the hard-labor system in some of the English prisons. The next five years of his life he spent in devising measures for the alleviation of the horrors of the plague. In 1785 he started on a new tour through Italy, Turkey, and Asia Minor, in order to make himself acquainted with the lazarettos, and on his return published, in 1789, *An Account of the Principal Lazarettos of Europe*. In order to push his researches into this subject still further, he started in the same year on a tour to Asia, but died Jan. 20, 1790, at Kherson, Russia. His *Correspondence* was published in London (1855), edited by Field. His *Life* was written by Hepworth Dixon (1849; 5th ed. 1854), and by Stoughton (1853; new ed. 1884).

Howard, JOHN EAGER: soldier; b. in Baltimore co., Md., June 4, 1752; served throughout the Revolutionary war with the greatest honor, and was present upon most of the important battle-fields of the war, attaining the rank of lieutenant-colonel, and receiving a medal from Congress for his valor at the Cowpens, Jan. 17, 1781. He was a member of Congress 1787–88; Governor of Maryland 1789–92; declined a position in Washington's cabinet in 1796; was U. S. Senator 1796–1803; in 1798 was appointed a brigadier-general by Washington; in 1816 was a candidate for Vice-President. D. at his residence, Belvedere, in Baltimore County, Oct. 12, 1827.

Howard, OLIVER OTIS, LL. D.: soldier; b. at Leeds, Me., Nov. 8, 1830; graduated at Bowdoin College 1850 and at the Military Academy 1854; appointed second lieutenant of ordnance; first lieutenant 1859; resigned 1861; appointed colonel of the Third Maine Volunteers June 4, 1861; was appointed brigadier-general of volunteers Sept., 1861; served in the Virginia Peninsular campaign 1862, and at the battle of Fair Oaks (June 1) was twice wounded, losing his right arm; was appointed major-general of volunteers Nov., 1862; was transferred with his command to Tennessee Oct., 1863; in 1864 was assigned to the command of the Fourth Corps, Army of the Cumberland, and in the July following to that of the Army of the Tennessee. He was appointed brigadier-general U. S. army Dec. 21, 1864; brevet major-general Mar. 13, 1865. Was commissioner of the Freedmen's Bureau 1865–74; was special commissioner to hostile Apaches 1872; and president of Howard University 1869–73. He was mustered out of volunteer service Jan. 1, 1869; was in command of Department of the Columbia Sept., 1874, to Jan., 1881, commanding the expedition against the Nez Percés under Chief Joseph, June to Oct., 1877, and in other Indian campaigns; and was superintendent of West Point Military Academy Jan. 21, 1881, to Sept. 1, 1882; commanding Department of the Platte 1882–86. He was appointed major-general in Mar., 1886, and became commander of the Division of the Atlantic in 1888. Retired 1894. He received the degree of A. M. from Bowdoin College 1853, and of LL. D. from Waterville and Shurtleff Colleges and Gettysburg Theological Seminary. He was made a chevalier of the French Legion of Honor 1884. He is the author of *Donald's School-days* (1879); *Chief Joseph, or the Nez Percés in Peace and War* (1881); and translator of a *Life of Count Agenor de Gasparin*.

Revised by JAMES MERCUR.

Howard City: village; Montcalm co., Mich. (for location of county, see map of Michigan, ref. 6–I); on the Det., Lans. and N. and the Gr. Rap. and Ind. railways; 33 miles N. of Grand Rapids. It is in an agricultural and lumber region, and has large lumber, shingle, and planing mills, furniture-factory, and weekly newspaper. Pop. (1880) 924; (1890) 1,137; (1894) State census, 1,391.

EDITOR OF "RECORD."

Howard University: an institution of liberal learning in Washington, D. C., established in 1867, primarily for the education of freedmen, and named in honor of Gen. O. O. Howard, then in charge of the Freedmen's Bureau. The value of the property is about $600,000. Pupils are admitted without distinction of sex or color. The institution is non-sectarian. Besides the college course the university includes dental, law, medical, normal, pharmaceutical, and theological departments. In 1896 the number of instructors was 62, of students 629. Rev. J. E. Rankin, D. D., LL. D., is president.

C. H. THURBER.

Howe, EDGAR WATSON: journalist and novelist; b. in Wabash co., Ind., May 3, 1854. He was a printer by trade, and in 1878 became editor of the Atchison *Daily Globe*. His *Story of a Country Town* (1882) was written at night after business hours, and received high praise from W. D.

Howells and other competent critics. It was followed by *The Mystery of the Locks* (1885); *A Moonlight Boy* (1887); and *A Man Story* (1888). H. A. Beers.

Howe, Elias: inventor; b. at Spencer, Mass., July 9, 1819; was the son of a farmer and miller; went in 1835 to Lowell, and worked there, and afterward in Boston, in machine-shops. In 1845 he completed a sewing-machine, and patented it in 1846, laboring with the greatest persistency, in spite of poverty and neglect, working for a time as an engine-driver on a railway for small wages and with broken health. He spent two years of unsuccessful exertion in England, striving in vain to bring his invention into notice. He returned to the U. S. in almost hopeless poverty, to find that his patent had been violated; but he at last found friends who assisted him with money, and after years of litigation he made good his claims in the courts in 1854. He afterward realized a large fortune from his invention. During the civil war he volunteered as a private of the Seventeenth Connecticut Volunteers, and served for some time. He received the cross of the Legion of Honor and many medals. D. in Brooklyn, N. Y., Oct. 3, 1867.

Howe, John: Puritan divine; b. in Loughborough, Leicestershire, England, May 17, 1630; completed his education at Cambridge and Oxford. After holding a rural curacy for several years, he was appointed (1654) domestic chaplain to Cromwell, a position he held until the death of the Protector (1658). He was an eloquent preacher, and universally esteemed for his ability and Christian character. He was the friend of Baxter, and labored in the same line with him for Christian unity. He was one of the leading controversialist writers of his day among the Nonconformist party, but free from all animosity and bitterness. D. in London, Apr. 2, 1705. His principal works are *The Oracles of God*, *The Living Temple*, *The Redeemer's Tears over Lost Souls*, and *The Blessedness of the Righteous*. Editions of his *Complete Works* have been issued at London, 1810–22 (8 vols.); *ibid.*, 1848 (3 vols.); *ibid.*, 1862–63 (6 vols.); and at New York, 1875 (2 vols.). The best biography is that of H. Rogers (London, 1836). Revised by S. M. Jackson.

Howe, Joseph: statesman; b. near Halifax, Nova Scotia, Dec. 13, 1804; was the son of John Howe, a journalist and a loyalist refugee from Boston in 1776. He was bred a printer, and in 1827 became connected with *The Acadian* newspaper, and in 1828 editor and proprietor of the *Nova Scotian*. As an outspoken Liberal and friend of responsible government he was involved in a vexatious libel suit and fought a duel with Mr. Haliburton. As a member of the Provincial Parliament, colonial agent in England, provincial secretary, etc., he was long one of the most prominent men in Nova Scotia, and was one of the founders of responsible government in the province. He was (1869–72) Secretary of State for the provinces in the Dominion Government, and superintendent of Indian affairs, and afterward became a member of the Dominion Parliament for Hants, Nova Scotia; was afterward lieutenant-governor of Nova Scotia. He published two volumes of *Speeches and Public Letters* (1858). D. at Halifax, June 1, 1873.

Howe, Julia (*Ward*): author; b. in New York, May 27, 1819. She was married in 1843 to Dr. S. G. Howe, the philanthropist, and was associated with him in editing the Boston *Commonwealth*, an anti-slavery journal. She has lectured on social subjects and preached in Unitarian pulpits. Her *Passion Flowers* (1854), *Words for the Hour* (1856), and *Later Lyrics* (1866) contain her most important lyric poems, the best known of which is the *Battle Hymn of the Republic*. *The World's Own* (1855) and *Hippolytus* (1858) are dramas. Among her other publications are *Modern Society* (1881); a *Life of Margaret Fuller* (1883); two volumes of travel, and many able papers upon social and philosophical subjects. She is an active worker in the woman's suffrage movement. Revised by H. A. Beers.

Howe, Richard, Earl: admiral; b. in England, Mar. 19, 1725; was the third son of the second Viscount Howe; studied at Eton and Westminster; became a midshipman under Anson 1739; post-captain for gallantry at Fort William 1745; captured Cherbourg and Martignan 1758; succeeded his brother as viscount (Irish peerage) 1758; defeated Conflans 1759; treasurer of the navy 1765; rear-admiral of the blue, with chief command in the Mediterranean, 1770; with William Howe, his brother, was appointed commissioner to avert the war in the American colonies 1776; fought d'Estaing off Rhode Island 1778; became admiral and viscount in the British peerage, by creation, 1782; relieved Gibraltar in 1782; first lord of the admiralty 1783; created earl 1788; took command of the Channel fleet 1793; defeated the French off Brest 1794; K. G. and general of marines 1795. D. in London, Aug. 5, 1799.

Howe, Timothy Otis: U. S. Senator; b. at Livermore, Me., Feb. 24, 1816; received an academic education; adopted the profession of law and was admitted to the bar; member of State Legislature 1845; removed to Wisconsin late in 1845, and in 1850 was elected judge of the circuit and supreme courts of Wisconsin, which position he held until 1855, when he resigned. He was chosen U. S. Senator for Wisconsin in 1861, and twice re-elected; was Postmaster-General 1881–83; and delegate to the international monetary congress in 1881. D. at Kenosha, Wis., Mar. 25, 1883.

Howe, Sir William, Viscount: soldier; b. Aug. 10, 1729; brother of Richard, Earl Howe; studied at Eton; entered the Dragoons; served at Quebec under Wolfe; colonel of the Fourth Foot 1764, and major-general 1772; took the chief command in North America 1775, after Gage's departure, Howe having previously commanded at Bunker Hill; evacuated Boston Mar., 1776; went to Halifax, and thence to Staten Island; gained the battle of Long Island Aug. 27; occupied New York Sept. 15; won the victory of White Plains Oct. 28; of Fort Washington Nov. 16; of Brandywine Sept. 11, 1777; occupied Philadelphia Sept. 26; repulsed Washington at Germantown Oct. 4; was superseded by Sir H. Clinton in 1778; returned to England, where his conduct was vindicated after a parliamentary investigation; became a lieutenant-general 1782; general 1786; succeeded to the Irish peerage as viscount 1799. D. July 12, 1814.—The families both of Earl and Viscount Howe are extinct, those who bear the title of Earls Howe being of the Curzon family, ennobled in 1788 and raised to the earldom in 1821.

Howell: village; capital of Livingston co., Mich. (for location of county, see map of Michigan, ref. 7–J); on the Detroit, Lans. and N., and the Tol., Ann Arbor and N. M. railways; 33 miles E. S. E. of Lansing, 50 miles N. W. of Detroit. It is in an agricultural region, manufactures foundry and machine-shop products, condensed milk, flour, and doors and sashes, and has three weekly newspapers. Pop. (1880) 2,071; (1890) 2,387; (1894) 2,560.

Editor of "Livingston County Republican."

Howell, David, LL. D.: jurist; b. in New Jersey, Jan. 1, 1747; graduated at Princeton College in 1766, and soon removed to Rhode Island. At the age of twenty-three he was appointed Professor of Natural Philosophy and Mathematics, and filled the chair of Law at Brown University from 1790 to 1824. In the interval he filled the several offices of attorney-general of the State, judge of the Supreme Court, member of the Continental Congress, commissioner for settling the eastern boundary of the U. S., and district attorney, and was subsequently district judge for Rhode Island till his death. D. in July, 1824.

Howell, James: author; b. probably in Wales in 1595; d. in 1666. He was educated at Oxford, was a member of Parliament, was imprisoned during the civil war, and received at the Restoration the post of historiographer royal. He was the author of over forty works on various subjects, the most important being *Epistolæ Ho-Elianæ*, *Familiar Letters, Domestic and Foreign, divided into sundry sections, partly Historical, partly Political, partly Philosophical*, which reached eleven editions. Revised by H. A. Beers.

Howell, John Cumming: rear-admiral; b. in Philadelphia, Nov. 24, 1819; entered the U. S. navy as a midshipman June 9, 1836; was executive officer of the steam-frigate Minnesota at the battle of Hatteras Inlet, which resulted in the capture of Forts Hatteras and Clark, and commanded the Nereus in both the Fort Fisher fights; from 1868 to 1870 chief of staff of the European fleet; from 1870 to 1872 commandant of navy-yard at League island, Philadelphia; from 1872 to 1874 commandant of navy-yard at Portsmouth, N. H.; in Sept., 1874, appointed chief of the bureau of yards and docks; retired Nov. 24, 1881. D. Sept. 12, 1892.

Howells, William Dean: author; b. at Martinsville, Belmont co., O., Mar. 1, 1837. In 1840 his father, who was a printer, removed to Hamilton, O. Mr. Howells learned the printer's trade of his father, and was afterward editorially connected with the Cincinnati *Gazette* and the *Ohio State Journal*. He was U. S. consul at Venice 1861–65, and was editor-in-chief of *The Atlantic Monthly* 1871–81. He is one of the most facile and readable authors of our

time, a graceful poet, and a writer of dainty, elegant prose. Among his works are *Poems of Two Friends* (written with J. J. Piatt, 1860); *Venetian Life* (1866); *Italian Journeys* (1867); *No Love Lost* (1868); *Suburban Sketches* (1868); *Their Wedding Journey* (1871); *A Chance Acquaintance* (1873); *A Foregone Conclusion* (1874); *Out of the Question* (1876); *A Counterfeit Presentment* (1877); *The Lady of the Aroostook* (1878); *The Undiscovered Country* (1880); *Dr. Breen's Practice* (1883); *A Modern Instance* (1883); *The Rise of Silas Lapham, Tuscan Cities* (1885); *Indian Summer* (1886); *Modern Italian Poets* (1887); *A Hazard of New Fortunes* (1889); *The Shadow of a Dream* (1890); *An Imperative Duty* (1891); *The Coast of Bohemia* (1893); *Impressions and Experiences* (1896). He has also written some minor dramas, such as *The Parlor Car, The Sleeping Car, The Elevator, The Register*, remarkable for their elegant dialogue and exquisite humor. He became the occupant of "The Editor's Study" of *Harper's Magazine* in 1886, retaining the position till 1892. During 1892 he was editor of *The Cosmopolitan.* Revised by H. A. Beers.

Howitt, Mary: author; wife of William Howitt; b. at Uttoxeter, England, Mar. 12, 1799, the daughter of a Mr. Botham, a Quaker; was married in 1823. She wrote many poems, hymns, and ballads, some novels, and instructive books for the young; translated Miss Bremer's works and some of those of H. C. Andersen, and was with her husband joint author of *The Literature and Romance of Northern Europe* (1852), etc. D. in Rome, Jan. 30, 1888.

Howitt, William: author; b. at Heanor, England, in 1795, of Quaker stock; in 1847 he left the Society of Friends, having become a Spiritualist. His first books were written partly by his wife, Mary Howitt. He also published a *History of Priestcraft* (1834); *Rural Life in England* (1837); *Student Life in Germany* (1841); *Rural and Domestic Life in Germany* (1842); *Land, Labor, and Gold* (1855), an account of his experiences in Australia; *History of England* (1854–61); and translations from the German. D. in Rome, Mar. 3, 1879.

Howitzer [deriv. of earlier *howitz*, howitzer, from Germ. *haubitze*, for earlier *haubnitze*, from Bohem. *haufnice*, catapult, howitzer]: a short cannon for firing shells *horizontally*, differing in this from the *mortar*, which is used for *vertical fire*. Guns of a construction similar to the howitzer, and used for firing stone projectiles, are described by military historians as used in the fifteenth century. Upon the successful manufacture of shells by the Dutch artillerists in the sixteenth century the howitzer was naturally developed from the mortar, and soon became of general use, except by the French, who, considering it of small value because of the short range and inaccurate fire, did not introduce it in large numbers into their service until about 1799. The howitzer was made with a chamber for the powder (of smaller diameter than the bore), and with a length of bore regulated to admit of the shell being reached by the hand, to adjust the fuze in the axis, after the gun was loaded. After the adoption of the *sabot* (a block of wood to which the shell is attached) this could be secured in long guns, and the howitzers for field and garrison service were then made of greater length and came into universal use. The siege howitzer, generally of 8-inch diameter, is still made short, as the sabot can not be safely used if the gun is fired over advanced parties, as is necessary in siege firing. The first cannon cast by the colonial authorities of America were 8-inch and 24-pounder brass howitzers, some of which are now preserved. The Russians in 1777 introduced the *licorne*, an improved howitzer. Smooth-bore howitzers, except for siege and mountain service, were displaced in the U. S. by guns equally suitable for shell-firing in field or garrison service, but with the general introduction of breech-loading cannon, rifled howitzers, especially of large calibers, have come into general use, and constitute an important part of modern artillery.

Revised by James Mercur.

Howlan, George William: Canadian statesman; b. in Waterford, Ireland, May 19, 1835; was brought up in Prince Edward Island, whither his parents had emigrated in 1839. He is a merchant, vice-consul for Sweden, Denmark, and Norway, vice-president Dominion board of trade, and a governor of Prince of Wales College. He was a member of the executive council of Prince Edward Island 1866–73; a delegate to Washington on trade matters in 1869; to Ottawa in 1873 to settle terms of union with Canada; and became a member of the Dominion Senate in 1873.

Neil Macdonald.

Howland, Sir William Pearce: Canadian statesman; b. in Paulings, Dutchess co., N. Y., May 29, 1811; educated at Kinderhook, N. Y.; removed to Canada in 1830, and was long prominent in trade. He represented West York in Canada Assembly 1857–67, and same constituency in Dominion Parliament 1867–68; was Minister of Finance 1862–63; Receiver-General 1863–64; Postmaster-General 1864–66; Minister of Finance 1866–67; Minister of Inland Revenue 1867–69; and lieutenant-governor of Ontario 1868–73. He was a delegate to Washington respecting reciprocal trade in 1866; to the London colonial conference 1866–67; and was knighted in 1879. Neil Macdonald.

Howling Monkey: a name given to South American monkeys of the genus *Mycetes*, from the hideous howls they utter, especially at night. In these animals the body of the hyoid bone is expanded into a large deep cup, which communicates with the larynx and acts as a resonator. It is very much larger in the males than in the females. The howling monkeys have long hair, strong, prehensile tails, and well-developed thumbs. They are the largest of the South American monkeys. There are ten or a dozen species, but there seems to be considerable individual variation and in at least one case the sexes are very different in color. The most common species are the ursine howler, or *araguato* (*Mycetes ursinus*), which is blackish or dark brown, washed with yellow, and the golden howler (*M. seniculus*), which is of a rich chestnut red, yellow on the back. F. A. Lucas.

Howman, John: See Feckenham.

Howrah: a city of Bengal, British India; on the right bank of the Hughli, opposite Calcutta (see map of North India, ref. 8–I). It is the industrial suburb of this metropolis, and is the terminus of the great railway system from the W. In 1785 it was a small village, but in 1891 the population was 129,800. M. W. H.

Howson, John Saul, D. D.: ecclesiastic and author; b. at Giggleswick, Yorkshire, May 5, 1816; graduated with high honors at Cambridge in 1837; was ordained in 1845, and was principal of the Liverpool College 1849–65; vicar of Wisbech 1866–67; Dean of Chester 1867; became examining chaplain to the Bishop of Ely, and with W. J. Conybeare he published (in London, 1850–52) *The Life and Epistles of St. Paul*, furnishing most of the geographical and historical matter. He also published *The Character of St. Paul* (1862; 4th ed. 1884); *The Metaphors of St. Paul* (1868); *The Companions of St. Paul* (1871). Dean Howson delivered the Bohlen lectures for 1880 at the Church of the Holy Trinity, Philadelphia, on *The Evidential Value of the Acts of the Apostles*, which were published in New York the same year. His later days were devoted to the effort to restore the fabric of Chester Cathedral, under the shadow of the walls of which he and his wife are buried. D. at Bournemouth, Dec. 15, 1885. Revised by W. S. Perry.

Hoyle, Edmond: writer on games; b. in 1672. He is said to have been called to the bar, but little is known of his life. He gave lessons in playing whist and other games, and was the first to write scientifically on any card game. Author of *A Short Treatise on the Game of Whist* (London, 1742; 15th ed. 1770), and of works on other games, most of which were incorporated with the first after its seventh edition. D. in London, Aug. 29, 1769. Innumerable editions of works on games have since been issued under Hoyle's name both in Great Britain and the U. S., and "according to Hoyle" is in card-playing almost synonymous with "according to the rules of the game."

Hoyt, Arthur Stephen, D. D.: Presbyterian minister and educator; b. in Meridian, N. Y., Jan. 3, 1851; graduated at Hamilton College 1872; was instructor in Robert College, Constantinople, 1872–75; and graduated at Auburn Theological Seminary in 1878. Then he was pastor in Oregon, Ill., seven years; professor in Hamilton College six years, at the head of the department of Logic, Rhetoric, Elocution, and English Literature; and in 1891 became Professor of Sacred Rhetoric and Pastoral Theology in Auburn Seminary.

Willis J. Beecher.

Hoyt, John Wesley, M. D., LL. D.: educator; b. in Franklin co., O., Oct. 13, 1831; educated at Ohio Wesleyan University and in the Law and Medical Schools of Cincinnati, O.; professor at Antioch College, Ohio, 1855–57, and in Cincinnati College of Medicine 1852–57; editor of *The Wisconsin Farmer* 1857–67; secretary and manager of Wisconsin State Agricultural Society 1860–72; vice-president of U. S. Agricultural Society; Wisconsin commissioner to

London Exhibition of 1862; U. S. commissioner to Paris Exposition 1867; U. S. commissioner to Vienna Exposition of 1873; president international jury for education 1873; knighted in 1874 by Emperor of Austria for services in interest of industry and education; secretary and acting chairman of board of centennial judges for education and science; he was Governor of Wyoming Territory 1878–82; in 1887 was chosen president of Wyoming University; author of report on *Resources and Progress of Wisconsin*, and of report to Secretary of Interior on the *Resources, Condition, and Progress of Wyoming Territory* (1879), etc.

Hoyt, Wayland, D. D.: minister and author; b. at Cleveland, O., Feb. 18, 1838; educated at Madison University, Brown University (where he graduated in 1860), and Rochester Theological Seminary (1863). His principal pastorates have been at Pittsfield, Mass., 1863, Ninth Street Baptist church, Cincinnati, O., 1864; Strong Place church, Brooklyn, 1876; Memorial church, Philadelphia, 1882; and at the First Baptist church, Minneapolis. He has published *Hints and Helps for the Christian Life* (New York, 1880); *Present Lessons for Distant Days* (1881); *Gleams from Paul's Prison* (1882); *Along the Pilgrimage* (Philadelphia, 1884); *The Brook in the Way* (1886); *Saturday Afternoon* (1890); *Light on Life's Highway* (1890); besides numerous newspaper and review articles. W. H. Whitsitt.

Hrotsvitha, or **Roswitha**: mediæval German poetess and dramatist. Born probably soon after 930, of noble Saxon family, she entered young the convent Gandersheim, then under the immediate patronage of the new Saxon royal family. There under the Abbess Wendilgard and her successor Gerberg, niece of Otto I., and guided also by the learned nun Riccardis, she received an extended education, both in sacred and profane literature. The account she gives us of the intellectual activity of these women is highly interesting and important for the history of European culture. The result of her association with them and of her own studies was that first among women of the Germanic race she felt the need of literary expression, and produced works of literary art. In spite of the primitive condition of letters in her time she displays a talent genuine, original, and essentially feminine—that is, she has the enthusiasms of a woman, and her mind dwells upon the questions which must always engage women. It is not life as a whole that interests her, but the life of woman as disturbed and perplexed by the presence of man. To be sure, her solution of the problem is the common mediæval theory of monastic asceticism; but there appears in what she writes something more than a conventional acceptance of this theory. For her it is the ideal that best meets the needs of those who suffer and are perplexed. Her poetical works, collected and arranged by herself, are divided into three books, each prefaced by a kind of personal introduction. The first contains eight legends, and was completed, or at any rate given to the world, after 962. Several of these legends have great interest for the literary historian. The first, entitled *Maria*, is the first complete poetical version of the first part of the apocryphal gospel of the Pseudo-Matthew (Cynewulf had used part of it in his *Christ*), later so common. The fifth is the first poetical version of the mediæval form of the Faust legend, *Lapsus et conversio Theophili vicedomini*. The last is the pathetic tale of the passion of St. Agnes. In book ii. we have those works of Hrotsvitha that have attracted most attention—her dramas. There are six of these, commonly known by the names of the chief personages of each—*Gallicanus*, *Dulcitius*, *Calimachus*, *Abraham*, *Paphuntius*, *Sapientia*. They are the first attempts at the regular drama known to us after the fall of the Roman empire. They were not, however, intended for the stage, but for reading. As the writer tells us, she was led to undertake them by seeing how popular the immodest plays of Terence were among her contemporaries. Accordingly, she imitated him (*non recusavi illum imitari dictando*), as well as she could, in the pleasantness of his manner, but chose subjects as she believed of an edifying kind. In fact, her theme is almost always the conflict of ascetic purity with lust. Her sources are the pious legends current in the Middle Ages, and her object is always clearly moral. She permits herself, however, probably in imitation of Terence, a freedom of expression, and even of comic situation, that accords ill with her professed purpose. The character of her own mind and interests is everywhere visible. It is not without significance, for example, that two of the plays—the *Abraham* and the *Paphuntius*—deal with the subject of *La Dame aux Camélias*, i. e. the conversion of lost women. Finally, book iii. of the works is taken up by two narrative poems of a very different character. The first, which connects itself with the imperial ideals and achievements of the Ottos, and was written between 962 and 967, is called *De gestis Oddonis I. imperatoris*, and is both poetically interesting and extremely valuable as an historic document. The second is devoted to the story of Hrotsvitha's own dearly loved convent, Gandersheim, and is entitled *De primordiis cœnobii Gandersheimensis*. Hrotsvitha is believed to have died about 975. See her works, ed. Barack (Nuremberg, 1858); *Hrotsvithæ Gandersh. Comoedias VI.*, ed. Bendixen (Lübeck, 1857); Köpke, *Hrotsuit von Gandersheim* (*Ottonische Studien*, Theil ii., Berlin, 1869); Magnin, *Hrosvita* (*Revue des deux Mondes*, séries 4, t. 20); Ebert, *Literatur des Mittelalters* (Bd. iii., s. 285 ff., Leipzig, 1887); *Studien und Mittheilungen aus dem Benediktiner- und Cistercienser-Orden*, Jahrg. 5 (German trans. by Bendixen, Altona, 1853; French trans. by A. Magnin, 1835). A. R. Marsh.

Huacas: See Incan Antiquities.

Huaina Capac, wăă-ee'năă-kăă'păăc (also written Huayna Capac, or Ccapac): the eleventh and one of the greatest of the Inca rulers of Peru. His reign began in 1480 (other accounts say in 1491) and was prosperous throughout. He completed and consolidated the immense conquests of his father, Tupac Inca Yupangui, defeated the armies of Quito in a sanguinary battle, and carried his arms far south into Chili; the Inca empire thus attained its greatest extent and glory. D. at Quito, Dec., 1525. His domains were divided between his two sons, Huascar and Atahualpa. H. H. S.

Huallaga, wăă-laa'găă: a river of Peru; a southern branch, or, as some geographers regard it, the head of the Amazon; rising in a swamp on the side of the Pucayaco Mountains, about a mile N. of Cerro de Pasco, and nearly 15,000 feet above the sea; flowing with many curves, but in a general northerly direction, to its confluence with the Marañon in 5° 6′ 20″ S. lat. and 75° 34′ 50″ W. lon.; length along the main curves, 700 miles. In its upper course it is a mountain torrent; nearly everywhere it is bordered by luxuriant forests, and the whole valley is one of the most rainy regions in the world. The Huallaga is navigable for river-steamers to the Pongo de Aguirre, 285 miles from the mouth, and canoes ascend to Tingo Maria, 40 miles farther. During its annual floods the river attains 40 feet above low-water mark. At its mouth it is nearly a mile wide. It receives numerous affluents. There are a few settlements near the head and mouth. The Huallaga has been explored by Smyth (1835), Herndon (1851), Spruce (1855–56), Tucker (1873), and others. See Herndon, *Valley of the Amazon* (1853); Wertheman in the *Zeitschrift* of the Berlin Geographical Society (1880); *Proceedings of the Royal Geog. Soc.* (1872, p. 271). Herbert H. Smith.

Huamanga, or **Guamanga**, goo-aa-maan'găă: the name, until 1825, of the Peruvian department and city now called Ayacucho (*q. v.*). It was in this city that Gen. Sucre, in command of the armies of Colombia and Peru, defeated the Spaniards Dec. 9, 1824, and thus put an end to Spanish dominion in America.

Huamantla, wăă-maant'lăă: a town of the state of Tlascala, Mexico; on the railway from Vera Cruz to Mexico city; 161 miles from the former city, and 8,163 feet above the sea (see map of Mexico, ref. 7–H). It is in a mountain valley, surrounded by magnificent scenery, and almost at the culminating point of the railway; the climate is cool—sometimes cold in the winter months—and very pleasant. The valley and vicinity form a rich agricultural district, the principal product being maize. Huamantla was founded in 1534. Pop. about 8,000. H. H. S.

Huananica: See Ica.

Huancavelica, wăăn-kăă-vā'lĕĕ-kăă (incorrectly written Guancavelica): a central department of Peru; bounded N. W. by Lima and Junin, E. by Ayacucho, and S. by Ica. Area, 15,043 sq. miles. It is crossed by the main Cordillera, and the whole surface is cut up by branches of that chain; there is little good agricultural land; the climate, even in favored places, is cold and disagreeable, and the mountain roads are the worst in Peru. But this department is probably the richest in the country in minerals, embracing deposits of gold, silver, cinnabar, copper, iron, and, it is said, lead and coal. Owing to their inaccessibility (often near the limit of perpetual snow) and to want of capital and modern appliances, only a few of the mines are

worked, the most important being those of Castrovireyna, on the west side of the Cordillera (silver). Pop. (1876) 104,-155; probably little more in 1893. Huancavelica, the capital and largest town, is on the east slope of the Cordillera, 12,460 feet above the sea (see map of South America, ref. 5–B). It owes its existence to the quicksilver mines, formerly of great importance, but now nearly abandoned. The climate is cold, variable, and very disagreeable. In the vicinity are hot springs. Pop. about 3,000. H. H. S.

Huancayo, waän-kī'yō: a city of Peru, in the southwestern part of the department of Junin; in the valley of Xauxa; 187 miles E. of Lima, and 10,880 feet above the sea (see map of South America, ref. 5–B). It is noted for the constituent congress which assembled there in 1839, and on Nov. 10 promulgated the constitution known as that of Huancayo. This was in force in Peru until Nov. 25, 1860, when it was supplanted by the present constitution. Pop. about 5,000. H. H. S.

Huánuco, waa'noo-kō: a department of Peru; bounded N. and E. by Loreto, S. by Junin, and W. by Ancachs. Area, 23,791 sq. miles. In general the western part is very mountainous; the eastern part is lower, subsiding to the plains of the Ucayali. The Andean chain called the Cordillera of Peru, and its branch, the Eastern Cordillera, cross the department from S. to N., in the western part; between them the upper Huallaga (*q. v.*) passes. W. of the Andes is Lake Lauricocha, the head of the Marañon, or Amazon; and E. of the Eastern Cordillera numerous streams flow to the Ucayali. This eastern region is warm and very rainy, and is covered in great part with matted forests, but interrupted by the open Pampas del Sacramento. The mountain region has no forest except on the lowest eastern slopes, and most of it is cold and sterile; but it is known to be rich in gold, silver, quicksilver, and other minerals, now little worked. Nearly all the scanty population (about 80,-000) is in this part; the forest plains are inhabited only by roving Indians. The department was created in 1871 from a part of Junin. Huánuco, the capital, near the upper Huallaga, is 5,945 feet above the sea (see map of South America, ref. 4–B). It was founded about 1543, is the seat of a bishopric, and up to 1855 was the capital of the department of Junin; most of the older buildings are falling to ruins. Estimated pop. (1889) 7,500. The still older Huánuco Viejo, 35 miles to the W. of it, originally an Inca town, settled by the Spaniards in 1535, has some remarkable remains of Inca architecture. It is now nearly abandoned. H. H. S.

Huaras, waa'räz, or **Huaraz**: capital and largest city of the department of Ancachs, Peru; on a plain on the right bank of the river Huaras; 9,931 feet above the sea (see map of South America, ref. 4–B). A railway, following down the river valley 165 miles, connects it with the port of Chimbote, and is the outlet of an important agricultural and mining district; there is a large trade in transit with the interior. Wheat and maize are extensively cultivated in the vicinity. Huaras is one of the older Spanish towns of Peru, and the streets though regular are narrow. The climate is delightful throughout the year, but the water in use is said to be unwholesome. Estimated pop. (1889) about 17,000. H. H. S.

Huascar, waas'kaär: Inca sovereign of Peru; b. probably at Cuzco about 1495. He was the son and legitimate heir of Huaina Capac. By the will of his father, or for other reasons now unknown, he inherited only the southern part of the empire, beginning his reign at Cuzco in Dec., 1525; his illegitimate brother, Atahualpa, retained the province of Quito. War broke out between the two and lasted several years; Huascar was finally defeated and captured in 1532, and the whole empire fell into the hands of the conqueror. Shortly after Pizarro landed in Peru and seized Atahualpa. The latter feared that the Spaniards would interfere in favor of his captive brother, and by his secret orders Huascar was drowned at Andamarca, Jan., 1533. H. H. S.

Huastecas: See Indians of Central America.

Huaylas, waä-ee'läs: a Spanish *intendéncia* of Peru, afterward a department, but now called Ancachs (*q. v.*).

Hubbard, Joseph Stillman: astronomer; b. at New Haven, Conn., Sept. 7, 1823; graduated at Yale College in 1843. In 1844 he was appointed an assistant in the High School Observatory at Philadelphia, then in charge of the distinguished astronomer, Sears C. Walker. The next autumn he was employed by Capt. (afterward Maj.-Gen.) Fremont to reduce his Rocky Mountain observations, and was invited to accompany him on his next expedition. Declining this offer, he was appointed and commissioned a Professor of Mathematics in the U. S. navy May 7, 1845, at the instance of Fremont and Senator Benton, and was at once assigned to duty in the Naval Observatory at Washington, where he remained until the time of his death. He soon acquired a brilliant reputation, and the printed volumes of the Washington observations are full of the evidences of his skill as an observer and computer. He was a frequent contributor to *The Astronomical Journal*, which contains his elaborate investigations on Biela's comet, as also those on the great comet of 1843, on the orbit of Egeria, and on other subjects. D. at New Haven, Aug. 16, 1863.

Hubbard, William: clergyman and author; b. in Tendring, Essex, England, in 1621; went in 1635 to New England; graduated at Harvard College 1642; was minister of Ipswich, Mass., 1658–1703; temporary president of Harvard University in 1688. D. at Ipswich, Sept. 14, 1704. Author of *The Present State of New England* (London, 1677; n. e. with *Life*, Roxbury, Mass., 1865); *Memoirs of Maj.-Gen. Denison* (1684); and a *General History of New England from the Discovery to 1680*, for which the colonial authorities paid him £50. An edition of this work was printed in Cambridge, Mass., for the Massachusetts Historical Society in 1815; 2d ed. 1848. Revised by S. M. Jackson.

Huber, ü'bär', François: entomologist; b. at Geneva, Switzerland, July 2, 1750; d. at Pregny, near Geneva, Dec. 22, 1831. Inheritance and education combined to awaken early in him a passion for natural history, but intense application and study at night brought on ophthalmia, and at the age of seventeen he became totally blind. At an early age he married Marie Aimée Lullin, and by her devoted aid and that of an intelligent servant, François Burnens, he successfully prosecuted his studies in natural history, devoting himself particularly to bees. He discovered that the fertilization of the queen-bee takes place in the air, and but once, and that a queen whose impregnation is deferred beyond the twenty-first day produces only drones. He determined the fact of the yearly massacre of the drones, and that it takes place only when swarming time is past and a fertile queen secured. He observed that queens manifest bitter animosity against each other, engage in combats if there are two in the hive at the same time, and destroy all royal pupæ. He examined into the senses of bees, and discovered that they use their antennæ for the communication of ideas and for the accurate performance of their varied work within the darkened hive. By means of dissections made at his request by Mlle. Jurine he exploded the theory of neuters, and proved the worker to be an imperfectly developed female. He found that the workers were of two kinds—wax-workers and nurse-bees—demonstrated the origin of propolis, and discovered the whole secret of the secretion and manipulation of wax for building purposes. He detected the *Sphinx atropos* in its ravages in the hive, and discovered the bees' contrivances for their own protection. He found that bees respired, absorbing oxygen and evolving carbonic acid, and that the purity of the air is maintained by a system of ventilation, the currents of air being induced by the rhythmic motion of their wings. The record of his work he first gave to the world under the title of *Lettres à Ch. Bonnet* (1792). In 1796 other discoveries were added to the former, and the new edition was entitled *Nouvelles Observations sur les Abeilles*. Later editions have included his subsequent observations under the same title. In connection with Senebier he published the *Mémoire sur l'influence de l'air dans la germination des plantes* (Geneva, 1801), contributing the materials, which were worked into form and recorded by Senebier. His son Jean Pierre also wrote on the *Habits of Bees* (1810). Revised by F. A. Lucas.

Huber, hoo'bär, Johann Nepomuk: polemical writer; b. in Munich, Aug. 18, 1830; graduated at the university of his native city 1854; became Professor of Theology in 1859, and same year he published at Munich his *Philosophie der Kirchenväter*, which was soon after placed in the *Index Expurgatorius*. He was the avowed antagonist of the Ultramontanists; and they, in turn, used every effort to coerce him to silence, but without success. In 1871 he took a prominent part in the war against the Jesuits, and was an active and formidable opponent of the dogma of papal infallibility in connection with the Old Catholic movement in Bavaria. With Döllinger he wrote *Janus* (Leipzig, 1869), and he was the author of *Quirinus* (1870). He wrote several other po-

lemical works and pamphlets in support of his peculiar views. D. in Munich, Mar. 20, 1879. See his *Life* by E. Zirngiebl (Gotha, 1881). Revised by S. M. Jackson.

Hubli, hoobli, or **Hoo'bly**: a town and railway junction in the Dharwar district, Bombay, British India; in lat. 15° 20' N., lon. 75° 12' E.; 13 miles S. E. of Dharwar. (see map of S. India, ref. 4–D). It is in the center of the cotton-trade of the South Mahratta country, and has important factories of silk fabrics and copper utensils. The Jains are numerous here, and have many fine ancient temples in the suburbs. Pop. (1872) 37,961; (1891) 50,780. M. W. H.

Hub'meyer, or **Hübmaier**, Balthasar: prominent in connection with the Anabaptist movement in Germany in the first part of the sixteenth century; b. about 1480 at Friedberg, near Augsburg; studied theology and philosophy at Freiburg under Eck 1503; became Professor of Theology in Ingolstadt in 1512, and in 1516 preacher at the Cathedral of Regensburg, whence he removed in 1523 to Waldshut. Here he became a Protestant, under the influence of Zwingli, but soon began to develop separatist ideas. He taught that it was wrong to baptize small children; that baptism ought not to take place until the full-grown man demands it as the external symbol of his faith. As Hubmeyer was a very gifted preacher, his whole congregation adopted his ideas, but soon the Austrian Government interfered, and he then fled (in 1525) to Zurich. Imprisoned and persecuted here also, he went to Nikolsburg, in Moravia, where he formed a large Anabaptist congregation. Although he was a sound and clear-minded man himself, he could not prevent the religious fanaticism and social eccentricities which sometimes characterized the Anabaptists from breaking out in his congregation. Disorders arose, and when, at the death of Ludwig of Hungary, Moravia fell to Ferdinand of Austria, Hubmeyer was seized, carried to Vienna, sentenced to death, and burned at the stake Mar. 10, 1528. Some of his writings were collected and published in 1746. See Anabaptists. Revised by W. H. Whitsitt.

Hübner, hüp'ner, Joseph Alexander, Baron: statesman; b. in Vienna, Nov. 26, 1811. Having completed his studies at Vienna, he traveled in Italy, and on his return (in 1833) was introduced by Prince Metternich into the service of the Government. His diplomatic career began at Paris in 1837. After several minor appointments he was sent as ambassador to Paris in 1849, and recalled in 1859. It was to him, on New Year's Day, 1859, that Napoleon III. addressed the remark which foreshadowed the Franco-Austrian war. From 1866 to 1867 he was a second time at the head of the Austrian embassy at Rome. He managed many delicate and difficult matters with consummate ability and tact, and was grand officer of the Legion of Honor. He visited the U. S. in 1870, and again in 1871. He became a resident of Rome, and published an admirable work on Pope Sixtus V. —*Sixtus der Fünfte* (2 vols., 1871; English trans. 1872); a charming account of a tour around the globe—*Ein Spaziergang um die Welt* (Leipzig, 1873; 5th ed. 1885; Eng. trans. 1874); and *Durch das britische Reich 1883–84* (Leipzig, 1886). D. in Vienna, July 30, 1892.
Revised by C. H. Thurber.

Hübschmann, hüpsh'măn, Johann Heinrich, Ph. D.: philologist and specialist in Iranian and Armenian philology; b. at Erfurt, July 1, 1848; studied at the gymnasium in Erfurt and at the Universities of Jena, Tübingen, Leipzig, and Munich; privat docent and professor extraordinary at Leipzig; full professor in Strassburg; author of *Zur Casuslehre* (1875); *Ueber die Stellung des Armenischen im Kreise der indogerm. Sprachen* (Kuhn's *Zeitschr.*, vol. xxiii.); *Iranische Studien* (*ibid.*, vol. xxiv.); *Grundzüge der armenischen Etymologie* (1883); *Das indogerm. Vocalsystem* (1885); *Etymologie und Lautlehre der ossetischen Sprache* (1887); *Sage und Glaube der Osseten* (*Zeitschr. der morgenl. Gesellsch.*, vol. xli.). Benj. Ide Wheeler.

Huc, Évariste Régis: missionary and traveler; b. Aug. 1, 1813, in Toulouse, where he studied theology; entered the order of the Lazarists and took holy orders in 1839. Immediately after he set out for Macao, where he lived for eighteen months, studying the Chinese language. With his skin dyed, his head shaved, and in Chinese costume, he then traveled from Canton through the interior of the empire to Peking, and from Peking to He-Shuy in Mongolia, a place just N. of the Great Wall, and containing a considerable congregation of Chinese Christians. From He-Shuy he visited several other places in Mongolia, and during his stay in that country he translated several books of prayer and instruction into Mongol. In 1844 he started from He-Shuy for Lhassa, in Tibet, which he reached in 1846, having stopped for half a year in the lamasery of Koonboom, where he studied the Tibetan language and Búddhist literature and was treated with great hospitality and kindness. In company with a Tibetan embassy which was returning from Peking, he then crossed the desert and the glaciers, and was well received in Lhassa, but had, nevertheless, after a stay of a few months, to leave at the instance of the Chinese ambassador. He now traveled through the southern part of the empire to Canton, and in 1852 he left China in order to return home. His health had suffered very much, and he died in Paris, Mar. 31, 1860. He published *Souvenirs d'un voyage dans la Tartarie, le Thibet, et la Chine* (2 vols., 1852); *L'Empire Chinois* (2 vols., 1854); *Le Christianisme en Chine, en Tartarie, et en Thibet* (4 vols., 1858)—all translated into English, the first by William Hazlitt (London, 1852; New York, 1853), the second in 1855, and the third in 1857–58.

Huckleberry and **Blueberry**: names applied to the North American representatives of the Whortleberry (*q. v.*) of Europe. Huckleberry-bushes are ericaceous shrubs of the genera *Gaylussacia* and *Vaccinium*. The berries are extensively marketed, and eaten as dessert fruit, and in pies and puddings. *Gaylussacia brachycera*, *dumosa*, *frondosa*, *resinosa*, and *ursina* furnish mostly hard and dark-colored fruits, which in some localities are known distinctively as huckleberries; the blueberries, generally lighter colored, softer, and sweeter than the huckleberries, are the fruits of *Vaccinium pennsylvanicum*, *canadense*, *vacillans*, *corymbosum*, and other species. The annual product and the money value of fruits of these two genera are very great, and efforts are now being made to cultivate them.
Revised by L. H. Bailey.

Huddersfield: town; in Yorkshire, England; at the confluence of the Holme and the Colne; 26 miles N. E. of Manchester (see map of England, ref. 7–G). It has very large manufactures of cloths, kerseymeres, flushings, and serges, extensive coal mines in the vicinity, and easy communication with all important commercial points of England. It is connected by canals with the Mersey and the Humber, and forms the center of an extensive railway system. It is an old town and is mentioned in Doomsday, but its importance dates from the development of the woolen manufactures in the eighteenth century, and it is the principal seat of the fancy woolen trade in England, comprising shawls, waistcoatings, etc., of the finest fabric and the most elegant patterns. It is well built, and has many good educational institutions. In the vicinity are the Lockwood spa baths. One member is returned to Parliament. Pop. (1891) 95,422.

Hudson: town; Middlesex co., Mass. (for location of county, see map of Massachusetts, ref. 2–H); on Assabet river and the Boston and Maine and the Fitchburg Railways; 27 miles W. of Boston. It has a public library (opened 1868), weekly newspaper, and manufactures of boots and shoes. Pop. (1880) 3,739; (1890) 4,670; (1895) 5,308.

Hudson: village; Lenawee co., Mich. (for location of county, see map of Michigan, ref. 8–J); on the Tiffin river, and the Cin., Jack. and Mack. and the Lake S. and Mich. S. Railways; 17 miles S. of Adrian, the county-seat, 50 miles W. of Toledo, O. It has manufactures of spokes, buttertubs, carriages, and other articles, and two weekly newspapers. Pop. (1880) 2,254; (1890) 2,178; (1894) 2,346.

Hudson: city (incorporated 1784, chartered 1785, made a port of entry 1790, formerly known as Claverack Landing); capital of Columbia co., N. Y. (for location of county, see map of New York, ref. 6–K); on the Hudson river, and the Boston and Albany, Kinderhook and Hudson, and the N. Y. C. and H. R. Railways; 36 miles S. of Albany, 115 N. of New York. It has an area of 1 sq. mile; contains 11 churches, high-school building that cost $30,000, young ladies' seminary, State House of Refuge for Women, Home for Indigent Volunteer Firemen, orphan asylum, water-supply obtained from the river at an expense of $250,000, electric-light plant, electric street railway, and 2 daily and 3 weekly newspapers; and has 3 knit-goods mills, 2 iron-furnaces, sash and blind factory, and manufactories of steam fire-engines, paper car-wheels, and stoves. Pop. (1880) 8,670; (1890) 9,970.
Editor of "Register."

Hudson: city; capital of St. Croix co., Wis. (for location of county, see map of Wisconsin, ref. 4–A); on St. Croix

Lake, and the Chi., St. P., Minn. and Omaha Railway; 18 miles E. of St. Paul, Minn. It is in a grain, dairy, and stock-raising region, and contains a sanitarium, railway machine-shops, several flour-mills and wheat warehouses, sawmill, furniture-factory, wagon and plow works, and two weekly newspapers. Pop. (1880) 2,298; (1890) 2,885; (1895) 3,338. EDITOR OF "STAR AND TIMES."

Hudson, ERASMUS DARWIN, M. D.: surgeon; b. at Torringford, Conn., Dec. 15, 1806; graduated in medicine at the Berkshire Medical College 1827; practiced in Bloomfield, Conn., and was a member of the Connecticut State Medical Society, etc. In 1828 he began to lecture on temperance. From 1837 to 1849 he was lecturing agent of the Connecticut Anti-Slavery Society and general agent of the American Anti-Slavery Society. From 1849 he devoted himself to mechanical and orthopædic surgery, not only in private practice, but in a majority of the Government cases of gunshot injuries of bones, resections, ununited fractures, and amputations at the knee and ankle joint. He wrote *Essay on Temperance* (1828); contributed to *The Liberator* and *National Anti-Slavery Standard* (1837–49); coeditor of *The Charter Oak* (1838–41); published monographs on *Resection* (1870), *Syme's Amputation* (1871), *Immobile Apparatus for Ununited Fractures* (1872); and contributed numerous reported cases, published in the *Medical and Surgical History of the War of the Rebellion*. D. at Riverside, Greenwich, Conn., Dec. 31, 1880.

Hudson, ERASMUS DARWIN, Jr., M. A., M. D.: physician; b. at Northampton, Mass., Nov. 10, 1843; graduated at the College of the City of New York in 1864, and at the College of Physicians and Surgeons, New York city, in 1867; in 1867 and 1868 was house-surgeon of Bellevue Hospital; from 1868 was engaged in the practice of medicine; served as health inspector 1869–70; was attending physician to the class for diseases of the eye, out-door department of Bellevue Hospital, same year; was attending physician at Northwestern Dispensary 1870–72; attending physician to Trinity chapel parish and Trinity Home 1870–75. In 1872 he became Professor of Principles and Practice of Medicine at the Women's Medical College of the New York Infirmary; was Professor of General Medicine and Diseases of the Chest in the New York Polyclinic, visiting physician to Bellevue Hospital, and physician in St. Elizabeth's Hospital. He published *Report of Pulse and Respiration of Infants* in Elliot's *Obstetric Clinic* (1872); *Doctors, Hygiene, and Therapeutics* (1877); *Limitations of the Diagnosis of Malaria* (1885); *Physical Diagnosis of Thoracic Diseases* (2d ed. 1887); and other works. D. May 9, 1887.

Hudson, HENRY, or HENDRIK: an English discoverer of whose birth and early history nothing is known. In 1607 he made a voyage in search of the Northwest passage. In 1608 he sailed to Nova Zembla, and in 1609, in the service of the Dutch India Company, he sailed in the Half Moon for Davis's Straits; but reached Cape Cod, went to Chesapeake Bay, discovered the Hudson river, up which he sailed as far as where Albany stands. In 1610 he sailed again in an English ship, discovered Hudson's Strait and Hudson's Bay, in which he wintered; but after suffering many hardships his crew became mutinous and set him, with his son John and seven infirm sailors, adrift in a shallop, after which he was never heard of. A part of his crew arrived in England in 1611. Hudson published *Divers Voyages and Northern Discoveries* (1607) and *A Second Voyage* (1608).

Hudson, HENRY NORMAN: Shakspearean scholar; b. at Cornwall, Vt., Jan. 28, 1814; was bred a farmer and coachmaker; graduated in 1840 at Middlebury College; taught in Kentucky, Alabama, and elsewhere, and became a successful lecturer on Shakspeare. In 1849 he was ordained a priest of the Protestant Episcopal Church; was for a time editor of *The Churchman*; rector of a church at Litchfield, Conn., 1859–60, and was an army chaplain during the civil war. He published *Lectures on Shakspeare* (2 vols., 1848); an edition of Shakspeare (11 vols., 1850–57); *A Chaplain's Campaign with General Butler* (1865); *School Shakspeare* (1870); *Shakspeare, his Life*, etc. (1872); was Professor of Shakspearean Literature in Boston University. D. at Cambridge, Mass., Jan. 16, 1886.

Hudson, MARY (*Clemmer*): poet and novelist; b. in Utica, N. Y., in 1839. She contributed to the Springfield *Republican*, and wrote for the New York *Independent* her *Woman's Letters from Washington*. She was divorced from her first husband, Rev. Daniel Ames, and was afterward married to Edmund Hudson, editor of *The Army and Navy Register*. Among her books are *Ten Years in Washington* (1871); *His Two Wives*; *Memorials of Alice and Phœbe Cary*; and *Poems* (1882). D. in Washington, D. C., Aug. 18, 1884. H. A. BEERS.

Hudson, WILLIAM HENRY: professor of English literature; b. in London, England, May 2, 1863. He was educated under private teachers in London; was five years private secretary to Herbert Spencer; assistant librarian in Cornell University 1890–92; Assistant Professor of English Literature Leland Stanford Junior University, 1892; author of *The Church and the Stage* (1886); *An Introduction to the Study of Herbert Spencer* (1893); and numerous articles in English and American magazines. C. H. T.

Hudson City, N. J.: See JERSEY CITY.

Hudson River, called also **North River** in its lower course: a river of the U. S. It rises some 3,000 feet above tide-water in Essex co., N. Y., among the Adirondacks. After a rapid and devious course among the mountains, it is joined by the Schroon river, and 10 miles farther on by the Sacondaga. Thence its course is generally eastward to Sandy Hill, from which point it flows almost due S. to its mouth. The Batten Kill and Hoosick join it from the E. At Cohoes it receives the Mohawk, which more than doubles its volume. Three miles below, at Troy, it becomes a navigable tidal stream. Above this it is chiefly noteworthy for its romantic scenery and its great and unfailing water-power. The largest affluent received below Troy is the Walkill. The tidal rise at Albany is only one foot, and below this point there are some obstructions to rapid navigation, the most noteworthy of which is the "Overslaugh" or bar at Castleton. To remedy these difficulties large sums have been expended by both the Federal and State governments in deepening and dredging channels, building dikes, revetments, and the like, and the work is not yet complete. There are also twenty-one lighthouses and lighted beacons owned by the general Government upon the banks. The appropriations have been almost entirely expended above the city of Hudson, where the obstructions cease. The river is navigable 117 miles to that city for ships of the first class, and to Troy, 166 miles, for steamers and schooners. Thirty miles below Troy the river approaches the remarkably fine scenery of the Catskill Mountains. At Newburg, 60 miles from New York, the Hudson enters the Highlands, through whose impressive scenery it flows for 20 miles. Below Verplanck's Point the river expands into Haverstraw Bay and the Tappan Sea, a noble, lake-like expansion. Below, the western bank of the river is marked by the PALISADES (*q. v.*), a precipice of lofty trap-rock, at some points 500 feet high. The fisheries of the Hudson are of considerable importance. Shad, bass, and sturgeon are extensively taken, and several species of fish native to the St. Lawrence basin have naturalized themselves in the Hudson since the opening of the Champlain and Erie Canals. It is probable that the Hudson was never a salmon stream, but some attempts have been made to stock it with *Salmo salar* and *S. quinnat*, the true and the California salmon. The Erie Canal connects the river with Lake Erie, the Champlain Canal with Lake Champlain, the Delaware and Hudson with the Pennsylvania coal-regions. The river is thus the thoroughfare for large numbers of canal and freight boats to and from New York and the neighboring cities. Its passenger steamers are not excelled in splendor by any vessels afloat, and for size and speed they take a high rank. The waters of the Hudson enter the inner bay of New York, flowing between New York city and Jersey City on the E. and W. respectively. The river, with its canal connections, has done much to make New York what it is industrially and commercially. It is about 300 miles in length. It was named in honor of Henry Hudson, its first European explorer.

Hudson's Bay: a great landlocked sea of British North America, discovered by Henry Hudson in 1610. It is 800 miles long from N. to S. and 600 miles across, and lies between 51° and 64° N. lat. and 78° and 95° W. lon. It is so much obstructed by ice that in winter it is not navigable. At no time is its navigation safe or easy. It has many islands and shoals. There is a considerable summer whale-fishery within its limits. Area, 300,000 sq. miles. Hudson's Strait is its outlet to the Atlantic. It is 450 miles long, and its breadth averages 100 miles, the narrowest point being 60 miles. The bay and straits are ice-bound for about eight months in the year, and usually abound in icebergs, floes, and fogs during the remainder. Were the navigation of

the bay more practicable it would form part of a very favorable route between Great Britain and a large part of North America. A project was formed about 1884 to connect Winnipeg by rail with York Factory on Hudson's Bay. This is the plan for the so-called Hudson's Bay Railway, and the route was to be over one of the old company routes. The road is now built to Shoal Lake, about 40 miles from Winnipeg, and near the southern end of Lake Manitoba. The proposed railway would be about 1,000 miles long.

Revised by M. W. HARRINGTON.

Hudson's Bay Company: the last of the great English commercial corporations. It was chartered May 2, 1670, by Charles II., and ceased to exercise its monopoly June 23, 1870, after 200 years of authority in the northern parts of North America. For many years after its foundation the French were in possession of Canada. The Northwest Company of Montreal was a formidable rival from 1783 to 1821, when the younger company was merged into the older. The principal trade of the company was in furs, and it was uniformly a profitable trade. It originally possessed a proprietorship and a monopoly of trade throughout Rupert's Land, as the land whose streams flow into Hudson's Bay was called. This name was derived from the famous Prince Rupert, the principal original corporator. In 1821 this jurisdiction (with the original authority to govern and also to make war upon savage nations) was extended westward to the Pacific—the authority for the new territory to last only for periods of twenty years by royal license. From 1849 to 1859 Vancouver island was also licensed to this company. After 1859 the company had no monopoly W. of the Rocky Mountains. In 1868 the company was authorized by act of the British Parliament to surrender its powers and rights to the crown and incorporate its territories with the Dominion of Canada. In 1869 this was carried out, and in 1870 the full transfer was accomplished.

Hué, hwā': the capital of Annam; on the Tuong-tien river, about 10 miles above its entrance into the China Sea (see map of East Indies, ref. 2–C). In the beginning of the nineteenth century it was regularly fortified by French engineers for the native rulers, and it is generally well built, but it is accessible only to small vessels, on account of the shallowness of its harbor. It nevertheless carries on a lively trade, and has considerable ship-building. Pop. 30,000; with surroundings, 50,000. See Chaigneau, *Souvenirs de Hué* (1867).

Revised by M. W. HARRINGTON.

Huebner, hüp'ner, EMIL: Latin epigraphist; b. in Düsseldorf, Germany, July 7, 1834. He is professor ordinarius at the University of Berlin; editor of volumes ii. and vii. of the *Corpus Inscr. Latinarum* (containing the Latin inscriptions of Spain and of England); *Exempla scripturæ epigraphicæ Latinæ* (Berlin, 1885), containing 1,200 inscriptions with commentary; author of *Grundriss zu Vorlesungen über Geschichte und Encyclopädie der class. Philologie* (2d ed. Berlin, 1892); *Grundriss zur röm. Literatur*; *Grundriss zur griech. u. lat. Grammatik*.

ALFRED GUDEMAN.

Huehuetenango, wā-wā-tā-năăn'gō (incorrectly written *Gueguetenango*): a western department of Guatemala; bounded W. and N. by Mexico, E. by Quiché, and S. by Totonicapan, Quezaltenango, and San Marco; area, 4,550 sq. miles. The surface is high and in great part mountainous; in the south of the department is the divide where three rivers—the Chiapas, or Grigalva, the Negro, and the Ixcan—take their rise. Maize, wheat, oats, and in the lower lands coffee and sugar, are the chief products. There are lead and salt mines of no great importance. Pop. (estimated, 1892) 137,701. Huehuetenango, the capital and largest city, is on a high plain near the source of the Chiapas, 106 miles N. W. of Guatemala city (see map of Central America, ref. 3–C). Pop. (1890) 11,200. Near it there are some interesting Indian antiquities.

HERBERT H. SMITH.

Huelva, wel'vă: the capital of the province of Huelva, Spain; at the junction of the Odiel and the Tinto; 68 miles by rail S. S. W. of Seville (see map of Spain, ref. 19–C). It is a handsome town, but unhealthful on account of the salt-marshes in its vicinity. It has a brisk coasting-trade, especially in fruits, some manufactures of mattings, and considerable sardine, tunny, and bonito fisheries. The principal source, however, of its prosperity is the extensive exportation of ore from the Tharsis and Rio Tinto copper mines. Pop. (1887) 18,195.

Huerta, wār'tă, VICENTE GARCIA, de la: poet and critic; b. at Zafra, Estremadura, Spain, in 1730; held the office of first librarian of the royal library at Madrid. In the hot contest which took place at that time in the Spanish literature between the adherents of the French influence and the defenders of the old Spanish taste, Huerta headed the latter party, and exercised a considerable influence, both by his tragedy, *Raquel*, which was first produced in Madrid in 1778, and made a great success, and by his collection of the best works of the elder Spanish dramatists (17 vols., 1784–85). He also published two volumes of poems, *Obras Poéticas* (1778–79). His lyrics are printed in vol. lxi. of the *Biblioteca de autores españoles* (Madrid, 1869). D. at Madrid, Mar. 12, 1787.

Revised by A. R. MARSH.

Huesca, wes'kăă: the capital of the province of Huesca, Spain; on the Isuela; 55 miles by rail N. E. of Saragossa (see map of Spain, ref. 13–I). The town is beautifully situated on a plain covered with vineyards and olive forests, and has many interesting buildings, among which are a Gothic cathedral built in 1400, the Romanesque church of San Pedro (1150), a university founded in 1354, and a circus for bull-fighting. Huesca is a bishop's see. Pop. (1887) 13,041.

Huet, ü'et', CONRAD BUSKEN: critic; b. at The Hague, Holland, Dec. 28, 1826; d. in Paris, May 1, 1886. Coming of a family originally French and famous among French Protestants, it was natural that he should study at Leyden to prepare for the ministry of the Dutch French Reformed Church. There were not lacking signs, however, even in his university days, that he was meant for literature rather than theology. For three years (1848–50) he contributed to the Leyden *Studenten-almanah*, and one of his pieces, the tale called *Familie over* (1848), was heard of outside Leyden. Still he persevered in his studies, passing some time also in Switzerland for the purpose. Returning to Holland, he preached for a time in Utrecht, and then was settled for ten years at Haarlem (1851–62). He found the career, however, more and more distasteful. He had early fallen under the influence of the most advanced school of Bible critics. He was a student of Scholten and a warm friend of Kuenen; he had also been powerfully affected by Potgieter. Accordingly, in 1862 he gave up his work as a preacher and turned wholly to literature. In the same year he was associated with *De Gids*, the leading literary review of Holland, and in its columns he set about a task of universal criticism similar to that of Sainte-Beuve in France. The severity of his judgments made him many enemies, but no one could fail to acknowledge his extraordinary range and the ability of his work. For some years he continued to write for *De Gids*, connecting himself also with other periodicals from time to time. In 1867, however, the desire for fresh fields led him to go to Batavia, in the Dutch East Indies, where he became editor of the journal *Java-Bode*. Later he established a paper of his own called *Algemeen Dagblad van Nederlandsch Indië*. To this he devoted himself assiduously, finding time, however, to bring out in Batavia new criticisms and several stories. In 1876, desirous of educating his son in Europe, he decided to return, but settled in Paris instead of Holland. Here until his death he wrote constantly. The enduring part of Huet's work is his criticism. Of this the best is contained in the collections of essays called *Litterarische Phantasiën* (1ste Reeks, Arnhem, 1868); *Nieuwe Litterarische Phantasiën* (2de Reeks, Batavia, 1874); *Nederlandsche Belletrie* (Batavia, 1875); *George Sand* (Amsterdam, 1877); *Oude Romans* (*ibid.*, 1877); *Potgieter* (*ibid.*, 1878); *Nieuwe Litterarische Phantasiën* (3de Reeks, *ibid.*, 1878); *Litterarische Phantasiën* (4de Reeks, 10 vols., Haarlem, 1880–85). All these have been republished in twenty-five volumes (Haarlem, 1881–88). In his earlier life Huet wrote several theological treatises, and the following further titles are worth mentioning: *Overdrukjes* (1858); *Lidewyde* (1868); *Novellen* (1875); *Nationale vertvogen* (1876); *Van Napels naar Amsterdam* (1877); *Europeesche Brieven door Fantasis* (1878); *Het Land van Rubens* (1879); *Het Land van Rembrandt* (2 vols., 1882–84).

A. R. MARSH.

Huet, FRANÇOIS: religious reformer; b. at Villeau, Eure-et-Loire, France, Dec. 26, 1814. Huet was one of the precursors of Döllinger, Hyacinthe, and other Old Catholics, though his own doctrine, which found some adherents in France, bore the name of Neo-Catholicism; was opposed to the ultra dictates of the Vatican, and claimed to have realized the alliance of reason with religion. Huet was a pupil or disciple of Bordas-Demoulin; with him published *Essais sur la réforme catholique* (Paris, 1856) and edited his posthumous works (1861, 2 vols.). He held a professorship in

the University of Ghent; about 1865 returned to Paris and was tutor to Prince Milan Obrenovitch, whom he accompanied to Servia when the prince was elevated to the throne. Huet published *Recherches historiques et critiques sur la vie, les ouvrages, et la doctrine de Henri de Gand, surnommé le Docteur Solennel* (Ghent, 1838); *Histoire de la vie et des ouvrages de Bordas-Demoulin* (Paris, 1861); *La révolution religieuse au dix-neuvième siècle* (1868). D. in Paris, July 1, 1869. According to his own request he was buried *civilement*—that is, without the accompaniment of any religious ceremonies. Revised by S. M. Jackson.

Huet, Pierre Daniel: classical scholar; b. at Caen, France, Feb. 8, 1630; went to the court of Christine of Sweden in 1652; became the tutor, together with Bossuet, of Louis XV. Chiefly known as the originator of the Delphine editions of classical authors; became bishop in 1685, but was not consecrated till 1692; retired in 1699. D. Jan. 26, 1721. Author of many theological and philosophical works, and of a still valuable dissertation entitled *De optimo genere interpretandi et de claris interpretibus* (1691). See J. Aikin, *Memoirs of the Life of Huet* (2 vols., London, 1810). His complete works (6 vols.) were published in Paris in 1856.
Alfred Gudeman.

Hufeland, hoo'fe-lănt, Christoph Wilhelm: physician; b. at Langensalza, in Thuringia, Aug. 12, 1762; studied medicine at the Universities of Jena and Göttingen; was appointed a Professor in Medicine at the University of Jena in 1793, and removed in 1798 to Berlin, where in 1809, on the establishment of the new university, he became Professor in Special Pathology and Therapeutics. He was a noble and kind-hearted man, of sound and comprehensive views, and, with the exception of his *Enchiridion medicum, oder Anleitung zur mediz. Praxis* (1836), most of his writings have a generally instructive, philanthropical, rather than a scientific character, such as *Makrobiotik oder die Kunst, das menschliche Leben zu verlängern* (1796); *Guter Rath an Mütter über die wichtigsten Punkte der physischen Erziehung der Kinder* (1799), etc. D. Aug. 25, 1836. See his *Autobiography*, edited by Göschen (Berlin, 1863).

Hug, hookh, Johann Leonhardt: Roman Catholic theologian and professor; b. at Constance, June 1, 1765. He studied theology at Freiburg, and was appointed professor there 1791. He is author of numerous learned works in biblical criticism, of which the best known is an *Introduction to the Study of the New Testament* (Stuttgart and Tübingen, 1808, 2 vols.; 4th ed. 1847; Eng. trans. by D. G. Wait, London, 1827, and by David Fosdick, New York, 1830). He also published a commentary on Solomon's Song (Freiburg, 1813), and several essays on the indissolubility of marriage. D. in Freiburg, Mar. 11, 1846. Revised by S. M. Jackson.

Hü'gel, Karl Alexander Anselm, Baron von: diplomat and traveler; b. at Ratisbon, Apr. 25, 1796; studied law at Heidelberg 1811; entered the Austrian army in 1813, and was employed in different diplomatic missions; retired in 1824 to devote himself exclusively to the study of natural science; undertook (1831–37) very extensive travels through Western and Southern Asia, and died in Brussels, June 2, 1870. He wrote *Kaschmir und das Reich der Sikhs* (4 vols., 1840–42) and *Das Becken von Kabul* (2 vols., 1851–52). His rich collections in ethnography and natural science were bought by the Austrian Government and incorporated with the collections of Vienna.

Huger, yu-jee', Benjamin: soldier; b. at Santee, St. James parish, S. C., Nov. 22, 1805; graduated at West Point, and entered the army as second lieutenant of artillery July, 1825; served on topographical and ordnance duty till May 1, 1832, when he was promoted to be captain of ordnance. In the war with Mexico he was chief of ordnance and artillery with Gen. Scott's army, being in charge of the siege-train at Vera Cruz, and present at the battles of Cerro Gordo, Molino del Rey, Chapultepec, and final capture of the city of Mexico. He was breveted major, lieutenant-colonel, and colonel, and was presented with a sword of honor by the State of South Carolina. From 1848 to 1861 he commanded various arsenals, and was employed on important board duties. In Apr., 1861, being at that time a major of ordnance, he resigned his commission and entered the Confederate army. He was made a major-general, and bore a prominent but unsuccessful part in the early days of the civil war. From 1866 to 1877 he was engaged in farming in Virginia. D. at Charleston, S. C., Dec., 1877.
Revised by James Mercur.

Huggins, William, F. R. S., D. C. L., LL. D., Ph. D.: b. in London, Feb. 7, 1824; was educated at the City of London School and by private instructors, giving much attention to the experimental study of the physical sciences and to astronomy; in 1852 was made a member of the Microscopical Society, and became a student of biology; in 1855 established a private astronomical observatory, where after 1862 he gave great attention to spectroscopic observations upon the heavenly bodies, with important results, especially with respect to the discovery of the direction and rate of the proper motions of the fixed stars, and since 1875 he has obtained many photographs of the ultra-violet portions of the spectra of the stars. President of the British Association 1891–92.

Hughes, hyuz, Ball: sculptor; b. in London, Jan. 19, 1806. He studied with Edward Hodge Bailey, and while a student won prizes awarded by the Royal Academy, and other silver and gold medals; made busts of George IV. and the Dukes of York, Sussex, and Cambridge; settled in New York in 1829; made the marble statue of Hamilton for the Merchants' Exchange, which was destroyed by fire in 1835; also the high relief of Bishop Hobart in Trinity church. Later he removed to Dorchester, Mass. The *Little Nell* and *Uncle Toby*, in plaster, in the Boston Athenæum are his work, and the bronze statue of Dr. Bowditch in the cemetery of Mt. Auburn. Other works are a bust of Washington Irving, a statuette of Gen. Warren, a *Crucifixion* and a model for an equestrian statue of Washington. D. in Boston, Mass., Mar. 5, 1868. Revised by Russell Sturgis.

Hughes, David Edward, F. R. S.: inventor of the printing telegraph; b. in London in 1831. His parents emigrated to the U. S., where in 1855 he patented the printing telegraph. His instrument was adopted by the French Government in 1861, in Italy in 1862, in England in 1863, and eventually in Russia and other European countries. In 1878 he announced his discovery of the microphone; in 1879 announced the invention of the induction balance. He was elected fellow of the Royal Society in 1880, and has received numerous orders of knighthood, medals, and other honors. C. H. T.

Hughes, Hugh Price, M. A.: minister of the Wesleyan Church; b. at Carmarthen, Wales, Feb. 7, 1847; was educated at University College, London, and Richmond Theological College; held pastorates in Dover, Brighton, Oxford, and London. He is superintendent of the West London Mission. He is author of *Social Christianity* (1889); *The Philanthropy of God* (1890); *The Atheist Shoe-maker* (1889); *Ethical Christianity* (1892). In 1885 he became editor of *The Methodist Times*. C. H. T.

Hughes, John, D. D.: archbishop; b. at Annalogham, Tyrone, Ireland, June 24, 1797; emigrated to the U. S. in 1817, and worked for a time as a gardener and nurseryman; was educated at Mt. St. Mary's College, Emmittsburg, Md., which he entered in 1820, and where he sustained himself for a time by the care of the college garden. Here he won the lifelong esteem of Dr. Dubois and Dr. Bruté, both afterward bishops. In 1825 he was ordained a deacon of the Roman Catholic Church, and in 1826 a priest. He had (1826–38) pastoral charges in Philadelphia, where he founded St. John's Asylum in 1829, and established *The Catholic Herald* in 1833. In 1838 he was made Bishop of Basileopolis *in partibus*, and coadjutor to Bishop Dubois of New York, and in 1842 he became Bishop of New York. In 1839 he founded St. John's College, Fordham. In 1850 he was made Archbishop of New York. In 1861–62 he was a special agent of the U. S. in Europe, and in 1863 publicly addressed the draft-rioters in New York with a view of dissuading them from violence. He died in New York city, Jan. 3, 1864. Archbishop Hughes early attracted much attention by his controversial correspondence with Rev. John Breckinridge in 1833–35. In 1839–42 he was prominent in the struggle of the Roman Catholics against the public-school system of New York, and in 1851 had a famous controversy with Erastus Brooks respecting the tenure of church property. His writings, nearly complete, have been published in 2 vols. 8vo, New York, 1865. See his *Life* by J. R. G. Hassard (1866).

Hughes, Thomas, Q. C.: author; b. at Newbury, Berkshire, England, Oct. 20, 1823; was educated at Rugby and at Oriel College, Oxford, where he graduated in 1845; studied at Lincoln's Inn; was called to the bar in 1848; became queen's counsel in 1869; was in Parliament from Lambeth 1865–68, from Frome 1868–74; author of *Tom Brown's*

School-days (1856); *The Scouring of the White Horse* (1858); *Tom Brown at Oxford* (1861); *Alfred the Great* (1869); *Memories of a Brother* (1873); *Life of Livingstone*, and other works. He became principal of College for Working Men and Women, London, and was prominent in practical reforms and social science. In 1880 he aided in founding the town of Rugby, Tenn. In 1882 he became a county court judge. D. at Brighton, England, Mar. 22, 1896.

Hugli: See HOOGHLY.

Hugo, VICTOR MARIE: poet; b. at Besançon, France, Feb. 26, 1802; d. at Paris, May 22, 1885. His father was a native of Lorraine and an officer of the empire; his mother was from La Vendée, and royalist in sentiment; he was the youngest of three brothers. The father's military fortune led the family to Corsica (1802–05), to Paris (1805–07), to Italy (1807–08), to Paris again (1808–11), to Spain (1811–12), and finally back to Paris. The light and color of Italy and Spain, and the quiet life of his Paris home, an old house with ample garden, where his first education was left mainly to the hazard of books and of nature, both left a deep impress upon the boy. With his regular school life (1815–18) began also his devotion to letters, which was professional almost from the very first. While at the *lycée* he practiced all kinds of composition. In 1817 he competed for the prize of the Academy, and received mention in ninth place. In 1818 he wrote in a fortnight the first draft of the novel *Bug-Jargal*. In 1819 two of his odes were crowned by the Academy of Toulouse. In 1822 appeared the first volume of his verse, *Odes et poésies diverses*, which brought a pension of 1,000 francs, and so permitted Hugo's marriage with Adèle Foucher (Oct. 12, 1822). This collection was increased by *Nouvelles Odes* in 1824, and all appeared in 1826 under the title which has since been retained, *Odes et Ballades*. The novel *Han d'Islande* appeared in 1825, and *Bug-Jargal* in its rewritten form in 1826. So far Hugo's work shows him mainly interested in getting command of the instrument of expression. The circle of ideas in which he moves is that of an ardent royalist and Catholic. With the drama *Cromwell* (1826–27) his work becomes more significant: and its preface is one of the important literary documents of the century. In this Hugo declares against the limitations of traditional classicism, and demands that art be made no more narrow than the whole range of life. Instead of classical unity and regularity he saw in life, variety, color, concrete forms, violent contrasts (especially that between spirit and body, which he made the source of the grotesque as well as the dramatic characteristics of the modern world). To this view he gave a very personal expression. An ardent band of admirers rallied around him and recognized him as the chief of romanticism. In the next lyrics, *Les Orientales* (1829), he is still occupied with outward shape, glitter, and color, and with sonorous effects of language; but in the following collections, *Les Feuilles d'Automne* (1831), *Les Chants du Crépuscule* (1835), *Les Voix intérieures* (1837), and *Les Rayons et les Ombres* (1840), he is more concerned with thought and experience. He has felt the spell of Napoleon, and the essential democracy of his conception of man is transforming his earlier royalism, bringing it into harmony with the larger currents of opinion in France. Doubt has beclouded the serenity of his ardent faith, and it is losing its specifically Catholic features. This development is less visible (though in them, too, the personal, lyric note is conspicuous) in the dramatic works in which especially he sought to exemplify his literary doctrine between 1826 and 1842, and which may be termed poetic melodramas: *Marion Delorme* (1829); *Hernani* (1829–30), memorable for the literary battle between classics and romantics fought over it; *Le Roi s'amuse* (1832); *Lucrèce Borgia* (1832); *Marie Tudor* (1833); *Angelo* (1835); *Ruy Blas* (1838); *Les Burgraves* (1842). He paid tribute to the fascination of the mediæval in his historical novel *Notre Dame de Paris* (1830–31); and a leaning toward sentimental humanitarianism marks the story *Le Dernier jour d'un Condamné* (1828) and the narrative *Claude Gueux* (1834)—both passionate pleas against the death penalty. Travel in 1838–39 produced *Le Rhin*. His early critical essays were collected in *Littérature et Philosophie mêlées* (1834). After three unsuccessful candidacies he was chosen to the Academy in 1841. After the failure of his last drama there came a lull in his literary activity, as he gave himself up to the political and social questions then absorbing the attention of France. He entered the political world, was made a peer in 1845, and took active part in the discussions of the years culminating in 1848. His democracy was constantly developing, and he felt much sympathy for the ideas of social reform then rife. He supported Louis Napoleon for a moment, but soon became a bitter opponent. After the *coup d'état* he fled to Brussels, and then to Jersey and Guernsey. The first works following his banishment were denunciations of Louis Napoleon, explosions of personal hate redeemed by patriotic indignation: *L'Histoire d'un Crime* (not published till 1877); *Les Châtiments* (1853); *Napoléon le Petit* (1852). Then in the long solitude of exile he produced those works in which meditation and reflection have a larger share, often treating an epic material with philosophic intention, *Les Contemplations* (1856); two volumes of *La Légende des Siècles* (1859); *Les Chansons des Rues et des Bois* (1865); the novels more or less directly in service of social reforms or democratic ideas, *Les Misérables* (1862); *Les Travailleurs de la Mer* (1866); *L'Homme qui rit* (1869); and the critical volume *Shakspeare* (1864). In these works his democracy has become radical and socialistic, and, while his philosophy is deeply religious, most positive features of Christian theology have faded from it; he is violently anti-clerical. In 1870 he returned to Paris, where he remained during the siege, the poetic record of which he gave in *L'Année terrible* (1872). He welcomed the republic, but incurred the hostility of the conservatives by his radicalism. In 1876 he was chosen senator, and spent his last years in Paris, idolized by the populace. In the works of these last years the philosophic intention predominates, and meditation yields now and then to a sort of prophetic vision. They are mainly philosophical poems. They include new parts of *La Légende des Siècles* (1877, 1883); *Le Pape* (1878); *La Pitié suprême* (1879); *Religions et Religion* (1880); *L'Âne* (1880); *Les Quatre Vents de l'Esprit* (1881). *L'Art d'être Grand-père* (1877) is the lyrical expression of those domestic affections which had inspired much of the contents of earlier collections. He celebrated the Revolution in the novel *Quatre-vingt-treize* (1874). Speeches and letters on political and social questions were collected in *Actes et Paroles* (1st series 1875; 2d series 1876). *Torquemada*, a drama, was published in 1882. Since his death a considerable number of volumes left in manuscript have appeared, but without revealing any new phrase of his genius: *La Fin de Satan* (1886); *Toute la Lyre* (1888, 1893); *Dieu* (1891); *Le Théâtre en Liberté* (1886); *Amy Robsart* and *Les Jumeaux* (1889); *Choses vues* (1887); *En Voyage, Alpes et Pyrénées* (1890). Others are in preparation by his literary executors. In spite of a serious reaction against the school he led and a general tendency to question the originality of his ideas and his philosophic competence, Victor Hugo remains both by the vast bulk of his production and by the brilliancy and power of his imagination and the almost unexampled command over the sonorous and melodious capacities of words, the most imposing literary figure of his country in the nineteenth century.

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Huguenots, hyu'ge-nots [Fr. The etymology is uncertain, but probably diminutive of proper name *Hugues, Hugo*. A common explanation is that from Germ.-Swiss *eidguenot* (: Germ. *eidgenosse*), confederate, but this is unlikely. The Mod. Lat. *Hucno'ticus* is falsely constructed from the words *huc nos* (hither we), with which one of the early documents of Fr. Protestantism begins]: the name by which in the year 1560 the Roman Catholics began to designate the adherents of the Calvinistic Reformation in France. After the consolidation of the Reformation in France, it fell into disuse, and the Protestant establishment of that country is now known under the name of the Reformed Church of France. Protestantism was not introduced into France from Germany. There were from olden times dissenting elements in the Gallican Church, especially in the southern parts of the country, where the Visigoths had settled. The Visigoths were Arians, and in the course of time

one sect after another arose in these regions and protested against the authority of the pope and the doctrines of the Roman Catholic Church; as, for instance, the Albigenses. The general commotion which at the end of the fifteenth and in the beginning of the sixteenth century took place within the Roman Catholic Church itself was strongly felt in France, and showed itself even at the Sorbonne, which, next to the pope, was the highest theological authority in Christendom. But in France, at the court of Queen Marguerite of Navarre, this movement partly assumed a merely literary form, and became a simple assertion of independence rather than a protest, until Calvin gave to the somewhat vague tendency a more decided direction than it received anywhere else. Francis I. tried to stop the movement, and Huguenots were burned. But during the reign of Henry II. (1547–59) Protestantism was rather favored, and at his death there existed a Protestant party of great political power; and a religious war began which lasted till 1598, was renewed in the first quarter of the next century, and did not finally subside until the spirit of tolerance, the best acquisition of the eighteenth century, made religious persecutions an impossibility in France. At the head of the Roman Catholic party stood the famous family of the Guises, represented by Duke Francis and the Cardinal of Lorraine; at the head of the Protestants stood the family of Bourbon, represented by the King of Navarre and the Prince of Condé, and supported by Admiral Coligny. Between the two parties the royal power, represented first by Catharine of Medici, last by Cardinal Richelieu, occupied an intermediate position, using with great art the one to crush the other. Francis II., a son of Henry II. and Catharine of Medici, married in 1558 Mary Stuart, a niece of the Cardinal of Lorraine. He was only fifteen years old when in 1559 he ascended the throne, and with him the Guises were brought to the court and came into power. Their arrogance, ambition, and audacity caused immediately the formation of a Protestant party, and the war began. Next year (1560) Francis died, and, in order to curb the Guises, Catharine, regent during the minority of her second son, Charles IX., favored the Protestants. The edict of Jan. 17, 1562, gave them freedom of conscience and a limited liberty of worship, and to these rights were added several fortified cities, among which was Rochelle, as places of safety, by the peace of St.-Germain-en-Laye, Aug. 8, 1570—a peace which for a moment stopped the war that was still waging in spite of all edicts and treaties. Catharine, however, meant by no means to tolerate Protestantism in her realm. She hated it as an abominable heresy, and she began to fear the party, since, during the preceding wars, she saw how it was supported from England with money and from Germany with troops. Immediately after the peace of St.-Germain-en-Laye she concluded an alliance with the Guises, which resulted in the massacre on the night of St. Bartholomew (Aug. 25, 1572) of 5,000 Protestants—among whom was Coligny, their leader—in Paris, and 30,000 in the provinces. The Protestants fled to their places of safety, and the war began again; but the royal army was repelled from Rochelle, and when in 1574 the Duke of Alençon, the youngest son of Catharine, and a large party of the Roman Catholic nobility allied themselves with the Protestants against the queen and the Guises, the cause of the Reformation stood better than ever before. Treaties of peace were concluded and broken several times, but when (in 1584) Henry of Navarre, the head of the Protestant party, became heir-apparent to the French throne on the death of the Duke of Anjou, it came at last to a final battle. The Guises now openly avowed that they aspired to the crown of France, and the king, Henry III., had both Duke Henry and Cardinal Louis murdered at Blois in 1588. Pursued by the Roman Catholic party, he then fled to the Protestant camp, but next year he was himself killed by a monk, and Henry IV. ascended the throne. Henry entered the Roman Catholic Church from political reasons, but by the Edict of Nantes in 1598 the position of the Reformed Church in France became finally settled and secured, and a period of peace followed. The Protestants possessed in their places of safety and in their right of assembling a political power which it was difficult for the royal authority to consent to, and when the idea of the absolute power of royalty found an adequate representative in Cardinal Richelieu, a change in the political position of the Protestants was unavoidable. After several years of civil war, Rochelle was taken in 1628; of its 24,000 inhabitants only 4,000 were left; the rest had fallen or perished from hunger. Their other strongholds were also taken, but their freedom of conscience was respected, and even their liberty of worship; Richelieu's measures were purely political. Once more, however, the Protestants of France had to experience persecutions on account of their religion. Louis XIV. and Madame Maintenon, who was herself bred a Protestant, were both very devout, and after the death of Colbert (1684) their devotion showed itself in the harshest and most cruel measures against the Protestants. Their churches were destroyed and their property confiscated; bands of dragoons accompanied by fanatical monks scoured the country, and such as would not renounce their religion were exiled or killed, while the quartering of troops in private households subjected the Protestant families to intolerable insults and abuse. These so-called *dragonnades* made many reluctant converts to the Roman Catholic faith. Some of the Huguenots fled to the Cévennes, where they were butchered; others fled to Switzerland, Holland, and England. In the three years following immediately after the Revocation of the Edict of Nantes (Oct. 23, 1685) France lost nearly 500,000 inhabitants of the most desirable class. Many of these refugees ultimately settled in America, and wherever they came they brought art and manufacture and the refinements of civilization, and so they enriched their adopted country. Louis XV. also tried to do something "for the glory of God," and issued in 1752 an edict which declared the Protestant baptism and marriage invalid, but the edict caused such indignation, even among the Roman Catholics, that it had to be revoked. By the Code Napoléon, the Chartes of 1815 and 1830, and the constitutions of 1848 and 1872, the social and political position of the Protestants in France has been made equal to that of the Roman Catholics, and during the last twenty years their spiritual life has developed with great energy and exercised a considerable influence on the Protestant Churches of other countries. See G. de Félice, *History of the Protestants of France* (Eng. trans. New York, 1851); H. M. Baird, *History of the Rise of the Huguenots of France* (1512–74) (New York, 1879, 2 vols.); same, *The Huguenots and Henry of Navarre* (1574–1610) (1886, 2 vols.); Poole, *History of the Huguenots of the Dispersion at the Recall of the Edict of Nantes* (London, 1880); C. W. Baird, *History of the Huguenot Emigration to America* (2 vols., New York, 1885).

Revised by S. M. Jackson.

Hulin, ü'lăn', or **Hullin**, Pierre Augustin, Count: soldier; b. in Paris, France, Sept. 6, 1758; enlisted in the army in 1771; distinguished himself at the storming of the Bastile July 14, 1789; was appointed captain of the National Guard Oct. 8, same year, but, falling under the suspicion of Robespierre on account of his moderation, was imprisoned. Liberated on the fall of Robespierre, he entered the Italian army; was made a general of division in 1802; presided over the court martial which sentenced the Duke of Enghien to death Mar. 24, 1804; was military governor of Vienna in 1806, of Berlin in 1807, of Paris in 1812, and was created a count in 1808. On the restoration of the Bourbons he was banished from France in 1816, but allowed to return in 1819. D. in Paris, blind, Jan. 9, 1841. In 1823 he published *Explications offertes aux hommes impartiaux au sujet de la commission militaire instituée en l'an XII. pour juger le duc d'Enghien.*

Hull: city and commercial center of England; situated in the East Riding of Yorkshire, at the influx of the Hull into the Humber, and known officially as Kingston-upon-Hull (*q. v.*).

Hull: a thriving city of Ottawa County, Quebec; on the Ottawa river, at the junction of the Gatineau, nearly opposite the city of Ottawa, with which it is connected by a suspension bridge (see map of Ontario, ref. 2–H). It has a very great water-power, and manufactures immense quantities of lumber and some woolen goods, cooperage, axes, etc. There are valuable iron mines in the vicinity. Pop. (1891) 11,265, mostly French-Canadians.

Hull, Isaac: naval officer; b. at Derby, Conn., Mar. 9, 1773 the son of a Revolutionary officer; became a mariner, and when nineteen years of age was master of a merchant ship in the London trade; became lieutenant U. S. navy 1798; was made first lieutenant of the frigate Constitution 1801; distinguished himself by valor and skill against the French on the coast of Haiti; served with distinction in the Barbary expeditions; and was promoted to the rank of captain in 1806. He sailed for New York from Annapolis in command of the Constitution July 12, 1812, and for three days was chased by a British squadron of five ships, from which

he escaped by bold and ingenious seamanship. On Aug. 19 he encountered the frigate Guerrière, Capt. Dacres, one of his late pursuers, and fought her for half an hour at close quarters, when she surrendered, but was so much cut up that she was burned. For this, the first naval victory of the war, Hull received a gold medal from Congress, and swords and silver plate from several States; was afterward made a naval commissioner, and had command of the Pacific and Mediterranean squadrons, and was at the head of the Washington and Boston navy-yards. D. in Philadelphia, Feb. 13, 1843. Revised by JAMES GRANT WILSON.

Hull, WILLIAM: soldier; b. at Derby, Conn., June 24, 1753; graduated at Yale 1772; studied divinity one year; went to Litchfield (Conn.) Law School, and in 1775 was admitted to the bar; served with distinction throughout the Revolutionary war, in which he rose from the rank of captain to that of colonel: became a very successful lawyer of Newton, Mass.; was major-general of militia in Shays's insurrection; commissioner to treat with the Indians of Upper Canada 1793; was very prominent in the public affairs of Massachusetts, in which State he became a judge of common pleas; Governor of Michigan Territory 1805–14. As brigadier-general commanding the army of the Northwest he surrendered Detroit to Gen. Brock, for which he was court-martialed, found guilty of cowardice, and sentenced (1814) to be shot, but was pardoned in consideration of his age and former services. He published *The Campaign of the Northwest Army* (1824). D. at Newton, Mass., Nov. 29, 1825. See his *Life*, by Maria Campbell and James Freeman Clarke (1848), in which Hull's character is successfully vindicated. Revised by JAMES GRANT WILSON.

Hullah, JOHN: musician; b. at Worcester, England, June 27, 1812; began musical study in 1829 under William Horsley; entered the Royal Academy of Music in 1833, and early began to compose. He wrote several operettas, including *The Village Coquettes* (1836); *The Barbers of Bassora* (1837); and *The Outpost* (1838); but the business of his life was teaching vocal music, which he began on Feb. 10, 1840. He claimed that from 1840 to 1860, inclusive, 25,000 scholars passed through his classes. In 1872 he was appointed inspector of music under the education department. He was also music critic on the London *Globe*. He wrote many theoretical and historical music books, and composed a number of good songs, besides editing many works on music. D. in London, Feb. 21, 1884. D. E. HERVEY.

Hulse'an Lectures: a number of lectures, not exceeding six and not less than four, annually delivered at the University of Cambridge, explanatory of the evidences of Christianity and of the difficulties of Scripture. There are also a Hulsean professorship of divinity, a Hulsean prize, and scholarships, etc. These were founded by the Rev. John Hulse (1708–89).

Humaitá, oo-mă-ē̆-taa': a town in the southwestern part of Paraguay; on the river Paraguay, about 15 miles above its confluence with the Paraná (see map of South America, ref. 7–E). At present it is important chiefly for its orange-plantations, whence fruit is exported to Buenos Ayres and Montevideo. The river here is greatly narrowed and the banks on the Paraguayan side form low bluffs, while on the Chaco side they are swampy. Humaitá is thus a military position of great importance, commanding the entrance to the Paraguay. It was fortified in 1855, greatly strengthened by the younger Lopez, and during the war of the triple alliance withstood a long and sanguinary siege by the fleets and armies of Brazil and Argentina. It was finally abandoned by the Paraguayans on the night of July 24, 1868; the Brazilians dismantled the fortress. Pop. about 3,000. Curupaití, an advanced post of Humaitá, a few miles to the S., was hardly less celebrated in this war.
HERBERT H. SMITH.

Humanism: that theory of education which aims at giving symmetrical development to the intellectual and moral powers by means of the study of classical literature and art. Or, more largely, the study of the classics, or the cultivation of the *belles-lettres* in general. The word *humanism* seems to be of comparatively recent origin, hardly antedating the discussion in Germany in the end of the eighteenth century between the educational innovators, followers of BASEDOW (*q. v.*), who called themselves *philanthropinists*, and the advocates of the traditional literary education based upon the study of the classics. The companion-word *humanist*, however, is much older, being no other than the Italian *umanista*, the common title during the Renaissance of the adepts in the newly revived Greek and Latin learning. Both go back in the last resort to the Latin use of *humanus, humanitas*, as applied to liberal education. (Cf. Aulus Gellius, xiii., 16. Under the influence of the Germans, humanism has more and more during the nineteenth century come to be limited in all the European languages to classical learning, as the basis of higher education; and in that sense it will be used in this article.

The history of humanism falls properly into four distinct periods: I.—The period of formulation, extending from the fifth century before Christ to the fifth century after Christ; II.—The period of the Middle Ages; III.—The Renaissance or revival of learning, extending from the beginning of the fourteenth to the end of the eighteenth century approximately; IV.—The period of philological science, embracing a portion of the eighteenth and the nineteenth centuries. The last of these periods will better be treated in a separate article.

I. PERIOD OF FORMULATION.—The systematic use of literary studies in education seems hardly to have begun among the ancients before the end of the fifth century B. C. At that time the much maligned sophists and rhetoricians gave a new direction to education in their effort to make it more practical. As a result, they helped greatly all the arts connected with literature—as grammar, rhetoric, logic, lexicography, etc. After the founding of Alexandria and the extraordinary development of intellectual activities there, these studies were greatly enlarged. It may be said that the scholarly investigation and explanation of past literary monuments really began among the Alexandrian professors and librarians. And among them, too, the necessary helps for the study of literature—lexicons, grammars, dictionaries of mythology, biography, history, etc.—were first prepared on a large scale. Toward the end of the second century B. C. the Romans began to imitate Greek education; and during the first century B. C., the efforts of men like Varro and Cicero completely remodeled Roman methods along Greek lines. Education was henceforth conceived by the Romans in essentially Greek terms. It was outlined after an essentially Greek scheme, that of the seven liberal arts (grammar, rhetoric, logic, arithmetic, geometry, astronomy, and music); and the substance of the studies was mainly what the later Greeks had conceived that it should be. During the empire there was a remarkable development of schools all through the Roman world; and in the last centuries before the Germanic invasions almost all the intellectual life of the Romans was connected with education. The third and fourth centuries A. D. may be called the golden age of professors. Men like Ausonius, professor at Bordeaux, were rewarded with wealth, offices, reputation, the friendship of statesmen and emperors. In the chief cities of the Latin part of the empire groups of such persons were to be found, constituting what were essentially university faculties. And it was the custom for students to go from one to another of these in search of training. Thus St. Jerome went from his native Stridon, in Dalmatia, first to Rome, and then to Trier in northern Gaul, which in the fourth century boasted of schools of remarkable reputation. The regulations governing the residence of students in Rome have been preserved to us in the so-called Theodosian Code, and the same document gives us interesting information in regard to the salary and position of professors.

The consequence of this widespread attention to education was that by the fourth century A. D. a regular system had been formulated and compacted, which was everywhere accepted and handed down from generation to generation. And in this system the central thing was the study of the older and greater Greek and Latin writers. The grammarian made use of these for his instruction in language; the rhetorician to illustrate the true method of eloquent speech; and the philosopher to make clear the differences between schools of thought. Original creation, whether in literature proper or philosophy, had virtually come to an end, and it seemed to all educated persons that the study of the works of the past was the most profitable of intellectual pursuits. And, what is perhaps most noteworthy of all, both gentiles and Christians accepted this conception of education. The latter had had many hesitations on this point, and the obscurantist utterances of men like Tatian, Tertullian, Gregory the Great, and even Jerome and Augustine are well known. Nevertheless, it is clear that from the earliest period the Church found it impossible to do without the philosophy and literature of the old classical world, and

Christian theology shows everywhere large obligations to both. It was impracticable also for Christians to give their children a separate education, in which only Christian material should be employed; and we early find Christian grammarians and rhetoricians using the gentile poets and orators as freely as their pagan neighbors. Hence it was that in the last years of the empire but one scheme of education obtained in both sections of the community; and that was essentially literary, or humanistic. It is significant that throughout the Christian Middle Ages, the standard work on education was the grotesque encyclopædia of the seven liberal arts by Martianus Capella; and that Dante's view of the necessary elements of instruction is the same as Varro's.

II. Mediæval Period.—In the fifth century A. D. the ancient world began to experience those successive barbarian invasions which speedily brought the old order of things to an end. It may be said that only two institutions survived these shocks—Christianity and education; and these survived together. The gentile world was destroyed by the Germans; its philosophers and teachers with the rest. From the fifth century on, therefore, all education was in the hands of Christians. Undoubtedly there were terrible losses even among them. The destruction of schools, libraries, and the other apparatus of learning made teaching necessarily very elementary in its character, and restricted much the number of those who could obtain it. The first two or three centuries after the fall of the empire were not so bad; scholarship still survived in some sense. The Christian encyclopædists, like Isidore of Seville and Cassiodorius Senator, possessed very considerable attainments. But the number of these men steadily declined. And then the civilized world became smaller and smaller. First it was Africa, that rich and cultivated province, that fell into the hands of the Moslems. Then almost all Spain met the same fate. The whole Eastern empire was parted from the West even earlier. In Gaul itself, where in the fourth century there had been on the whole the most highly developed culture anywhere to be found in the Latin world, the fifth and sixth centuries were so terrible that little of the old civilization remained. It is curious to find that in the end of the sixth and the beginning of the seventh century it was in remote Ireland, which had really never formed part of the Roman empire, that studies and scholarship were most to be found. There Greek was still read; there the ardor of the faith did not prevent monks from studying Vergil, Cicero, and even Ovid. From Ireland indeed seems to have come the first impulse to a renewal of the decaying study of literature. Columba, Columban, and their disciples, carried not merely the gospel, but also letters, first to the neighboring English, then to the French, the Germans, and even the Italians. Wherever the Irish missionaries established themselves, studies and scholars were sure to be found. The monasteries of Hy (Iona), off the coast of Scotland, Luxeuil, in France, St. Gall, in Switzerland, Bobbio, in Italy—all Irish—were for centuries the resorts of those who desired learning. In them were libraries, prized and fostered, when everywhere else books were moldering in neglect. In them were monastic schools in which attention was paid to the sound Latinity of the ancients; and in which the memory even of Greek was kept alive. They had teachers who retained something of the humanity that seemed elsewhere to have disappeared.

The English were the first to take up for themselves the torch of learning offered by the Irish. During the second half of the seventh and the eighth century scholarship made really remarkable progress among them. The efforts of the Irish in England were indeed seconded by the happy chance that in 669 brought a cultivated Greek, Theodore, to be Archbishop of Canterbury; but the main source of English scholarship remained Irish. Aldhelm in the seventh century and Bede in the eighth were great scholars; and the schools of Wearmouth and Jarrow, and later York, were the most famous of Europe. Nor did the English monopolize this learning and keep it to themselves. Like the Irish, they soon began to carry it to the Continent. St. Boniface (Winfrid) was another Columban, scholar and apostle at once; and his abbey of Fulda, founded in 744 in the great forest between Hesse and Bavaria, was destined to be for centuries an outpost of culture, as well as of Christianity, among the rude Germans. Later in the eighth century, when Charlemagne began to dream of an empire modeled upon the dead Roman one, and as a necessary accompaniment conceived of restoring studies and the intellectual life, he found in the English Alcuin a learned, if not very original, director of his enterprise. With Alcuin (*q. v.*) and Charlemagne's so-called School of the Palace (*Schola Palatina*) the history of modern humanism as a continental affair may almost be said to begin. There is something naïve and even amusing about the scholarship of Alcuin and his disciples; but the impulse to studies that resulted from their efforts is incontestable. The ninth century gives us names of first-rate importance—Rabanus Maurus, who came from Fulda to Tours to study with Alcuin; Lupus Servatus, Abbot of Ferrières, an eager lover of the classics; perhaps most important of all, John Scotus Erigena, scholar and thinker at once, out of whose Neo-Platonic speculations the scholastic philosophy of the Middle Ages may be said to proceed. These men and their pupils diffused through Western Europe an altogether new interest in the ancient world; and for the next four centuries we can see an ever-enlarging knowledge of the classics among clerks, and to some extent among the laity. Especially as scholastic philosophy developed, more and more recourse was had to the ancient writers on the subject, especially to Aristotle, though it was not till the twelfth and thirteenth centuries that the whole body of the Stagirite's works was made accessible through Latin translations from the Arab commentators. The tendency was strengthened furthermore by the political ideals and speculations of the time. Charlemagne, the Ottos, and the Suabian emperors all had before their imaginations the grandeur of the Roman empire, and did much to impress mankind with the unapproachable excellence of it and its works. In the later Middle Ages even the laity had begun to know something in a vague and imperfect way of the heroic deeds and of the writers of antiquity. Apocryphal accounts of Troy, of Thebes, of Alexander, of Cæsar, of the magician Vergil, and so on, were widely known. They were even made use of in the new literatures in the vulgar tongues. The revival of encyclopædic learning, which is so marked a characteristic of the twelfth and thirteenth centuries, led to more and more minute study of the works which were regarded as the great sources of all knowledge, except what is purely theological. Learning, to be sure, was not yet much cultivated for its own sake, but rather for the light to be derived from it upon the problems that interested the mediæval mind. Still, men like Abelard, John of Salisbury, Adelard of Bath, Albertus Magnus, and St. Thomas Aquinas, by their respect for scholarship and their passion to embrace the *omne scibile*, immensely assisted the rising study of the great classics. How far this study had gone by the end of the thirteenth century is best to be seen in Dante. The great Florentine poet, whose *Divine Comedy* is at once a judgment upon his age and a reflection of its higher life, appears to us in it and in his other works as a scholar whose reading of the Latin authors it would be hard to find surpassed in any time. Of Greek literature he knew nothing except at second hand; but he had already made out the unapproachable excellence of the works of the Greek genius. See Schück, *Dantes Classische Studien*, in *Neue Jahrbücher für Philol. und Pädag.* (1865).

III. The Renaissance.—Through causes that are very obscure the intellectual leadership of Europe, which, during the Middle Ages, had been in the hands of France, passed in the fourteenth century to Italy. Scholastic philosophy, the most important of the spiritual works of the French, began after the thirteenth century to lose its power; and the enormous secular literature of France, which for two centuries had been esteemed the finest and most beautiful in the world, rapidly decayed. The rise of Italy to the preeminence formerly enjoyed by her neighbor was attended by so remarkable an intellectual revolution as to be generally called a "new birth"—*renaissance*. And this new birth was from the beginning marked by a greatly heightened enthusiasm for the classics. The first man of the Renaissance, and at the same time the first modern *humanist*, was Petrarch (*q. v.*), born in 1304, more than seventeen years before the death of Dante. The difference between the two men is, however, almost incredible. Dante still belonged to the Middle Ages—his mind was of the mediæval type, his intellectual interests, his studies, his learning, all were mediæval. Petrarch, on the other hand, is almost completely a modern. He no longer looks upon the world as a mystic, striving to connect the present with eternal life. He turns his eyes rather away from what is not here and now humanly important. He has the clearness, the sanity, the skepticism of the modern man. And in the living world he finds chiefly interesting the immediately human aspects of it. He loves beauty, desires fame, prizes learning, in and for themselves. He is a modern patriot, enthusiastic for his country for

what she has been and is to be; not, like Dante, a theorist in search of a divinely appointed and universal system of government. These prepossessions all powerfully operated to withdraw Petrarch from the intellectual ideals of his older contemporaries; and the literature, whether learned or secular, in which those ideals were expressed, speedily became distasteful to him. He turned away from it to the older literature of classic Italy, whose richness, whose charm, whose "eloquence" (a favorite word of his) were after his own heart. A very passion seized upon him to know all that could be known of those great writers; and nothing in his career is more moving than the eagerness with which for years he gathered manuscripts, collated texts, and strove to repair the dreadful ravages of time and man's neglect. The result was a new tendency in the intellectual activity of the best spirits. Petrarch became almost a god—the pointer-out of new and more beautiful ways for human feet. We see the effects of this in the case of the slightly younger Boccaccio (*q. v.*), who, abandoning his craft as a gracious but essentially mediæval story-teller, spent the last years of his life in preparing now forgotten works of classical erudition. And these two men became the models of the succeeding generations. The last quarter of the fourteenth century saw Italy permeated with the new enthusiasm. In Florence, especially, all the finest minds were turned in this direction, though in many other places also there were not wanting eager youth to give up the study of theology or jurisprudence for the delightful classics.

The fourteenth and fifteenth centuries, then, were the centuries in which the study of the classics for their own sake was rehabilitated. We are able to follow all the steps of the process. One of the most important of these was the recovery of Greek. Petrarch had felt the importance of this, though he had been unable to accomplish it himself. Boccaccio had gone a little further, though he also had never really mastered the Greek tongue. Between them, however, they had procured from a certain Leontius Pilatus, a Greek by birth, a rude translation of Homer into Latin, the first modern translation of a Greek poet. This, however, was only a beginning. The true revival of Greek studies dates from the appointment of Manuel Chrysoloras (*q. v.*), a Byzantine scholar, as Professor of Greek at Florence in 1396. From him and from his pupils descended the ever-increasing generations of Greek scholars, who, during the fifteenth century, made known to Western Europe the great originals and models of all classical literary art. The limits of this article do not permit mention in detail of these scholars, nor of those who still confined themselves in the main to Latin literature. Suffice it to say that after the year 1400 there was in Italy the most rapid extension of all the subsidiary as well as of the essential interests of classical learning. Wandering professors diffused a knowledge of the Greek and Latin writers throughout the Peninsula; libraries and collections of antiquities were brought together by rich patrons of letters; princes and popes gathered renowned humanists at their courts as the surest means of obtaining name and fame for themselves. Every portion of Italian culture was profoundly modified. Literature, art, education, manners—all felt the powerful influence; and by the end of the fifteenth century antiquity had become almost the chief constituent part of Italian civilization. At the same time an unexpected cause gave permanence to what had been gained. This was the invention of printing. The first Latin book to be sent abroad in indestructible type was Cicero's *De officiis*, printed in 1465; the first Greek authors to be printed, Theocritus and Æsop, appeared together in Milan, probably in 1480, though no date appears on the title page. In less than twenty years after this latter date the great Venetian printer, Aldus Manutius (*q. v.*), had entered upon his noble task of giving to the world almost the whole body of ancient literature, in beautiful volumes, clearly printed, and of a small and convenient size.

The recognition of the importance of the studies of the Italian humanists by the other countries of Europe was not immediate. For these countries the classic past was not their own past, as was the case with Italy. Accordingly, it is not until well on in the fifteenth century that we can discover much change in the attitude of scholars outside Italy toward ancient literature. Even when they came in contact with the Italians they did not feel the influence of the new movement. Thus the English Chaucer knew much of both Petrarch and Boccaccio, and at the same time had wide reading in the Latin classics, yet he remained as mediæval as Dante in his scholarship. It was not in the nature of things, however, that so powerful an intellectual movement as Italian humanism should not finally extend to the rest of Europe. Toward the end of the fifteenth century we see evidences in France that it is beginning to be felt there. Chastellain and the so-called *rhétoriqueurs*, though mediæval in matter, belong to the Renaissance by the affected Latinism of their style. After we pass over into the sixteenth century the signs of growing enthusiasm for the classics multiply. The poet Marot and his school seem to hesitate between mediævalism and humanism; and perhaps for this reason time has dealt severely with them. In Rabelais, on the other hand, the tide of new learning rises like a flood, uncontrollable, confused, full of the strangest and most incongruous matters. But contemporary with Marot and Rabelais the first great classical scholars of France appear. These are Robert Estienne (Stephanus) and Henri, his son; Adrien Turnebous (Turnebus), Denis Lambin (Dionysius Lambinus), and Marcus Antonius Muretus. Exactly in the middle of the century we have a document of great interest, which shows us that humanism has triumphed, or at least is on the point of triumphing, in France. This is the famous manifesto of Ronsard and the Pléiade, written by Joachim du Bellay (*q. v.*), and entitled *Deffence et illustration de la langue françoyse* (1549). Of this the keynote was the passage, *Ly doncques, et relу premièrement (ô Poëte futur), feuilleté de main nocturne et journelle, les exemplaires Grecz et Latins, puis me laisse toutes ces vieilles poësies françoises aux Jeux Floraux de Toulouze, et au Puy de Rouan.* From the moment when this appeared France more and more swiftly and disdainfully turned away from her own splendid mediæval past and gave herself to the new gods. School after school of writers eliminated the last vestiges of the old literary forms and ideals, and disciplined the French language, and French thought with it, to that regularity and precision which now chiefly distinguish them. First it was Malherbe who guided the movement; then, half a century later, Boileau. And the age of Boileau was also the age of Louis XIV., with its magnificent literature of the classical type. Scholarship and education followed literature; Casaubon seconded Malherbe; and so completely was the intellectual life of the French remodeled after the new ideals that even to-day no nation in Europe is, on the whole, so careless as France of all the Middle Ages accomplished.

While humanism was thus triumphing in France, it was not less surely advancing in the rest of Europe. In Spain the influence of Italy began to be felt early in the fifteenth century. Micer Francisco Imperial and, above all, the Marquis of Santillana spread among their countrymen the name and fame of Dante, Petrarch, and Boccaccio. At the same time they were powerfully affected by the enthusiasms of their great models. After these writers Spanish literature shows greater and greater traces of the influence of the classics; though it must be said that the Spaniards never so thoroughly put off the Middle Ages as did their neighbors, the French. The greatest Spanish poetry, that of Calderon and Lope de Vega, for example, belongs on the whole to an unbroken tradition that has its beginning in the mediæval time.

Among the Germanic nations the progress of humanism was no less sure. Holland was perhaps the first to produce an epoch-making scholar, in the person of Desiderius Erasmus (*q. v.*). This man's influence, however, was by no means limited to his native land. It extended to England, Germany, France, and even Italy. After him we have a long line of great Dutch humanists, reaching through the sixteenth, seventeenth, and eighteenth centuries. Lipsius, Scaliger, Vossius, Heinsius (father and son), Grotius, Gronovius, Burmann (uncle and nephew), Hemsterhuis, are names of which any nation may well be proud. And in Holland, too, the influence of humanism upon secular literature and upon education was hardly less strong than in France. Perhaps nowhere did the classics become more firmly intrenched in the higher schools and universities, as the only basis for serious instruction.

In England, apart from some isolated cases of Italian influence during the fifteenth century, it is hardly till after the beginning of the sixteenth that we can clearly make out the progress of the new culture. Perhaps the English visits of Erasmus had as much to do as any one cause with spreading an interest in classical scholarship, but the efforts of men like More (*q. v.*) and Colet (*q. v.*) were extremely important. Gradually the University of Cambridge became the center from which humanism diffused itself, and to this fact more than to any other was due the greater esteem

which this university had, as compared with Oxford, during the seventeenth century and much of the eighteenth. Mediævalism, however, only slowly yielded in the universities; in the lower schools the classics much earlier obtained the place of honor. In literature, the Elizabethan age saw Italian and humanistic influences everywhere get the upper-hand, though in England, as in Spain, the deep-seated traditions that came from the Middle Ages were not wholly sacrificed. To this, perhaps, in some degree, is due the imaginative richness of English as compared with French poetry. Throughout the seventeenth century, however, the tendencies in England were all essentially classical, though few great scholars appeared. Perhaps the greatest was Milton, a great humanist as well as great poet—though the Puritan strain in him was too strong to permit a really perfect fusion of these elements of his genius. It was not until the last decade of the century that England produced a man whose strength was in classical erudition alone. This was Richard Bentley (*q. v.*), who first showed the world the possibilities of minute, elaborate scholarship. From him have to a large extent proceeded the tendencies that have gradually, all over Europe, destroyed the older humanism, and erected in its place the technical science of classical philology.

One other country remains to be spoken of—Germany, which in the nineteenth century has been the chief seat of classical learning. Political complications brought the Germans into more or less close contact with Italy during the whole period of the rise of Italian humanism, and some traces of interest in the new studies are visible among them even in the fourteenth century. It was not, however, until the two councils of Constance (1414–18) and Basel (1431–50), at which several Italian scholars played important parts, that the Germans had an opportunity of seeing what humanism really was. Their interest was easily kindled, and in the immediately succeeding time it was kept alive by the sojourn in Germany of two or three famous humanists. Of these, the most important was Æneas Sylvius Piccolomini (later Pope Pius II.), who in 1442 became secretary of the imperial chancellery, and for more than ten years conducted an earnest campaign among the Germans in favor of pure Latinity and higher literary culture in general. He was succeeded by a whole generation of scholars, now Germans proper, among whom the names of Peter Luder, Samuel Karoch, and Rudolph of Langen are eminent. A little later we begin to have the names of really great students—Rudolph Agricola; the wandering teacher, Conrad Celtis; Trithemius, and, finally, Reuchlin. Toward the end of the fifteenth century the tendencies which were making possible the Reformation worked also for classical studies, and when the Reformation was an accomplished fact the reformers were found generally on the side of scholarship. They had found the grammatical and textual studies of the humanists very valuable in their controversy with the Church, and they naturally accepted at the same time the literatures which the humanists admired. They also saw the importance of controlling and molding education if they were to maintain themselves. The German universities had already in the fifteenth century shown some favor to the classics, and Erfurt had in the first decade of the sixteenth century boasted a whole group of eager classical scholars. The new universities, founded under the influence of the Reformers, and such old ones as felt it, showed ever-increasing favor to these studies. And, finally, they were carried down into the schools by the educational reforms due to Melanchthon. For two hundred years humanism had almost undisputed control of higher education in Germany.

During this period no essential change in the character of humanism took place. Great numbers of scholars and teachers transmitted from generation to generation what had been attained, and occasionally an important name stands out in the list—e. g. Fabricius, Gesner, Ernesti, Reiske, Heyne. Toward the middle of the eighteenth century, however, there began to be signs of change. On the one hand, the influence of Bentley began to be felt, urging scholars toward accurate and technical methods of dealing with their material; on the other hand, Winckelmann's labors upon ancient art, and the interests of writers like Lessing, made it seem desirable to complete and round out what was known of the classic world. Furthermore, the controversy already mentioned over *philanthropinism* as a proposed substitute for humanism forced upon scholars a new examination of what the latter meant. All these forces really tended in the same direction—i. e. to the definition of the field of classical studies, and the determination of the scientific method of working that field. The older humanism, as a form of the intellectual life quite as much as a certain body of studies, insensibly gave way. The first scholar definitely to express this new condition of things was Friedrich August Wolff (1759–1824), with whom the history of humanism ends and that of classical philology begins.

The limits of this article do not permit a discussion of humanism in Hungary, Bohemia, Poland, Denmark, and the Scandinavian countries.

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Humanist: a scholar versed in classical literature. In the sixteenth century the title was assumed by classical scholars as the exponents of Humanism (*q. v.*).

Humanitarians: a name which sometimes designates that school of Unitarians who consider Jesus Christ to have been a mere man, without superhuman attributes. It also sometimes designates the professors of the so-called "religion of humanity."

Humber: the estuary of the Trent and the Ouse, having its entrance on the east coast of England, in lat. 53° 38′ N. Its average breadth is between 2 and 3 miles, and it is navigable for the largest vessels up to Kingston-upon-Hull, 22 miles.

Humber: a river of Newfoundland; second in size, the river of Exploits being the first. It rises in Adie's Pond, flows N. E. toward White Bay, then turns S. W., and after receiving the outflow of Grand Lake and passing through Deer Pond, it turns westward and reaches the Bay of Islands on the French shore, through an estuary called Humber Arm. Its length is about 75 miles, but its upper course is almost unknown. Ores of molybdenum have been found near the mouth, but have not been worked, as permanent establishments of the Newfoundlanders on this coast are expressly forbidden by treaty. Mark W. Harrington.

Humbert I.: King of Italy; b. at Turin, Mar. 14, 1844, the eldest son of King Victor Emmanuel II. of Italy, and of Archduchess Adelaide of Austria. He accompanied his father in the war of 1859; aided in reorganizing the ancient kingdom of the Two Sicilies; took part in the war of 1866, commanding a division in 1866 and covered the retreat of the Italian army after the battle of Custozza. He married Apr. 22, 1868, his cousin Margarita of Savoy, the only daugh-

ter of Prince Ferdinand of Piedmont, Duke of Genoa, and on Nov. 11, 1869, a son was born, who received the name of Victor Emmanuel Ferdinand and the title of Prince of Naples. After the occupation of Rome by the Italian troops in 1870, the prince and princess took up their residence in that city. Humbert succeeded to the throne on the death of his father Jan. 9, 1878. In the fall of that year an attempt was made to assassinate him, but he escaped with a slight wound. During the cholera epidemic of 1884 he gained much favor by his bravery in visiting Naples and his generosity.

Humble-bee [M. Eng. *humbylbee*; cf. Dutch *hommelbei*, Germ. *hummel* < O. H. Germ. *humbal*, drone; etymol. obscure, though the word is doubtless influenced by the verb *hum*]: a name common to the hymenopterous insects of the genus *Bombus*, nearly fifty species of which are known to live in North America alone, besides numerous Old World species. The mother-bee hibernates, and in the spring selects a place for her nest in a wet, mossy place, or in a mouse's nest, or under a stump. She collects pollen, mixes honey with it, laying her eggs in the mass from time to time, and meanwhile busily adding to her store of food. From the egg to the perfect insect the transformation is very gradual. The larvæ eat out cells in the pollen mass, spinning a lining of silk, which the old bee fortifies with wax. The young bees come forth from time to time and add to the stores. There are many ways, among so many species, of constructing the nest. The males, females, and working-bees appear to live together in harmony. The aggregate number of insects in one community is usually very small as compared with the number in one swarm of honey-bees. The humble-bee is beset by numerous parasitic insects. Foxes, skunks, and bears, as well as boys, know well how to extract the sweet treasures of the humble-bee from the earth; for, though the sting is severe, most species of humble-bees are not very active in attack or defense.

Humboldt: town (settled by people from Central New York and Vermont in 1863–64); Humboldt co., Ia. (for location of county, see map of Iowa, ref. 3–F); on the Des Moines river, and the Chi. and N. W., and the Minn. and St. L. Railways; 17 miles N. of Fort Dodge. It derives excellent power for manufacturing from the river, is in an agricultural and stock-raising region, and has numerous mineral springs and quarries of fine building-stone. There are 4 churches, new and model public-school building, several attractive parks, and 3 weekly newspapers. Pop. (1880) 606; (1890) 1,075; (1895) 1,240.

Editor of "Humboldt County Independent."

Humboldt: city; Allen co., Kan. (for location of county, see map of Kansas, ref. 7–J); on the Neosho river, and the Atch., Top. and S. Fé, and the Mo., Kan. and Tex. Railways; 36 miles S. of Lawrence, 44 miles W. of Fort Scott. It is in an agricultural region, and has manufactures of flour, cheese, woolen goods, and carriages and wagons. Pop. (1880) 1,542; (1890) 1,361; (1895) 1,474.

Humboldt: city; Richardson co., Neb. (for location of county, see map of Nebraska, ref. 7–K); on the Burl. and Mo. River Railroad; 26 miles N. W. of Falls City, the county-seat. It is in an agricultural and stock-raising region, and has two weekly newspapers. Pop. (1880) 917; (1890) 1,114.

Humboldt: town (founded in 1859); Gibson co., Tenn. (for location of county, see map of Tennessee, ref. 6–B); on the Louisv. and Nashv. and the Mobile and Ohio Railways; 82 miles N. E. of Memphis, 128 S. W. of Nashville. It is the center of a rich fruit and vegetable growing region; has very large and important nurseries; ships annually about $500,000 worth of fruit and 3,500 bales of cotton, and has foundries, saw and planing mills, spoke, stave, and box factories, cotton-gins, marble-works, and two weekly newspapers. Pop. (1880) 1,572; (1890) 1,837; (1892) 2,600.

Editor of "Messenger."

Humboldt, Friedrich Heinrich Alexander, Baron von: naturalist; b. in Berlin, of a wealthy family, Sept. 14, 1769; received, together with his elder brother, Karl Wilhelm, a most careful education in his home under the direction of his mother, his father having died very early. In 1787 he studied at the University of Frankfort-on-the-Oder, and after spending the following year in Berlin, occupied in the study of the technology of manufactures and the Greek language, he passed two years at the University of Göttingen, studying philology under Heyne and natural history under Blumenbach. His first published work, *Ueber die Basalte am Rhein* (Berlin, 1790), belongs to this period. After a rapid journey through Belgium, Holland, England, and France, in company with George Foster, he settled for some time in Hamburg, studied the modern languages with great zeal, and heard lectures on banking and book-keeping, having determined to devote himself to commercial pursuits. His passion for studies, especially of nature, was too strong, however, and in 1791 he entered the celebrated mining school at Freiberg, where he studied under Werner and Leopold von Buch, and where he wrote his interesting essay on the *Flora Subterranea Fribergensis*, which appeared in 1793. From 1792 to 1797 he occupied a superior position as a mining officer at Bayreuth, at the same time exploring and conducting mines, making observations and experiments in almost every field of natural science, studying history and philology, making geognostic journeys, filling diplomatic missions, and finishing his work, *Ueber die gereizte Muskel- und Nervenfaser, nebst Vermuthungen über den chemischen Process des Lebens in der Thier- und Pflanzenwelt* (2 vols., Berlin, 1797–99). This is still admired, in spite of the subsequent progress of physiological knowledge, on account of the correctness of its observations, the ingeniousness of its experiments, and the general validity of its conclusions. On the death of his mother (in 1797) he determined to make a scientific journey in the tropical zones. He first planned a tour to Egypt with Lord Bristol; then he determined to join the expedition of Baudin which the Directory of France sent out; then he thought of accompanying the Swedish consul, Skjöldebrand, to Tunis; but all these plans failed. It was the generosity of the Spanish Government which at last brought him to America. On June 5, 1799, he started from Corunna; on Aug. 3, 1804, he returned to Bordeaux. He spent five years in the Spanish colonies of Central and South America, walking, riding on horseback, sailing, rowing, always carrying along with him a whole caravan with helpers and instruments. Humboldt brought back with him an immense store of the most valuable scientific materials, astronomical determinations of localities, barometric measurements, meteorologic, climatologic, and magnetic observations, maps, profiles of mountains, herbariums, etc. He settled in Paris, the scientific center of the world, and, although frequently engaged in scientific travels or diplomatic missions, he resided there from 1803 to 1827, occupied with the arrangement and publication of his scientific acquisitions, which appeared successively during the period in twenty-nine volumes, written in French and translated into German, and accompanied by upward of 2,000 exquisite illustrations. The information was new, exceedingly attractive, ranging over the whole field of natural science; and it was correct. New ideas were started, the geography of plants, the isothermal lines, etc.: new impulses were received by every branch of science; nay, an influence was felt even in poetry and art. In 1827 he removed to Berlin at the solicitation of the king, and resided in his native city for the rest of his life, occupying himself with diplomatic offices of a lighter description and the most severe studies. The two remarkable events of this period of his life were the Russian expedition to Central Asia and the publication of his *Kosmos*. In 1829 the Russian emperor Nicholas fitted out a most magnificent expedition, which he placed under the direction of Humboldt, and which went through Moscow, Kasan, and Tobolsk to the Atlas Mountains and the Chinese frontier, and thence back to the Caspian Sea. The results of this journey Humboldt communicated in his *Asie Centrale* (3 vols., Paris, 1843). The first volume of *Kosmos* appeared in 1845; the fourth and last was not published till after the death of the author, May 6, 1859. *Kosmos* is Humboldt's chief work, the most perfect and the most characteristic. It gives a striking and attractive description of the numberless varieties of forms which the world contains, but this multitude it gathers under total views, and represents the world as one consistent existence. See Klenke, *Alexander von Humboldt, ein biographisches Denkmal* (1859).

Revised by Charles E. Bessey.

Humboldt, Karl Wilhelm, Baron von: statesman and philologist; brother of Humboldt the naturalist; b. at Potsdam, June 22, 1767. After finishing his studies of philology and philosophy at Göttingen, he lived alternately at Erfurt, Weimar, Jena, and Berlin in intimate intercourse with Schiller, Goethe, F. H. Jacobi, and other celebrities of his time, and on the Thuringian estates of his wife, the spirited

Karoline von Dacheröden, whom he married in 1791. From 1797 to 1799 he resided with his family in Paris, whence he made a journey into Spain, spending his time partly in literary occupations, poetical and critical, of a lighter description, partly in penetrating and exhaustive linguistic studies. In 1801 he was appointed Prussian ambassador to the court of Rome, but returned in 1808 to Berlin as councilor of state, and in that office developed great activity for the reorganization of the Prussian state, more especially for the establishment of the University of Berlin, and also was minister of public instruction. In 1810 he went as minister plenipotentiary to Vienna, and he played a conspicuous part in the immense diplomatic stir which accompanied and followed the fall of Napoleon. He sat at the congresses of Prague, Châtillon, Vienna, and Aix-la-Chapelle. He signed the treaty of Paris, and represented Prussia in the first German diet. He was a member of the Prussian council of state up to 1819, and he exercised a great and beneficial influence on the development of German affairs. The Prussian king, like the other German princes, broke the promise of a representative constitution which he had given during the war against Napoleon, and under the pretext of putting down demagogism he persecuted liberty. Humboldt understood the manœuver, and fought against it with all his power. Suddenly (Dec. 31, 1819) he was dismissed in a signal manner. He afterward lived on his estate of Tegel at the Lake of Spandau. His influence was preventive, however, rather than productive. As a statesman he possessed great business capacity, industry, clearness, and tact, and he entertained liberal and even large views; but he had no invention, hardly any ideas. He was a man of exquisite taste, of warm interest, of ready sympathy, and his correspondence with Schiller, Goethe, and others shows how he brought light and elevation along with him wherever he went. But his poems, his criticisms, his letters, have only historical interest. The influence died out with the man. Not so, however, with his scientific works. His merits in the establishment and development of the science of comparative philology are lasting as they are great, and his linguistic researches are in many points both ingenious and exhaustive. He was the first to draw the attention of philologists to the Basque language of Northern Spain, the Kawi languages of Java, etc., and though his merits as a conqueror of new scientific materials were great, still greater were his merits as a philosopher of science. His principal works in this line are *Berichtigungen und Zusätze zu Adelungs Mithridates über die cantabrische oder baskische Sprache* (1817); *Prüfung der Untersuchungen über die Urbewohner Hispaniens vermittelst der baskischen Sprache* (1821); *Ueber den Dualis* (1828); *Ueber die Verwandtschaft der Ortsadverbien mit dem Pronomen in einigen Sprachen* (1830); *Ueber die Kawisprache* (1836–40); *Vocabulaire inédit de la langue Taïtienne* (1843), etc. This great and even brilliant scientific activity began after his removal from office. Died on his estate Apr. 8, 1835. See Schlesier, *Erinnerungen an Wilhelm von Humboldt* (1846); the biography by Haym (1856).

Revised by F. M. Colby.

Humboldt River: the longest river of Nevada. It rises in Elko County, and flows 384 miles in a generally southwest course. Its waters are alkaline, being charged with soda. It is nowhere many yards in width, and is generally fordable. Its banks have clumps of willows and other vegetation, and there are some fertile alluvial plains. Like other desert streams, it grows smaller by evaporation in its lower course; and it ends in Humboldt Lake, whence its water is returned to the air. Formerly the lake overflowed at high stages to Mirage Lake and North Carson Lake, but a dam was built to prevent this. The river is remarkable as furnishing the only east and west valley through this region, while north and south valleys are numerous. The Central Pacific Railroad follows its valley for many miles. The Little Humboldt is its largest affluent. Numerous streams approach the Humboldt, but sink after leaving their cañons; in high water the Reese river passes its sink and flows into the Humboldt. Some 5 miles above Humboldt Lake are the "Big Meadows," with an area of 5,000 acres, furnishing great quantities of hay and some peat. The lake is 3,929 feet above sea-level.

Revised by G. K. Gilbert.

Hume, David: the most noted of modern skeptical philosophers and a distinguished essayist and historian; b. at Edinburgh, Apr. 26, 1711. His father, Joseph Hume (or Home), a member of the faculty of advocates, and proprietor of the estate at Ninewells in the parish of Chirnside, Berwickshire, died leaving David still an infant. At the age of twelve Hume entered Edinburgh University, and, although he was intended for the bar, his own inclination was toward literature, his favorite authors being Cicero, Vergil, Seneca, and Plutarch. His slender means led him at the age of twenty-three to enter mercantile life at Bristol, but after some months he resolved to pursue his literary projects, and sought cheap living and retirement in France at Rheims and La Flèche, where he composed his *Treatise on Human Nature*, which he published in 1739–40, after his return to England. "It fell dead-born from the press," says Hume, "without reaching such distinction as even to excite a murmur among the zealots." In 1741–42 he published the first part of his *Moral and Political Essays*, which were favorably received. In 1744 his reputation for skepticism prevented the success of his application for the chair of Moral Philosophy in the University of Edinburgh. In 1748 he attended Gen. St. Clair on an embassy to Vienna and Turin. Having recast the first part of his *Treatise*, he published it as an *Inquiry concerning the Human Understanding*; in a later edition (1777) prefixing a disclaimer of the *Treatise*, and expressing the desire that the *Inquiry* "may alone be regarded as containing his philosophical sentiments and principles." In 1752 he became librarian of the Advocates' Library in Edinburgh, which position he held for five years, and, availing himself of its resources, undertook his *History of England*, publishing the first volume in 1754, treating the reigns of James I. and Charles I., and bringing much obloquy upon himself for his leniency shown toward Strafford and Charles I.; but his subsequent volumes achieved great popularity for the work. His *Political Discourses*, published in 1751, obtained wide fame on the Continent, and contributed largely to the creation of the science of political economy. His *Inquiry concerning the Principles of Morals* appeared in 1751, the same being a recast of the third part of the *Treatise*, and considered by Hume to be "incomparably the best of all his writings." He accepted the Earl of Hertford's invitation to attend him on his embassy to Paris in 1763, and on his arrival was "loaded with civilities" by the nobility, foreign ambassadors, the savants, and the royal family. He became intimate in the circle of d'Alembert, Marmontel, Diderot, Duclos, Helvétius, Hérault, Buffon, Malesherbes, Holbach, and Turgot, and was the special favorite of the ladies. In 1767–68 (he had returned from France in 1766) he was Under Secretary of State, appointed by Lord Conway, brother of the Earl of Hertford, and had charge of Scottish affairs, including the patronage of the churches. He resided at Edinburgh, and was chief of a literary circle including Robertson, Blair, Lord Kames, Adam Ferguson, Adam Smith, and others. Warned by an incurable disease, he wrote his own *Life* and provided for the publication of his *Dialogues on Natural Religion*, a work written in early life, and calmly awaited death, which came Aug. 25, 1776. His philosophy is the completest statement of the ideas that produced the French Revolution, as a general revolt against authority, both in the state and in the Church, extending to all Europe, and may be regarded as the culmination of the reactionary movement toward individualism and naturalism inaugurated in the era of Bacon and Locke, and reaching its *dénouement* in the eighteenth century. It has been the stimulating cause of the notable systems since. Kant confessed that "Hume's exception to the idea of causality first interrupted my [Kant's] dogmatic slumber." Hume expounds the basis of his system thus (*Treatise of Human Nature*, book i., part i., § 1): "All the perceptions of the human mind resolve themselves into two distinct kinds, which I call *impressions* and *ideas*. The difference between these consists in the degrees of force and liveliness with which they strike upon the mind and make their way into our thought or consciousness. Those perceptions which enter with the most force and violence we may name *impressions*, and under this name I comprehend all our sensations, passions, and emotions as they make their first appearance in the soul. By *ideas*, I mean the faint images of these in thinking and reasoning." Thus ideas are copies of impressions of individual things, and the phase of universality belonging to them is completely ignored. He consistently denies all objective validity to complex ideas, and holds the conceptions of substances, modes, and relations to be fictions of the mind. Hence "the identity which we ascribe to the mind of man is only a fictitious one." The complex idea of cause and effect is, as Hume says, "derived from experience, which, presenting us with certain objects constantly conjoined with each other, produces such a habit of surveying them in that relation that

we can not, without a sensible violence, survey them in any other." Habit is the sole universality and necessity. Hence the doctrine of an Absolute First Cause is unwarranted in philosophy. Pleasure and pain form the basis of moral principles. His famous argument against miracles—invented in 1736 at La Flèche to silence a Jesuit who claimed the recent occurrence of miracles at his convent—is this: "Invariable experience is in favor of the uniformity of nature, while it is not in favor of the infallibility of human testimony; hence there is, in all cases, a greater probability of the falsity of the testimony as to the occurrence of a miracle than of the violation of a law of nature thereby implied." For sources of information, see the *Life and Correspondence of David Hume*, by John Hill Burton (2 vols., Edinburgh, 1846); also *My Own Life*, published the year after his death; best of all by far, the four-volume edition of his philosophical writings, edited by T. H. Green and T. H. Grose (London, 1875–78), with masterly introductions, critical and historical, going to the roots of English philosophy, by T. H. Green.

W. T. Harris.

Hume, John: See Home, John.

Hume, Joseph: political reformer; b. at Montrose, Scotland, Jan., 1777; studied medicine at Edinburgh; became a surgeon in the service of the East India Company, and after holding several lucrative appointments in India, returned to England in 1808 with a considerable fortune. He then made a careful study of the political and social conditions of the country, and in 1812 was elected to Parliament in the Tory interest, but was soon compelled to resign on account of his reforming propensities. Returned again in 1818, he began his career as a radical reformer in every department of church and state, but at first especially in financial matters, scrutinizing every public measure with a view to preventing extravagance or corruption. He attacked the laws unfavorable to the working classes, caused the repeal of the law prohibiting the exportation of machinery, and protested against the practice of flogging in the navy, the impressment of seamen, imprisonment for debt, and public abuses of every kind. Despised at first, he showed himself so earnest, persistent, and at the same time disinterested in his endeavors that he won the respect of his political opponents, and enjoyed to a high degree the public confidence. Throughout his parliamentary career he held himself free from party ties. D. at Burnley Hall, Norfolk, Feb. 20, 1855.

F. M. Colby.

Hu'merus [Lat. *hu'merus, u'merus*, shoulder : Gr. ὦμος : Sanskr. *aṁso* : Goth. *amsa*, shoulder]: the large cylindrical bone of the upper arm from the shoulder to the elbow, forming at its upper extremity a hemispherical head, which is connected with the scapula and two tuberosities for the attachment of muscles. The whole combination of the head of the humerus, the scapula, and the clavicle is also called humerus.

Humidity: technically in meteorology, the amount of moisture or vapor of water in the air. It plays an important part in storms, apparently as important as steam plays in the steam-engine. It is invisible and colorless. In atmospheric phenomena the vapor of water gets into the air by evaporation. It is constantly passing off from the surface of water or of moist bodies, even from ice. A given space at a given temperature can contain only a definite amount of water. If it contains less it will endeavor to fill up by evaporation; if it contains more the surplus moisture will condense. When a mass of air contains all the moisture it is capable of holding it is said to be *saturated*. The higher the temperature the more moisture it takes to saturate the air. If it contains less moisture than would saturate it at the given temperature, then the lower temperature at which this would be sufficient for saturation is called the Dew-point (*q. v.*). If the temperature of such air falls, it will sooner or later reach the dewpoint and condensation will begin. The percentage of the moisture in the air to what it could hold if saturated is called the *relative humidity*. Thus if the air contains a half of the moisture necessary to saturate it, the relative humidity is 50; if only a third, it is 33. The vapor of water, like any other vapor or gas, exerts a pressure in its endeavor to expand. The pressure or *tension of the vapor*, expressed in inches or millimeters of the mercurial column of the barometer, is one way of expressing the *absolute humidity*, or the absolute amount of vapor in the air. Absolute humidity can also be expressed in terms of the number of grains weight of vapor in each cubic foot of air.

The amount of evaporation depends on the relative humidity of the air, and on the temperature. It depends also on the wind, being greater when the wind is higher; is greater when the general air-pressure is lower; and occurs the more readily the purer the water. Moist turf evaporates more than a water surface, and the latter more than wet soil. More is evaporated in the open than in forests and more in deserts, when the relative humidity is very low, than in fertile soil.

The relative humidity can be roughly indicated by all hygroscopic bodies, and many of the popular signs of rain or dry weather depend on the automatic motions of such bodies. The hair-hygrometer shows the change in length of a hair with change of humidity, and when well made it gives results which approximate accuracy. The instrument usually employed in meteorology is the psychrometer, or wet and dry bulb thermometers. Comparisons of the stand of two thermometers entirely similar, except that the bulb of one is kept dry while the other is moist, permit deductions as to both relative and absolute humidity. (See Hygrometry.) This instrument is a practical one except at temperatures below freezing, when it becomes slow in action and often misleading in indications.

The tension of vapor is least at night and greatest in the day, but it reaches its maximum generally in the early forenoon and early evening hours, having a slight minimum during the hottest part of the day. That the change in tension of vapor does not exactly follow the change in temperature, as would be expected since temperature has such a powerful effect on evaporation, is probably due to the facts that the surplus water on objects gets pretty well dried off in the middle of hot days, and that the ascending currents of air set up by the heat carry away with them some of the moisture already present. This idea is strengthened by the fact that on coasts generally and in the depth of winter the afternoon minimum of tension of vapor disappears. During the year the tension of vapor changes with the temperature, being greatest in midsummer and least in midwinter. The amount of moisture in the air decreases very rapidly as we ascend.

The absolute humidity decreases rapidly from equator to poles, but decreases more rapidly in the interior of continents than over the oceans. It is also much affected by the temperature of ocean currents, being greater over warm and less over cold ones.

The relative humidity is highest at night and lowest in the hottest part of the day. It is, of course, at its maximum, 100, when dew falls or fog forms. It is also highest in winter and lowest in late spring and summer in temperate regions. In the tropics it follows the wet and dry seasons. Over the oceans it is generally 75 or 80; over continents it is higher in winter and lower in summer.

The vapor of water disappears from the atmosphere by *condensation*. This may be on the surfaces of solids in the forms of dew, hoar frost, or the heavier frost-work or ice, or in the free air in the form of fog and cloud, either in droplets, ice crystals, or hailstones. It has been shown that the presence of solid particles of dust floating in the air facilitates condensation and the consequent formation of fogs and clouds. See Clouds, Cyclones, Hail-storm, Rain, and Climate.

Mark W. Harrington.

Humiliate Nuns: an order of Benedictine nuns, called also **Nuns of Blassoni**, from the name of their foundress. They served as nurses, etc. In 1571 they were suppressed by Pius V. for some disorders, but a few convents, greatly decayed, still exist in Italy.

Humiliates [from Mediæv. Lat. *Humilia'ti*, plur. of *Humiliatus*, a Humiliate, liter., perf. partic. of Late Lat. *humilia're*, make humble, humiliate, deriv. of Lat. *hu'milis*, humble (whence Eng. *humble*), deriv. of *humi*, on the ground : Gr. χαμαί, on the ground]: an order of canons and lay brothers following the rule of St. Benedict. They were originally lay brothers of a congregation founded about 1134. In 1151 they were reformed by St. John of Meda, and became in part canons regular of St. Benedict.

Hummel, hōō'mel, Johann Nepomuk: pianist and composer: b. at Presburg, Hungary, Nov. 14, 1778. His father, a proficient musician and an orchestra leader, taught him to sing and to play the piano. The Hummels removed to Vienna, where Mozart took the lad to his own house and gave him lessons. At nine years of age Hummel was so much admired by all who heard him that he and his father made a concert tour through Germany, Denmark, and Scotland. The years 1791 and 1792 he passed in London, and there

studied the pure, methodical style under Clementi. At fifteen years of age he returned home, and settled down to hard study in Vienna under his severe and exacting father. He afterward became the pupil of Albrechtsberger for harmony, and of Salieri for singing and the principles of dramatic composition; in 1803 entered the service of Prince Nicholas Esterhazy, for whom he wrote his first mass, which was well received by Haydn. From 1811 to 1816 he gave piano lessons in Vienna; in 1816 was appointed chapel-master to the King of Würtemberg; in 1820 resigned that office and became chapel-master to the Grand Duke of Saxe-Weimar; in 1822 obtained leave of absence to make a pedestrian tour in Russia, where he was enthusiastically received; in 1823 traveled through Holland and Belgium on his way to Paris, where the artistic world showed a worthy appreciation of his fame and genius. From Paris he returned to Weimar. In 1829 he made a second visit to Paris, where his performances were a failure. In London his presence was scarcely remarked. One other tour, in Poland, was the last of his wanderings. He died at Weimar, Oct. 17, 1837.

As a performer he founded a school which is the means by which most of his noted successors have risen to eminence. His voluminous *Method* for the piano was a new and valuable creation in the field of study, but has been entirely laid aside. As an improviser Hummel was remarkable. As a composer his works have not stood the test of time, and appear but rarely in the modern repertory. The most esteemed are the septuor in D minor, the concerto in A minor, two trios for piano with violin and violoncello, etc. He wrote 11 dramatic compositions, including operas, ballets, and cantatas; 4 compositions for the church; 22 instrumental works, including overtures, concerted pieces for the piano, violin, violoncello; and many sonatas and other compositions for the piano. Revised by DUDLEY BUCK.

Hummelstown: borough; Dauphin co., Pa. (for location of county, see map of Pennsylvania, ref. 5–G): on Swatara creek and the Phila. and Read. Railroad; 9 miles S. of Harrisburg. It has extensive quarries of brownstone and limestone, several mills, machine-shop, carriage-factory, waterworks, electric-light plant, and a weekly newspaper. Pop. (1880) 1,043; (1890) 1,486; (1893) estimated, 1,600.

EDITOR OF "SUN."

Humming-bird: the popular name given to the small, slender-billed birds of the family *Trochilidæ*, from the humming sound produced by their rapid wing-beats. Humming-birds may be distinguished by the structure of the wing alone, which is peculiar in the extreme development of the primaries and shortness of the secondaries. The latter are but six in number, are shorter even than the longest primary coverts, and do not extend beyond the tip of the shortest primaries. The primaries are ten in number, and except in a single genus (*Aithurus*) the first is the longest or as long as any. The tongue is long, slender, cleft for nearly half its length, and bordered on the outer edge by a delicate membrane. The humerus is the shortest among birds, the bones of the hand are long; the deeply keeled breast-bone extends nearly the length of the body, proportionately exceeding that of any other bird.

Humming-bird (*Aithurus polytmus*).

The family of humming-birds is exclusively American, and its range extends from Patagonia to British America. The most northern species are the ruby-throat (*Trochilus colubris*) in Eastern North America, and the red hummer (*Selasphorus rufus*) on the west coast. By far the greater number, both of species and individuals, are found in South America, Ecuador, Peru, Bolivia, and Columbia each having about 100 species; only seventeen out of the 467 recognized species occur within the limits of the U. S. Some species, like the well-known ruby-throat, have a wide range, while others are restricted to some valley or mountain peak. The largest member of the group (*Patagonagigas*) is 8½ inches long, while the smallest (*Calypte helenæ*) measures but 2¼ inches in length. In most species the bill is straight, or nearly so, but in one form (*Avocettula*) it curves upward at the tip, while in another (*Eutoxeres*) it curves abruptly downward. The length is even more variable than the form, the beak of the sword-bearer (*Docimastes ensifer*) being 5 inches long, and that of *Rhamphomicron microrhynchum* only measuring a quarter of an inch. Although the number of tail-feathers is always ten, their modifications are almost endless; they may be wide or narrow, rounded or pointed at the tip, or even racquet-shaped. The outermost feathers may be the longest, or they may be the shortest; the tail may be deeply forked, or it may be rounded, and finally as to length the tail may be four times the length of the body, or so short as to be hidden by the tail coverts. A few of the humming-birds are somber hued, and in about a third of them the sexes are clad alike. In the majority, however, the males are far more gorgeously plumed than their mates, the single exception being the mango humming-bird (*Lampornis mango*), in which the female is somewhat gayer than the male. The glowing,

Humming-bird. Sword-bearer (*Docimastes ensiferus*).

Humming-bird (*Campylopterus hemileucurus*).

metallic colors of these little birds are not due to any peculiar pigments, but to the remarkable structure of the feathers, which in certain positions absorb the light and in others reflect it. The most frequent ornament of humming-birds is a patch of metallic feathers on the throat, in some species extending on the sides into a ruff; some have in addition the neck decorated with slender, ray-like feathers, and a few have gleaming crests of various shapes.

Humming bird. White booted racket-tail (*Steganura underwoodi*).

The nests of these birds are dainty structures of plant down, interwoven with spider-webs, and often so covered with small bits of lichen as to resemble a mere knot upon the branch of a limb. Some hummers fasten their nests to the tips of slender leaves and a few suspend them, like hammocks, from the sides of rocks. The eggs are two in number, large for the size of the bird, and pure white.

The food of humming-birds consists largely of minute insects, and although they are fond of sweets, and undoubtedly do to some extent subsist on the nectar of flowers, their stomachs are usually found packed with remains of insects.

The most notable work on the humming-birds is Gould's Monograph on the *Trochilidæ*, in five folio volumes. A large amount of information regarding their habits may be found in Gosse's *Birds of Jamaica* and *Naturalist's Sojourn in Jamaica*, while a handbook by Robert Ridgway, published as part of the *Report* of the U. S. National Museum for 1892, gives a general account of the group and a particular account of the North American species.

F. A. Lucas.

Humor: the state of feeling which accompanies the violation of the requirements of certain of the elements of beauty while the others are present (see Sentiment) gives rise to what is known as the comic. The contemplation of the comic arouses certain emotions characteristic of humor and Wit (*q. v.*) In the *comic* we have violations of the law of consistency. The comic is the æsthetically abortive. A joke turns on a misplaced grammatical or logical relation, which, if properly placed, would have been æsthetic. A comic situation is an incongruity, where the conceptual process demands congruity and anticipates it. Hence the elements of surprise, disproportion, and disharmony, in all humor and wit. But not only is the comical the unexpected, but it is that which we have no right to expect—that which we have every right not to expect: and negatively the sense or fun or humor arises from the simple absence or failure of what we do expect. The comic is a matter largely of meaning. The *grotesque*, on the other hand, is the comic of form. J. Mark Baldwin.

Humpback Whale: a name given to whales of the genus *Megaptera*, possibly from the small size of the dorsal fin, possibly from their manner of diving. The humpback whales are comparatively short and stoutly built, the skin of the throat is deeply furrowed, and the side fins are very long. The baleen is short and poor, but these whales are hunted for the sake of their oil, being mostly taken with some form of the harpoon gun. The best known species, *Megaptera longimana*, is common in the North Atlantic. Very curiously, the humpback has no hump, but as good a fin as the finback. F. A. Lucas.

Humphrey, Edward Porter, D. D., LL. D.: clergyman; eldest son of Rev. Heman Humphrey; b. at Fairfield, Conn., Jan. 28, 1809; graduated at Amherst in 1828, and at Andover Theological Seminary in 1833; was tutor at Amherst 1832–33; from 1833 to 1835 preached at Jeffersonville, Ind.; was pastor of Second Presbyterian church in Louisville, Ky., 1835–53; was Professor of Ecclesiastical History in Danville (Ky.) Theological Seminary 1853–66; pastor of College Street church, Louisville, 1866–79; and emeritus pastor till his death there Dec. 9, 1887. He published *A Discourse upon the Spiritual Power of the Roman Catholic Clergy* (Louisville, 1849); *Our Theology in its Development* (Presbyterian Board, Philadelphia, 1857), and other monographs; *Sacred History from the Creation to the Giving of the Law* (New York, 1888). He bore an important part in the reunion of the two branches (Old and New School) of the Presbyterian Church. Revised by Willis J. Beecher.

Humphrey, Heman, D. D.: clergyman and educator; b. in West Simsbury, Hartford co., Conn., Mar. 26, 1779; graduated at Yale College in 1805. He was pastor of the Congregational church in Fairfield, Conn., 1807–17; pastor of the church in Pittsfield, Mass., 1817–23; and president of Amherst College 1823–45. Taking charge of that institution in its infancy, he contributed largely to its growth and prosperity, and impressed upon it much of his own character. He published some twenty-five or thirty sermons and addresses on special occasions, and left, besides, published works to the number of eleven volumes. Among the pamphlets, the most celebrated was his *Parallel between Intemperance and the Slave-trade*, which struck a heavy blow at intemperance, and was a scarcely less formidable indictment of slavery. Of his books, the *Tour in France, Great Britain, and Belgium* (New York), in two volumes, has had the widest circulation. D. at Pittsfield, Mass., Apr. 3, 1861. See *History of Amherst College*, by W. S. Tyler, and *Memorial Sketches of Heman and Sophia Humphrey*, by Z. M. Humphrey and H. Neill. Revised by George P. Fisher.

Humphrey, Zephaniah Moore, D. D.: clergyman; fifth son of Dr. Heman Humphrey; b. at Amherst, Mass., Aug. 30, 1824; graduated at Amherst College 1843 and at Andover Theological Seminary 1849; a popular preacher and pastor of churches at Racine 1850–56, and Milwaukee, Wis., 1856–59; of First Presbyterian church, Chicago, 1859–68; of Calvary Presbyterian church, Philadelphia, 1868–75; became Professor of Ecclesiastical History and Church Polity at Lane Theological Seminary, Cincinnati, O., 1875; was connected with the New School branch of the Presbyterian Church before the reunion of 1869; contributed his influence to the reunion, and was elected moderator of the reunited Church at Chicago in 1871. D. in Cincinnati, O., Nov. 13, 1881. Revised by S. M. Jackson.

Humphreys, Andrew Atkinson, LL. D.: topographical engineer; son of Samuel Humphreys, chief contractor of the U. S. navy 1815–46; b. at Philadelphia, Pa., Nov. 2, 1810; graduated at the U. S. Military Academy, and appointed second lieutenant of artillery July 1, 1831. In 1837 he entered the service of the Government as civil engineer; was promoted to be captain 1848, major Aug., 1861; was for five years (1844–49) in charge of the Coast Survey office at Washington. In 1850 and 1857 he was engaged in the topographic and hydrographic survey of the delta of the Mississippi. From 1854 till 1861 he was largely engaged in determining the most practicable and economical route for a railway from the Mississippi river to the Pacific Ocean. In conjunction with Lieut. Henry A. Abbot he published in 1861 a *Report on the Physics and Hydraulics of the Mississippi River*. He served as major on the staff of Gen. McClellan, and was chief topographical engineer throughout the campaign on the Virginia Peninsula; was made brigadier-general of volunteers Apr. 28, 1862; distinguished himself at the battles of Fredericksburg and Gettysburg; and was promoted to be major-general of volunteers and appointed chief of staff to the commanding general Army of the Potomac; in 1865 was breveted major-general U. S. army. He continued in the volunteer service until Aug. 31, 1866; on Aug. 8, 1866, was appointed chief of engineers, U. S. army, with the rank of brigadier-general. He retired from active service in 1879. D. in Washington, D. C., Dec. 27, 1883.

Humphreys, David, LL. D.: poet; b. at Derby, Conn., in 1752; entered the army as a captain at the beginning of the Revolutionary war; was appointed aide-de-camp to Washington in 1780; accompanied Jefferson to France in 1780 as secretary of legation; went in 1794 to Lisbon, and in 1797 to Madrid, as ambassador, and returned to the U. S. in 1802. He was one of the first to introduce merino sheep to the U. S., and established a large woolen and cotton factory in Derby. During the war of 1812 he commanded the

militia of Connecticut. While residing at Hartford (1786–88) he published, together with Hopkins, Barlow, and Trumbull, the *Anarchiad*. The most prominent of his other poems are *An Address to the Armies of the United States* (1782); *The Future Glory of the United States*; *The Love of Country*; and *The Death of Washington*. He also wrote a *Life of Putnam* in 1798. His works were collected and published in New York in 1790 and 1804. D. at New Haven, Feb. 21, 1818.

Humphreys, Milton Wylie, Ph. D., LL. D.: educator; b. in Greenbrier co., West Va., Sept. 15, 1844; educated at Washington and Lee University, Berlin and Leipzig; Adjunct Professor Ancient Languages, Washington and Lee, 1869–75; Professor of Greek, Vanderbilt University, 1875–83; Professor of Ancient Languages, University of Texas, 1883–87; Professor of Greek, University of Virginia, 1887; for several years was the American editor of *Revue des Revues*; president American Philological Association 1882. His principal works are *The Clouds of Aristophanes* (1885); *The Antigone of Sophocles* (1891). C. H. Thurber.

Humphry, George Murray, M. D., LL. D., F. R. S.: anatomist; b. in Sudbury, England, July 18, 1820; educated at Sudbury and Dedham and at St. Bartholomew's Hospital, London; from 1842 surgeon to Addenbrooke's Hospital in Cambridge; Professor of Surgery at Cambridge University; president of Pathological Society of London 1892 and 1893; president of the Anatomical Society 1888–89–90; author of *Treatise on the Human Skeleton, including the Joints* (1858); *The Human Hand and the Human Foot* (1861); *The Coagulation of the Blood in the Nervous System during Life*; *The Limbs of Vertebrate Animals* (1860); *Observations in Myology* (1872); *Old Age and the Changes Incidental to it* (1889); coeditor of *Journal of Anatomy and Physiology* since 1867. D. Sept. 24, 1896. C. H. Thurber.

Humphry, William Gilson, M. A.: theologian; b. at Sudbury, Suffolk, England, Jan. 30, 1815; graduated at Trinity College, Cambridge, 1837; was Hulsean lecturer at that university in 1849–50; vicar of St. Martin-in-the-Fields, London, 1855, till his death there Jan. 10, 1886. His Hulsean lectures were on *The Doctrine of a Future State* (London, 1850) and *The Early Progress of the Gospel* (1851). He also wrote *A Commentary on the Book of the Acts of the Apostles* (1847; 2d ed. 1854); *The Character of St. Paul* (1859); edited *Theophilus of Antioch* (1852), etc. He was one of the New Testament revisers, and published *A Commentary on the Revised Version of the New Testament* (1882; new ed. revised 1888).

Revised by W. S. Perry.

Hu'mus [Lat. *humus*, earth, soil]: a name given to a class of substances but little understood, formed by the natural decomposition of plant-tissues. Mixed with the decomposition products of the rocks they form the fertile soils of the earth's surface. They are particularly abundant in peat, manures, and rotten wood. Whether all the substances obtained from these different sources are identical or only similar is not known, owing to the difficulty of purifying them. Special names have been given to some of the substances, as ulmin, ulmic acid, humic acid, crenic and apocrenic acid. While these substances are, no doubt, of importance in connection with plant physiology, geology, etc., our knowledge regarding them is not sufficient to show what the relation is. Ira Remsen.

Hunan, hoo'năăn: an inland province of China lying, in a general way, S. of the Tung-ting Lake, hence the name "South of the Lake" (see map of China, ref. 7–I); area, 74,370 sq. miles. The province is well watered, the chief rivers being the Siang from the Meiling Mountains and the Yuen from Kwei-chow, both of which flow into the Tung-ting Lake, and through it find their way to the Yang-tse. Hunan is fertile, and is one of the principal tea-producing provinces. Coal is also abundant. The people of this province are noted for their hostility to foreigners, and the rowdyism of the Hunan "braves," or militia, is proverbial. Pop. (estimate of 1882) 21,002,004. Capital, Chang-sha-foo. The commercial capital is Siang-tan. R. L.

Hundred [derived use of numeral *hundred*, but whether originally based on area or population is uncertain]: a division of many English counties, stated to have been first made by King Alfred. Some of the counties have no hundreds, but have wapentakes, wards, or other similar divisions. The counties of Delaware are divided into hundreds.

Hundred Days, The: the period between Napoleon's return from Elba on Mar. 1, 1815, and his second abdication on June 22 of the same year. Louis XVIII. had found but slight popular support for the restored Bourbon monarchy, and when Napoleon advanced toward the capital with rapidly increasing forces, the king was forced to flee across the border. On Mar. 20 the invader was again installed in the Tuileries, and began his rule with promises of liberal government in France and assurances of peaceful intentions toward foreign powers, but the allies at once prepared to take the offensive, each agreeing to furnish an army of 180,000 men to serve against him. Then followed the short and decisive campaign that ended with the battle of Waterloo (*q. v.*) on June 18, and four days later Napoleon formally abdicated. See Napoleon I. F. M. Colby.

Hundred Years' War: the contest between England and France that lasted from 1337 to 1451, though that period was interrupted by several intervals of peace. It arose out of the Scottish war, in which France had aided the Scots against England, in the hope of wresting from the latter country the duchy of Guienne, and hostility between the two nations was kept alive by Edward's claim to the French throne through his mother, Isabella, the daughter of Philip IV., despite the decision of the States-General in favor of Philip VI., in accordance with the Salic law. The period of the war closing with the peace of Bretigny (1360) was marked by the English victories of Crécy and Poitiers (*qq. v.*) and the capture of Calais. Charles V. renewed the war in 1369 and won back much that had been lost, but in the reign of Henry V. of England there followed a second period of English success, signalized by the brilliant victory of Agincourt (*q. v.*) in 1415. By the treaty of Troyes (1420) Henry received in marriage the daughter of the French king, Charles VI., and was nominated as the latter's successor; but Henry died in the same year as Charles, and the war was renewed when the weak and incapable Henry VI. was on the English throne. Inspired by Joan of Arc (*q. v.*) and led by the skillful general Dunois, the French rapidly regained the upper hand. By 1451 the English were driven from the provinces, and four years later Calais was all that remained of the English possessions in France. F. M. Colby.

Hun'eric (in Gr. *Ὀνώριχος*): the second king of the Vandalic empire in Africa; reigned from 477 to 484 A. D. He was a son of Genseric, and married to a daughter of the Emperor Valentinian. He was cruel and cowardly, and became most noted for the persecutions which he raised against the orthodox Christians.

Hunfal'vy, Pál: philologist and ethnologist; b. at Nagy-Szalok, in Hungary, Mar. 12, 1810; studied law; was appointed Professor in Jurisprudence in 1842 at the Academy of Käsmark; sat in the Hungarian diet 1848–49, and subsequently lived in Pesth. By his philological and ethnological researches he defined the position of the Hungarian language in the Uro-Altaic family, and explained its relations to the Finnish and Turkish. In 1856 he founded *Magyar Nyelvészet* (*Hungarian Philology*), a periodical for the Hungarian language, in Pesth. He has published a *Chrestomathia Fennica* (1862); *The Language of the Konda-Woguls* (1872); *The Language of the Northern Ostiaks* (1875); *Hungarian Ethnography* (1876); *The Roumanian Language* (1878); *The Hungarians or Magyars* (1881).—His brother, János Hunfalvy, b. at Gross-Schlagendorf, June 8, 1820; d. Dec. 6, 1888; became Professor of Statistics and History at Käsmark in 1846; took part in the Hungarian uprising in 1848; 1866–70, Professor in Polytechnic School; from 1870 Professor of Geography in University of Pesth. He wrote a *Universal History* (3 vols., 1862); a *Geography of Hungary* (3 vols., 1863–66); *Universal Geography* (1884), etc. Revised by Benj. Ide Wheeler.

Hungarian Grass: an annual grass much sown as a forage-plant. It is a variety of *Setaria germanica*, is valuable for its quick, luxuriant growth on even poor soils, and is much relished by horses and cattle; but if overfed it appears to act as a diuretic, and is hence by many considered injurious to horses. If fed in reasonable quantity it is harmless and very nutritious. It gives a good weight of excellent hay.

Hungarian Language: The Hungarian or Magyar language is now generally held to belong to the Finno-Ugric group of the Ural-Altaic division of agglutinating tongues. The old view that it is related to the Semitic

family has long since been given up, and it is also admitted that it is akin to the Indo-European family; but some Hungarian scholars still maintain that the Magyars are to be classed not with the rude, low-statured, old Finns, but with the warlike Turks. This position is defended by Arminius Vámbery (*Der Ursprung der Magyaren*, Germ. transl. 1882) on historical, linguistic, and cultural grounds, and by A. von Török (in his *Anthropologiai füzetek*) on anthropological grounds; it is successfully opposed by Paul Hunfalvy in his various writings. The Finno-Ugric group may be divided into two sub-groups, the Finnic and the Ugric, the latter being composed of Magyar, Ostiak, and Vogul (the two last having their home in and near the Ural Mountains). From the ethnic name Ugar appears to come the name Hungarian (ungar, hungar); Magyar in like manner seems to come from the old Scythian tribal name Magar. Like other agglutinating tongues Hungarian is characterized by inviolability of roots and avoidance of prefixes. Its words are formed by attaching to a root one or more suffixes which preserve to a greater or less extent their independent character; there is not, as in inflecting tongues, a complete fusion of the root with the modifying additions. The suffixes are, however, in some cases no longer recognizable as independent words; as, for example, in *várok*, "I wait," the *k* no longer exists in the language as a separate pronoun. In other cases there are analogies with Semitic and Indo-European inflectional procedures. Hungarian further possesses the Ural-Altaic principle of vowel-harmony, according to which the vowel of the suffix is forced to agree with that of the root; thus *m* signifying "my," "my house" is *házam*, but "my book," *könyvem*; and so *atyának*, "to the father," *embernek*, "to the man." The vowels are divided into three classes: open, *a, á, o, ó, u, ú*; close, *é, e, ö, ő, ü, ű*; medial, *é, i, í*. Those of the first class never occur in the same word with those of the second, but the third may stand with either of the other two. Vowel-harmony appears to be an effort to express both phonetic unity and unity of sense. The Magyar people came into Europe from the western part of Central Asia, and their language, in the course of their wanderings, received accessions from the Turkish and perhaps from the Persian; in Europe, as it has developed in literary form, it has adopted words from Slavic and German, and from the former even inflections. The scientific vocabulary includes also a number of Latin and Greek terms. The native forms have been somewhat modified in the course of the last four or five centuries, and there are various dialectic differences.

The grammar of the language is well-developed. The consonants are: mutes, *k, t, p, g, d, b, f, v*; the breath, *h*; spirants, *l, r, j* (= Eng. *y*), *n, m*; sibilants, *sz* (= Eng. *s*), *z, s* (= Eng. *sh*), *c*, formerly *cz* (= Eng. *ts*), *cs* (= Eng. *ch* in chin), *zs* (= Eng. *z* in azure), *ds* (= Eng. *j*); *y* occurs only in the combinations *gy* (= Eng. *dy*), *ty, ly, ny*. The accent falls on the root, and has thus produced changes in the quality and quantity of vowels.

There is a definite article, *az* (*a*), developed, as in other languages, out of the demonstrative pronoun. The plural of nouns is ordinarily made by adding *k* to the singular, sometimes by adding *e* or *i*. Space-relations are indicated by attaching suffixes to the noun, or by means of post-positions. Pronominal suffixes are added to nouns and to post-positions (as in Semitic languages). Persons in the verb are made by the addition of the personal pronouns. There is a distinction between verbs subjective (in which the agent alone is expressed) and objective (in which both agent and object are expressed), as *var*, "he waits," *varja* (*vari*), "he awaits it." There is further a reflexive form of the verb, and a stem may be made transitive, causative, potential, etc., by the addition of various syllables. There is no verb "to have," the relation of possession being expressed by the verb "to be" plus the particle meaning "to."

The language is remarkable for its capacity of forming derivative words; thus in *leghatalmasabbak*, "the mightiest men," the root is *hat*, "to be able," whence a substantive = "ability" is made by the addition of *alm*, from this an adjective = "mighty" by adding *as*, the superlative is indicated by the *abb* with the prefix *leg*, and *ak* is plural sign; from the root *hal*, "to die," by adding *hat*, "to be able," the privative *atlan*, and the nominal sign of derivation *ság*, we get *halhatatlanság*, "immortality."

Grammars.—German, Riedl (Budapest, 1858), Töpler (7th ed. Budapest, 1882); French, de Ujfalvy (Paris, 1876); English, Csink (London, 1853), Singer (London, 1882); comparative grammatical researches in the works of Hunfalvy and Budenz.

Dictionaries.—Hungarian, *Dictionary of the Academy of Sciences* (Pest, 1862–74); German, Ballagi (3d ed. Budapest, 1872–74); English-Hungarian, Bizonfy (Budapest, 1878); *Magyar-Ugrian Comparative Dictionary*, by Budanz (Budapest, 1872). C. H. Toy.

Hungarian Literature: The Hungarian people entered Europe in the latter part of the ninth century as barbarians, bringing with them no literary material but folk-songs and folk-legends, nor did they for a long time after their establishment in Pannonia produce a really native literature. They were foreigners and it required time for them to accept their new social conditions, and after the first three centuries they were till recently under a foreign rule which tended to repress the national spirit. As in other European countries, Latin was the language of the educated class, and was, partly through ecclesiastical influence, made the official tongue in the twelfth century; but Hungarian literary speech remained Latin long after the native tongues in other countries had asserted themselves. The literary history may be roughly divided into the following periods: The time before the Reformation; the age of the Reformation; the period between the latter and the French Revolution; the modern period.

The earliest productions are Latin chronicles and Hungarian liturgical works and legends of saints, among which are the *Gesta Hungarorum* (middle of the twelfth century), the *Cronica Hungarorum* (Chronicon Budense), the *Halotti Beszéd* (a liturgical work containing funeral ceremonies of the latter part of the twelfth century), the *Legends* of St. Margaret (fourteenth century) and of St. Francis and St. Ursula (fifteenth century). The greatest impulses to literary work during this period were given by King Stephen I. (St. Stephen, 1000–38), who by richly endowing monasteries helped to form a learned class, and by King Mathias Hunyady (Corvinus, 1458–90), whose famous library gave employment to scribes and stimulated the collection and study of books. At the same time the better class of youth frequented foreign universities, especially those of Bologna and Paris.

The European religious movement of the fifteenth and sixteenth centuries manifested itself in Hungary largely in translations of the Bible or parts of it into the native tongue. The first of these translations (comprising the Old Testament lesser prophets, Ruth and Esther, some apocryphal books, and the four Gospels) was made by two friars for the use of Hungarian Hussites who had taken refuge in Moldavia (in the first half of the fifteenth century). This was followed by many others, and to the diffusion of these books must be ascribed in part the literary awakening which now began to show itself. To the fifteenth century also belong *John Hunyady's Oath* (1446), the *Legend of St. Catharine*, the *Emlékdal Mátyas Király halálára* (Memorial Song on the Death of King Mathias, 1490), and the oldest historical poem, the *History of the Conquest of Pannonia by the Magyars*.

Hungary was now beginning to come in contact with Europe. The seventeenth century witnessed the overthrow of the devastating Turkish rule. The Austrian domination (1526–1848), while it suppressed nationalism, diffused a certain culture, and the sixteenth, seventeenth, and eighteenth centuries produced a Hungarian literature of imitation. Lyrical poetry, the drama, and literary prose came into existence. The first dramatic work was *Balassi Menyhért*, by Karádi (1569). A turning point was marked by the poems of Tinódy, Balassa, and Rimay (sixteenth and seventeenth centuries), and especially Zrinyi, who wrote an heroic poem (*Zrinyiász*, 1651) on his grandfather's defense of the fortress of Sziget. There were imitations of Cervantes and other great writers. Philology and theology were cultivated, controversial works were produced by the Catholics Pázman, Esterházy, etc., and the Protestants Németi, etc., and dictionaries prepared by Párispapai (Hungarian-Latin) and Apáczai-Csere (encyclopædia). Peter Bod wrote a history of Hungarian literature, *Magyar Athénas* (1766), and the eminent prose-writer Faludi (1704–79) translated the works of William Darrell.

Through such training the Hungarian language began to acquire a fuller scientific and literary vocabulary, and Hungarian literature gradually made its way to an independent position. In spite of the depressing policy of Maria Theresa and Joseph II. (1740–90), the range of thought and produc-

tion constantly increased. The attempt to Germanize the nation was unsuccessful. Maria Theresa's life-guard, composed of Hungarians of noble birth, gave, in fact, an impulse to the national cultural development; young guardsmen carried home with them the literary ideas with which they came in contact in the Austrian capital. Many important books, it is true, were written in Latin and German, but, on the other hand, the influence of the English and French literatures made itself felt (imitations and translations of Milton, Pope, Young, and various French writers), and the Latin and Greek classics were studied and imitated (Virág, called "the Magyar Horace"). The first newspaper (1721) was published in Latin, the first Hungarian paper was established at Presburg in 1787. The beginning of thoroughly national writing may be traced in Dugonics (romances, 1790; Hungarian proverbs, 1820), and especially Alexander Kisfaludy (lyrics and tales, 1772–1844). The language was cultivated and refined by the writings of Kazinczy, Berzsenyi, and others. Though a national theater had existed at Pest since 1793, the foundations of the national drama must be ascribed to Károly Kisfaludy (1788–1830), whose first comedy (1817) was followed by a profession of dramatic works.

The quiet which ensued in Europe after the Congress of Vienna (1815) permitted Hungary to reap the fruits of her previous literary training. In the Diet of 1825 Count Stephen Széchenyi took the revolutionary step of speaking in Hungarian, and soon after performed the important service of founding the Academy of Sciences (1830). Since that time the progress has been steady in all directions. In 1836 was established the Kisfaludy Society for the promotion of general literature, the Academy devoting itself to philology, history, economics, and the physical sciences. Kossuth created the political newspaper press by the publication (1841) of the *Pesti Hirlap* (Pest Journal). The present century has produced a large number of poets, dramatists, novelists, historians, philosophers, and writers in all departments of science. Among these may be mentioned the epic poet Vörösmarty, by some regarded as the greatest of Magyar poets (*King Solomon*, 1821); Petöfi and Arany, the writers of lyrics; Szász (*Salamon*, 1878); the dramatists Szigligeti (Szathmáry), Obernyik, Madách, Berczik; the novelists Jósika (the "Hungarian Walter Scott"), Kemény, Kovács, Jókai, Ábrányi, Pétery; the historians Michael Horváth (*History of the Magyars*, 1871–73), Szalay, Pauler, Toldy; and the philosophers Cyril Horváth and Greguss. On the history of the literature, see the works of F. Toldy (3d ed. Pest, 1872) and J. Szinnyei, Jr. (Budapest, 1878), and also A. Dux, *Aus Ungarn* (Leipzig, 1880), and the *Hungarian Review* (Budapest, founded 1881). For translations of Magyar poetry, see the selections of Sir John Bowring (1830), de Ujfalvy (1873), G. M. Henning (1874), and E. D. Butler (1877). C. H. Toy.

Hungary: the eastern portion of the territory forming the monarchy of Austria Hungary. It covers an area of about 125,000 sq. miles, between 44° 10′ and 49° 35′ N. lat., and between 14° 25′ and 26° 25′ E. lon. As the form of the government and its geographical and statistical features are described in the article on Austria-Hungary, it remains to describe only the history and the language and literature of the country.

History.—The country is inhabited by a number of distinct races speaking several distinct languages, but the Magyars are the predominant people. They came into Hungary at the close of the ninth century. The country had been a Roman possession, forming parts of the two provinces of Pannonia and Dacia. After the fall of the Roman empire it was overrun by different nations, among which the Huns and the Avars sustained themselves on the soil for the longest period, and are supposed to have given the country its name. At the close of the ninth century it was divided into many small kingdoms, and Wallachs, Bulgarians, and Germans formed a large portion of the population. The Magyars are a Turanian people, allied to the Turks and to the Finns. For a long time they dwelt first in Caucasus, and then in the region between the Don and the Dniester; but in 887 they descended under Arpad into the plain of the Danube, and after ten years' fighting they conquered the country and ruled from the summits of the Carpathian Mountains to the foot of the Styrian Alps. Their history falls into three periods—under the dynasty of the Arpads to 1301, under the elective monarchy from 1301 to 1526, and under the dynasty of the house of Hapsburg from 1526 to our time—but during its whole course, and in spite of the many splendid deeds and great achievements which it contains, its general character throughout is a peculiar backwardness, tending either to enslave the nation by indolence or to break it into factions. The most remarkable of the Arpad dynasty was Stephen I., from 997 to 1038. He was crowned by Pope Sylvester II. in 1000 as King of Hungary, and received the title of "His Apostolic Majesty" (which since that time has been the title of the Hungarian kings) as a reward for his exertions in behalf of the Church. Under him Christianity was established among the people, the country was divided into bishoprics, and schools were founded for classical and theological learning. But it was also under him that Latin became not only the official language of the Hungarian Government, but also the acknowledged vehicle of Hungarian civilization, and this mistake continued for nearly 800 years. During the next period the elements of faction were grafted on the nation and the monarchy became elective. The elective monarchy gave the Hungarian nobility an opportunity of carrying changes into the constitution of the country which made it possible for them to depress the peasantry into serfdom, and prevent the formation of a powerful third estate living independent in the cities; and the nobility did not forget to utilize the opportunity. Up to the days of Francis Joseph I. it was the policy of Austria to try to dissolve the Hungarian constitution and recast the Hungarian nation in German molds. The effect of this policy was just opposite to what was intended; it brought the different estates of the Hungarian people, the haughty nobility and the poor serfs, nearer together, and that political movement in modern civilization which demands equal participation in the government for all citizens of the state, equal taxation of all the members of the society, equal acknowledgment of all religious denominations, and absolute abrogation of all privileges and monopolies, was in Hungary brought about by the nobility itself. A constitution dictated by this spirit, abolishing feudality, enacting a new election law, and proclaiming the liberty of the press, was sanctioned by the diet and by the Austrian emperor in 1848, but at the very same time the Austrian Government in Vienna began agitating through its agents, the German, Slavic, and Roumanian races living in Hungary, against the Magyars, and it succeeded in creating such an uproar and confusion in the country that the abrogation of the free constitution by Russian arms and the establishment of an unmixed despotism seemed the only means by which to procure order. The relations between Hungary and Austria were very near an open rupture when the revolution of Feb., 1848, broke out in Paris, and occasioned a similar rising in Vienna. On Mar. 13 Prince Metternich fell, and with him the old *régime*. The Emperor Ferdinand acceded in principle to all the demands of the Hungarians. An independent Hungarian ministry was formed under the presidency of Count Batthyányi; Kossuth and Déak were among its members, and the Diet of Presburg dissolved after sanctioning the necessary measures for the convocation of a national assembly at Pesth in July. It can hardly be doubted, however, that the Austrian Government began to undermine this agreement almost from the very moment it made it. The Slavonian, Roumanian, and German parts of the population of Hungary were jealous of the predominance of the Magyars. The Germans and Slavonians of Hungary proper protested against the separation from Austria, and Transylvania and Croatia demanded the same independence of the Hungarian crown as Hungary of the Austrian. This movement was stirred up by secret emissaries from Vienna, and in some cases—as, for instance, in the election of Jellachich as ban of Croatia, and his defiant opposition to the Hungarian Government—it was openly encouraged. Soon a war of races broke out with fury within the boundaries of Hungary. The national assembly convened in July, and, fired by the eloquence of Kossuth, it promptly agreed on measures for the suppression of the Slavonian rebellion: 42,000,000 florins were granted, 200,000 troops were levied, the Honvéds were formed, the fortresses equipped, etc. But from this time the central government at Vienna made greater and greater difficulties. It declared a separation between Hungary and Austria in military and financial respects an impossibility, and it continued to employ the Hungarian troops for the suppression of the insurrection in its Italian provinces. At last it plainly refused to sanction the measures of the national assembly, and Jellachich crossed the Drave. In September the cabinet of Batthyányi resigned, and a committee

of defense under the presidency of Kossuth was formed. A vigorous resistance against the Slavonians on the one side and the central Austrian Government on the other was organized; Jellachich was defeated; and when a new rising took place in October at Vienna, the Hungarian cause seemed to have won. But in December the Emperor Ferdinand abdicated; Francis Joseph acceded to the throne; the Austrian arms were successful in Lombardy; and in the spring of 1849 an Austrian army under Prince Windischgrätz entered Hungary, demanding unconditional obedience to the Austrian authority. The national assembly, which had moved from Pesth to Debreczin, declared the house of Hapsburg deposed, chose Kossuth governor-general of the country, and a deadly struggle began. The various successes, the military heroism, and the political confusion with which it was carried on, are described in the articles on Bem, Görgei, Klapka, Kossuth, etc. It was decided by the intervention of Russia. One Russian corps under Paniutine entered Hungary from the W., another under Lüders from the E., while a third army, numbering 130,000 men, under Paskewich, entered the Hungarian plain from the N., Aug. 13, 1849. Görgei surrendered at Viláyos; Kossuth, Mészáros, and others fled to Turkey; and many of the richest and noblest men of the nation became scattered all over the world. Batthyányi, Kis, and others were executed, and all the dungeons of the empire were filled. Thus Austrian order was once more restored. Nevertheless, in spite of the terrible defeat, the resistance of the Hungarian people was by no means broken. An opposition against the Austrian rule was soon formed on a broader basis and with a clearer consciousness, and the demands for the constitution of 1848 became louder and louder every year. At last, after the battle of Sadowa (July 3, 1866), and the entire separation of Austria from Germany, the Austrian Government felt compelled to submit. In Feb., 1867, an independent Hungarian ministry was formed under the leadership of Count Andrássy, and in December of the same year the final emancipation of the Hungarian crown on the basis of the constitution of 1848 was accomplished. There still reign a good deal of confusion and some strife in the relations of the country, both within and without, but, generally speaking, the country is now rapidly progressing in material as well as intellectual respects. See Slovak Literature.

Revised by C. K. Adams.

Hunger: See Fasting.

Huns, The [O. Eng. *Hūnas*, from Late Lat. *Hunni*: Late Gr. χοῦννοι, from the native name. Cf. Chinese *Hiungnu*, name of people whose empire extended in the third century B. C. from the Great Wall to the Caspian]: an extremely savage and ugly tribe of warlike nomads with dark complexions, small, deep-set, black eyes, broad shoulders, and flat noses. They came from the vast barren plateaus of Eastern Asia, N. of China, and while one part of them, after long migrations toward the W., settled along the shores of the Caspian Sea, and later became known as the White Huns, the other part crossed the Volga and conquered the Alani, who became incorporated with them. In 376 they crossed the Dnieper, defeated the Goths, and drove them over the Danube into the Roman province of Pannonia. In 432, under Attila, they crossed the Danube, and the Roman emperor, Theodosius II., had no other means of stopping them than by paying them an annual tribute. When, after the death of Theodosius, the tribute ceased to be paid, Attila pushed forward and visited Gaul, where he was defeated by the Roman general Ætius and the Gothic allies at the great battle of Châlons-sur-Marne, 451. With the fragments of his army he advanced into Italy, where Pope Leo I., by means of a personal interview, persuaded him to retreat. After the death of Attila (about 454) the Huns dissolved and disappeared among the other barbarian tribes. The Huns were probably Turanians of the Turkish branch, but their ethnology has not been very confidently determined. The term appears to have been used somewhat vaguely, and to have included perhaps even the Magyars.

Revised by C. K. Adams.

Hunt, Edward Bissell: military engineer; b. in Livingston co., N. Y., June 15, 1822; graduated at West Point Military Academy July 1, 1845. He was assistant to the board of engineers for coast defense at New York 1845–46; then was detailed for duty at West Point as assistant professor of engineering, which position he retained till 1849, when he was ordered to Boston, Mass., as assistant engineer in the construction of Fort Warren. From 1851 to 1855 he was on duty in the office of Prof. Bache, superintendent U. S. Coast Survey, and from 1855 to 1857 was engaged in the construction of fortifications and lighthouses on the coast of Rhode Island. He was transferred to Key West, Fla., in 1857, and engaged in the construction of Fort Taylor until 1862, when he became chief engineer of the department of the Shenandoah; was engaged from Apr., 1862, to Oct., 1863, in the construction of fortifications in Connecticut and Rhode Island, and during the same time on special duty under the Navy Department. He invented the seaminer submarine battery. Maj. Hunt died at Brooklyn, N. Y., Oct. 2, 1863. He was a brother of Washington Hunt, Governor of New York 1851–53. Revised by James Mercur.

Hunt, Helen: See Jackson, Helen Maria (*Hunt*).

Hunt, Henry Jackson: artillerist; b. in Detroit, Mich., Sept. 14, 1819; graduated at West Point Military Academy July 1, 1839, and entered the army as second lieutenant of artillery; served on frontier and garrison duty and in the Mexican war 1846–48. During the civil war he served in the defense of Fort Pickens, in the Manassas campaign, and as aide-de-camp to Gen. McClellan, and commanded the artillery reserves of the Army of the Potomac in the Peninsular campaign of 1862, and commanded in chief the artillery of that army from Sept. 18, 1862, to the close of the war. He was appointed brigadier-general of volunteers Sept. 15, 1862; brevet major-general of volunteers and brevet colonel, brigadier-general, and major-general U. S. army for gallant services at Gettysburg, Petersburg, and in the field. He published various reports and papers on military subjects; was member of various boards for the armament of fortifications, and president of the permanent artillery board for the army. He contributed more than any other officer to the organization and effective use of his arm of the service during the civil war. He retired 1883. He was governor of the Soldiers' Home, Washington, May 15, 1885, until his death, Feb. 11, 1889. Revised by James Mercur.

Hunt, James Henry Leigh: poet and essayist; b. at Southgate, Middlesex, England, Oct. 19, 1784; the son of a clergyman who had been a lawyer in Philadelphia. Leigh Hunt was educated at Christ's Hospital, read law for a time, and found a place in the War Office, which he left in 1808. His *Juvenilia* (poems, 1801) was published by his father, and in 1805 he became a critic for *The News*, and in 1808 established, with his brother John, *The Examiner*, a journal which became a power in the political world by reason of the independent course of its editors. The brothers were imprisoned (1812–15) for using language which was regarded as lacking in respect for the prince regent, but the kindness of Moore, Byron, and the Whig literati made Hunt's jail-life a very pleasant episode in his career. His best poem, *The Story of Rimini* (1816), was among the books written during his imprisonment. His literary life was one of much activity; many volumes of poems, essays, translations, and romance followed; but in spite of his industry Hunt was always very poor. In 1822 he visited Byron in Italy, and quarreled with him, but after the latter's death published *Recollections of Byron* in 1828. As a writer he had a felicitous style and an artistic way of putting things, but too often he wrote when he had nothing important to say, and most of his many books are already forgotten. Among the best are *Men, Women, and Books* (1847) and *Autobiography* (1850), edited by Thornton Hunt, his son. D. at Putney, Aug. 28, 1859.

Hunt, Richard Morris: architect; b. in Brattleboro, Vt., Oct. 28, 1828. He was a pupil at the École des Beaux-Arts in Paris, and in the office of H. M. Lefuel, who became director of the works of the new Louvre in 1854. Hunt was employed upon the building between the Louvre and the Tuileries, and especially upon the Pavillon de la Bibliothèque, opposite the Palais Royal. He returned to the U. S. in 1855; devoted himself actively to his profession, and did good service in elevating the taste for architecture at home. He built villas in Newport, residences in Boston and New York, the Stevens apartment-house, the Lenox Library, the Divinity College building at Yale, and *The Tribune* building in New York, the Naval Observatory at Washington, and the administration building at the Columbian Exposition at Chicago, 1893. He was chevalier of the Legion of Honor and corresponding member of the French Academy of Fine Arts. D. at Newport, R. I., July 31, 1895.

Hunt, Theodore Whitefield, Ph. D., Litt. D.: Presbyterian minister and professor; b. in Metuchen, N. J., Feb.

19, 1844, graduated from the College of New Jersey (1865); studied in Union Theological Seminary (1866–68); at Princeton Theological Seminary (1868–69 and graduated); and at University of Berlin; instructor in English in the College of New Jersey (1868–71); Professor of English from 1873. He has published *Cadmon's Exodus and Daniel* (Boston, 1883); *The Principles of Written Discourse* (New York, 1884); *English Prose and Prose-writers* (1887); *Studies in Literature and Style* (1890); *Ethical Teachings in Old English Authors* (1892). WILLIS J. BEECHER.

Hunt, THOMAS STERRY, Ph. D., F. R. S., LL. D.: chemist and geologist; b. at Norwich, Conn., Sept. 5, 1826; studied medicine and chemistry, and in 1845 became assistant in chemistry to Prof. Silliman; chemist and mineralogist for the Geological Survey of Canada 1847–72; was in 1855 one of the English jurors at the Paris Exposition, when he received the cross of the Legion of Honor. In 1859 he was chosen a fellow of the Royal Society. He was one of the organizers of Laval University, Quebec; was for four years a lecturer in McGill University, Montreal, and was Professor of Geology in the Massachusetts Institute of Technology 1872–78. He was one of the founders and first president of the Royal Society of Canada, and was one of the organizers of the international geological congress. D. in New York city, Feb. 12, 1892. He wrote many important papers upon mineralogy, chemistry, dynamic geology, and kindred topics.

Hunt, WARD, LL. D.: jurist; b. at Utica, N. Y., June 14, 1810; educated at Hamilton and Union Colleges, graduating in 1828; was mayor of Utica and member of New York Assembly; was judge of the court of appeals of State of New York from 1865 to 1873, when he became justice of the Supreme Court of the U. S. Retired Jan. 27, 1882. D. at Washington, D. C., Mar. 24, 1886.

Hunt, WASHINGTON: Governor of New York; b. at Windham, N. Y., Aug. 5, 1811; admitted to the bar at Lockport in 1834; appointed first judge of Niagara County in 1836; member of Congress 1843–49; comptroller of New York 1849, and Governor 1851–53. He was one of the leaders of the conservative wing of the Whig party, and when this party was dissolved he became a Democrat. He was a delegate to the Chicago convention in 1864. D. in New York, Feb. 2, 1867.

Hunt, WILLIAM (called also WILLIAM HENRY): water-color painter; b. in London, Mar. 28, 1790; studied with John Varley and at the schools of the Royal Academy. He was especially connected with the first Water-color Society, of which he was elected associate in 1824 and full member in 1827. His work was remarkable for minute execution and delicate finish. Flowers, fruit, and birds' nests are his common subjects, as well as dead birds painted for the beauty of their plumage; but he also made many drawings of peasant boys in smock-frocks and peasant children. D. in London, Feb. 10, 1864. In the South Kensington Museum there are his *Hawthorn Blossoms and Birds' Nests, Grapes, Melons, and Plums, The Doubtful Coin, A Brown Study*, and several other drawings. RUSSELL STURGIS.

Hunt, WILLIAM HENRY: lawyer; b. at Charleston, S. C., in 1824; educated in Yale College; studied law, and was admitted to the bar at New Orleans in 1844. He was a stanch adherent of the Union cause during the civil war; he was appointed attorney-general of Louisiana in 1876, judge of the court of claims in 1878, Secretary of the Navy in 1881, and minister to Russia in 1882. D. in St. Petersburg, Feb. 27, 1884.

Hunt, WILLIAM HOLMAN: figure-painter; b. in London, Apr., 1827; pupil of John Varley and of the Royal Academy, where he exhibited his first picture, *Hark!* in 1846. He is known as one of the chiefs of the Pre-Raphaelite group in British art, and has spent much time in the East, particularly in Jerusalem, where he has made studies of Oriental types of character for some of his pictures of religious subjects. In 1849 Hunt exhibited *Rienzi Vowing to Avenge the Death of his Brother*, the first of his works executed in the Pre-Raphaelite manner. His reputation, which is very high in certain circles in England, is due to the literary side of his compositions and his original conceptions of his subjects. *The Light of the World* (1854) is one of his best-known works, and one in which he most nearly approaches to successful treatment of technical difficulties. Other important works by him are *The Saviour in the Temple* (1860); *The Shadow of Death* (1873); and *The Triumph of the Innocents* (1885). WILLIAM A. COFFIN.

Hunt, WILLIAM MORRIS: portrait, landscape, and figure painter; b. at Brattleboro, Vt., Mar. 31, 1824. He was a pupil of the Düsseldorf Academy for about a year, studying with the intention of becoming a sculptor; afterward studied under Couture in Paris, and then went to Barbizon in the forest of Fontainebleau, where he worked with Millet, and was strongly influenced by his example and advice. He returned to the U. S. in 1855 and settled at Newport, R. I., but later went to Boston, where he remained permanently and was a successful teacher, reverenced by his pupils. His influence on art in the U. S. was considerable, and in a good direction. Some of his works are in the Boston Museum of Fine Arts, and in the Capitol at Albany, N. Y., he executed two mural paintings, *The Flight of Night* and *The Discoverer*, but they have been almost destroyed by a defective ceiling. His work is often fine in color, and is invariably distinguished by artistic qualities. D. at the Isles of Shoals, Sept. 8, 1879. WILLIAM A. COFFIN.

Hunter, DAVID: soldier; b. at Washington, D. C., July 21, 1802; graduated at the U. S. Military Academy, and entered the army as second lieutenant of infantry July, 1822; captain of dragoons 1833; resigned in 1836. In 1842 he reentered the service as paymaster, with the rank of major, on which duty he served until 1861, when (May 14) he was appointed colonel of the Sixth U. S. Cavalry, and three days later brigadier-general of volunteers, as such commanding division at Bull Run (July 21), where he was wounded; promoted major-general of volunteers Aug., 1861. In May, 1862, while in command of the department of the South, he issued an order declaring slavery abolished in that department, but this was annulled by President Lincoln in a proclamation. In May, 1864, Hunter succeeded Gen. Sigel in command of the department of West Virginia; the battle of Piedmont and subsequent march against Lynchburg viâ Lexington occurred the following month; a strong Confederate force arrived in good time to the relief of that city, however, and Hunter's ammunition giving out, he made a hasty retreat, closely pursued by the enemy. In 1865 he was member of the military commission which tried the conspirators engaged in the assassination of Lincoln. Retired July, 1866. D. at Washington, D. C., Feb. 2, 1886.
Revised by JAMES MERCUR.

Hunter, JOHN, F. R. S.: physiologist and surgeon; b. at Long Calderwood, Glasgow, Scotland, July 14, 1728; youngest of ten children, of whom one was the afterward celebrated William Hunter. John received very imperfect instruction at school; was apprenticed to a cabinetmaker; went in 1748 to study anatomy with his brother; studied at Oxford 1753–54; became a surgical pupil at St. Bartholomew's 1751, and at St. George's 1754; studied surgery under Cheselden and Pott; lectured upon anatomy 1754–59; attained great knowledge of human and comparative anatomy; served in France and Portugal as staff-surgeon 1761–63; began to practice surgery in London 1763; was made F. R. S. 1797, in consequence of the publication of important papers containing new discoveries in pathology and physiology; became surgeon to St. George's Hospital 1768; surgeon extraordinary to the king 1776; surgeon-general of the forces and inspector-general of hospitals 1790. John Hunter was the boldest and best operator of his time, an anatomist of marvelous knowledge, and one of the fathers of zoölogical science. He was author of *Natural History of the Human Teeth* (1771–78); *On Venereal Disease* (1786); *Observations on Certain Parts of the Animal Economy* (1786); *On the Blood, Inflammation, and Gunshot Wounds* (1794). He was the collector of the great Hunterian Museum, chiefly of pathological and anatomical specimens, purchased by the British Government and presented to the Royal College of Surgeons. D. in London, Oct. 16, 1793.

Hunter, WILLIAM, M. D., F. R. S.: anatomist and obstetrician; elder brother of John Hunter; b. at Long Calderwood, Scotland, May 23, 1718; studied at Glasgow University 1732–37, with a view to the ministry; became the medical pupil of Cullen; studied medicine in Edinburgh and London, whither he went in 1741; began to lecture on surgery and anatomy 1746; acquired a wide fame as a surgeon and accoucheur, devoting himself after 1749 chiefly to the practice of obstetrics; took his degree at Glasgow 1750; became physician to the queen 1764; F. R. S. 1767; Professor of Anatomy 1770; president of the College of Physicians 1781; associate of the Academy of Sciences, Paris, 1782. D. in London, Mar. 30, 1783. His splendid collection of anatomical and pathological specimens, coins, books, etc., is now the

Hunterian Museum of the University of Glasgow; it was partly collected by John Hunter. His principal published works were *Medical Commentaries* (1762–64) and the splendid *Anatomia Humani Uteri Gravidi* (1774).

Hunter, William, D. D.: minister and journalist; b. in the county of Antrim, Ireland, May 26, 1811. In 1817 his parents emigrated to the U. S. He entered Madison College at Uniontown, Pa., 1830, and in 1833 he joined the Pittsburg conference. He edited the Pittsburg *Conference Journal*, also the Pittsburg *Christian Advocate*, and was presiding elder in the Clarksburg and Beaver districts. In 1855 he became Kramer Professor of Hebrew and Biblical Literature in Allegheny College. In 1870 he returned to pastoral work, and in 1872 to religious journalism, being then re-elected as editor of *The Christian Advocate*. He was the author of several books of hymns and spiritual songs, and of a poem on *American Methodism, a Plea for Unity*, and *Commentary on Proverbs* in the Whedon series. He was one of the committee appointed in 1872 to revise the Methodist *Hymn-book*. D. at Cleveland, O., Oct. 18, 1877.

Revised by J. F. Hurst.

Hunter, Sir William Wilson: statistician; b. in Glasgow, Scotland, July 15, 1840; studied in his native city, in Paris, and in Bonn; entered the Indian civil service in 1862, and was in 1871 made director-general of Indian statistics. In 1872 the first census of India was taken, and in 1876 appeared the *Statistical Account of Bengal*, in twenty volumes. His best-known books are *Annals of Rural Bengal*; *Orissa, or an Indian Province under Native and British Rule* (1872); *A System of Famine Warnings*; *Life of Lord Mayo* (2 vols.; 2d ed. 1876); *Comparative Dictionary of the Non-Aryan Languages of India and High Asia* (1868); *The Indian Empire: its History, People, and Products* (1882; 2d ed. 1886); the *Imperial Gazetteer of India* (9 vols., 1881; 14 vols., 1886–88); and a *Life of Dalhousie*, in the Rulers of India Series, of which he is the editor. He was knighted in 1887.

Huntingburg: city; Dubois co., Ind. (for location of county, see map of Indiana, ref. 10–C); on the Louisv., Evansv. and St. L. Railroad; 48 miles N. E. of Evansville, 75 W. of Louisville. It is in a region abounding in block and cannel coal, fire and potter's clays, plumbago, iron ores, mineral paints, lime, and sandstone, and in which tobacco, grain, and fruit are extensively cultivated. There are manufactures of building-brick and architectural terra-cotta, flour, lumber, carriages, wagons, woolen goods, furniture, tobacco, saddlery, etc. The city has an improved system of water-works and four weekly newspapers. Pop. (1880) 781; (1890) 3,167. Editor of "Argus."

Hunt'ingdon: capital of the county of Huntingdon, England; on the left bank of the Ouse; 59 miles N. of London (see map of England, ref. 10–J). It was the birthplace of Oliver Cromwell, and from 1765 to 1767 the residence of the poet Cowper. Pop. (1891) 4,349.

Huntingdon: borough; capital of Huntingdon co., Pa, (for location of county, see map of Pennsylvania, ref. 5–E); on the Juniata river, the Pennsylvania Canal, and the Hunt. and Broad Top Mt. and Penn. railways; 97 miles W. of Harrisburg. It is in a region abounding in iron, lead, coal, fire-clay, limestone, and timber; is the seat of the State Industrial Reformatory; and contains a normal college, 2 graded public schools, water-works, gas and electric-light plants, and 6 newspapers. It has planing-mills, flour and feed mills, foundry, machine-shops, car-works, and manufactures of stationery, sewer-pipe, reed and rattan goods, furniture, etc. Pop. (1880) 4,125; (1890) 5,729.

Editor of "News."

Huntingdon, Selina, Countess of: religious leader; daughter of Washington Shirley, Earl Ferrers; b. Aug. 24, 1707. In 1728 she was married to Theophilus Hastings, Earl of Huntingdon, a man of great religious zeal, who died Oct. 13, 1746. The countess became a very devout and zealous Christian; made Whitefield her private chaplain, and became the leader of Calvinistic Methodism in England, and her followers were known as the "Countess of Huntington's Connection." Her large means were devoted to the dissemination of her religious views, and to this end she built and maintained a college at Trevecca, Wales, for the education of Calvinistic ministers; she also built chapels throughout England, and provided for their support. It is said that in all she erected sixty-four chapels, the finest of which is at Bath, for the management of which she bequeathed the bulk of her fortune in trust. D. June 17, 1791.

Hunt'ingdonshire: county of England; bounded by the counties of Cambridge, Bedford, and Northampton. It contains 229,515 acres of low, mostly level or slightly hilly ground, watered by the Ouse and the Nene, and well adapted to agriculture. It is traversed by two Roman roads, and within its limits have been found many Roman remains. It sends two members to Parliament. Pop. (1891) 57,772.

Huntington: city; capital of Huntington co., Ind. (for location of county, see map of Indiana, ref. 4–F); on the Little river, the Wabash and Erie Canal, and the Wabash and the Erie railroads; 24 miles S. W. of Fort Wayne, 118 S. W. of Toledo. It is the commercial center of the Upper Wabash valley, and the place of manufacture of the famous Huntington white lime, about fifty kilns being operated steadily in the vicinity. The city has a new system of water-works, the arc system of electric lighting, 4 public school-buildings, library with hall and reading-room, natural gas for fuel, and a semi-monthly, 2 daily, and 2 weekly periodicals. The shops and division headquarters of the Erie Railway are here, and there are numerous factories working wood into various shapes. Pop. (1880) 3,863; (1890) 7,328. Editor of "Herald."

Huntington: village; Suffolk co., N. Y. (for location of county, see map of New York, ref. 8–K); on Huntington Bay, which opens into Long Island Sound, and on the Long Island Railroad; 38 miles E. of New York. The town of the same name includes Lloyd's Neck and several villages, is in a rich agricultural region, and is one of the most charming resorts on the north shore of Long Island. There are remains of fortifications erected by the British during the Revolutionary war, manufactures of brick, pottery, thimbles, and carriages, union free school, an academy, public library, 8 churches, soldiers' and sailors' memorial building, public hall, a monument in honor of Nathan Hale, a street railway, gravity water-works, 2 weekly and 2 monthly periodicals, and many costly summer residences of New York business men. Pop. (1880) 2,952; (1890) 3,028.

Editor of "Long Islander."

Huntington: city (founded in 1871; named after Collis P. Huntington); capital of Cabell co., West Va. (for location of county, see map of West Virginia, ref. 8–D); on the Ohio river, and the Ches. and O., the Newport News and Miss. Val., and the Ohio River Railways; 52 miles W. of Charleston, the State capital. It is the seat of Marshall College (State Normal School), which in 1890 had four professional instructors and 164 students. The city has railway machine and car shops, saw and planing mills, and a variety of manufactures, and is the shipping-point of the coal, iron, and lumber products of a large region. It has 2 banks, a monthly, and 3 daily and 5 weekly periodicals. Pop. (1880) 3,174; (1890) 10,108. Editor of "Times."

Huntington, Daniel: portrait and genre painter; b. in New York, Oct. 14, 1816. He was a pupil of S. B. F. Morse and Inman; went to Europe in 1839 and again in 1844, and painted some important pictures in Rome and Florence; was made a National Academician 1840, and elected president in 1862 and 1869; then held the office continuously from 1877 to 1889; has painted the portraits of many well-known people in the U. S., including Presidents Lincoln (Union League Club, New York) and Van Buren (State Library, Albany, N. Y.); also those of Sir Charles Eastlake and the Earl of Carlisle in England. His *Mercy's Dream* is in the Corcoran Gallery, Washington.

William A. Coffin.

Huntington, Frederic Dan, D. D., LL. D.: Protestant Episcopal bishop; b. at Hadley, Mass., May 28, 1819. He graduated at Amherst 1839, and at Cambridge Divinity School 1842. Entering the Unitarian ministry, he held a pastorate in Boston 1842–55, when he became Plummer Professor of Christian Morals and preacher to Harvard University. In 1860 he resigned, and was rector of Emmanuel church, Boston, till his elevation to the episcopate as Bishop of Central New York. He was one of the founders of *The Church Monthly*, Boston. He has published *Lessons on the Parables* (1856); *Human Society* (1860); *Elim, or Hymns of Holy Refreshment* (1865); *Helps to a Holy Lent* (1872); *Memorials of a Quiet Life* (1874); occasional sermons and addresses, and other works.

Huntington, Lucius Seth: Canadian statesman; b. in Compton, P. Q., May 26, 1827; was educated at Sherbrooke,

and admitted to the bar in 1853. He had a seat in Canada Assembly 1861–67; in Dominion Parliament 1867–82; was Solicitor-General of Lower Canada 1863–64; president Privy Council of Canada 1874–75; and Postmaster-General 1875–78. He was active in pressing inquiry relative to the Pacific Railway scandal; was supposed to favor annexation of Canada to the U. S., and was largely interested in developing the mining resources of the Province of Quebec. For a few years preceding his death in New York, May 19, 1886, he resided there. He published a novel, *Professor Conant* (New York, 1884). NEIL MACDONALD.

Huntington, SAMUEL, LL. D.: a signer of the Declaration of Independence; b. at Windham, Conn., July 3, 1731; learned the trade of a cooper; became in 1758 a lawyer of Norwich, Conn.; held many important offices; was a member of the Continental Congress 1776–83, and its president 1779–81; judge of the Connecticut superior court 1774–84; its chief justice 1784; Lieutenant-Governor of Connecticut 1785; Governor 1786–96. He received the honorary degree of LL. D. from Yale in 1787. D. at Norwich, Conn., Jan. 5, 1796.

Huntington, WILLIAM REED, S. T. D., D. C. L.: clergyman and author; b. at Lowell, Mass., Sept. 20, 1838; graduated at Harvard College in 1859; was temporary instructor in chemistry there 1859–60. In 1860 he took orders in the Protestant Episcopal Church; was assistant rector of Emmanuel church, Boston, 1861–62; rector of All Saints', Worcester, Mass., 1862–83; since 1883 has been rector of Grace church, New York city. In 1870 he delivered the Phi Beta Kappa poem at Harvard. Among his published works are *The Church Idea, an Essay toward Unity* (1870); *Conditional Immortality* (1878); *The Peace of the Church* (1891); *Popular Misconceptions of the Episcopal Church* (1891); *The Church Porch* (a Sunday-school manual, with hymns); *Questions on the Fourth Gospel*; and the pamphlets *American Catholicity, Twenty Years of a Massachusetts Rectorship* (1883), and *The Book Annexed, its Critics and its Prospects* (1886). Dr. Huntington was the leading spirit in bringing to a successful termination in 1892 the revision of the American *Prayer-book*, which from the inception of the movement had been guided and shaped by himself more than by any other individual.

Revised by W. S. PERRY.

Huntsville: town; capital of Madison co., Ala. (for location of county, see map of Alabama, ref. 1–D); on a spur of the Cumberland Mountains, 640 feet above sea-level, and on the Mem. and Charl. and the Nash., Chat. and St. L. railways; 98 miles W. S. W. of Chattanooga, Tenn., 200 miles N. of Montgomery. It is in an agricultural, cotton-growing, and stock-raising region; contains Huntsville Female Seminary (Presbyterian, opened 1840), Huntsville Female College (Methodist Episcopal South, opened 1843), a State normal college and industrial institute (opened 1873), U. S. Government building (cost $100,000), water-works, gas and electric-light plants, and a monthly, 2 daily, and 3 weekly periodicals, and has 3 cotton-mills, one of which is said to be the largest in the U. S., railway machine-shops, brass and iron foundry, planing-mills, etc. Pop. (1880) 4,977; (1890) 7,995; (1893) estimated, 12,000. EDITOR OF "MERCURY."

Huntsville: town (founded in 1830); capital of Randolph co., Mo. (for location of county, see map of Missouri, ref. 3–G); on the Wabash Railroad; 153 miles N. W. of St. Louis. It has valuable coal mines, public high school, 7 churches, 2 flour-mills, rake and stacker factory, and weekly newspaper. Pop. (1880) 1,527; (1890) 1,836; (1891) city census, 2,040. EDITOR OF "HERALD."

Huntsville: city; capital of Walker co., Tex. (for location of county, see map of Texas, ref. 4–J); on the Int. and Gt. North. Railroad; 75 miles N. of Houston, 200 miles S. E. of Austin. It is the seat of the main State penitentiary (built in 1848–49), in which cotton and woolen goods, furniture, boots, carriages and wagons, and other articles are manufactured. It is also the seat of the Sam Houston State Normal School, which in 1890 had 10 instructors and 313 students. There are 8 churches, 2 public-school buildings, steam corn-mills, cotton-gins, an ice-factory, and a weekly newspaper. Gov. Sam Houston is buried here. The chief business is shipping cotton. Pop. (1880) including prison inmates, 2,536; (1890) excluding prisoners, 1,509; (1893) with suburbs, estimated, 2,500.

PUBLISHER OF "ITEM."

Hunyady, hoon'yăă-di, JÁNOS: military leader; b. in Hungary at the close of the fourteenth century. The year and the place of his birth, as well as his parentage and the origin of his surname, *Corvinus*, are unknown. Under Sigismund and Albert he acquired great fame by the valor and military skill with which he fought against the Turks, at that time the terror of Europe; and by Albert he was made governor of the Hungarian provinces S. of the Danube. In 1439 Albert died, and Vladislas, King of Poland, was elected King of Hungary. Under his reign the arms of Hunyady were still more successful. He drove the Turks behind the Balkan, and compelled them to conclude an armistice of ten years (July 12, 1444). But Vladislas broke this armistice, and the result was the battle of Varna, in which the Hungarians were totally routed, and the king fell (Nov. 10, 1444). During the minority of Ladislas, a son of Albert, who was elected King of Hungary in 1444, Hunyady governed the country, and he showed no less ability as a statesman than as a warrior. He kept order in the country; and although in his contests with the Turks he met with some severe reverses—as, for instance, in the three days' battle of Kossova, Oct. 17, 1448—he nevertheless succeeded in checking their progress and preventing them from overrunning the whole of Europe. His most brilliant exploit was the attack on the Turkish camp at Belgrade (July 14, 1456). Mohammed II. had laid siege to this city with an army of 150,000 men and 300 cannons. But with a far inferior force Hunyady compelled him to break up the siege and draw back, leaving behind him all his artillery. Shortly after Hunyady died. Of his two sons, the oldest, Ladislas, was beheaded at Buda for having killed Count Cilley, a personal enemy of his father; the younger, Matthias Corvinus, was educated by Georg Podiebrad, of Bohemia, and became King of Hungary after Ladislas.

Hupeh, or **Hoopeh** [Chinese, liter., north of the lake—i. e. of Tung-ting Lake]: a province of Central China; between lat. 29° and 33° N. and between lon. 108° and 116° E.; traversed by the river Yang-tse and by its great tributary the Han. Area, 70,450 sq. miles. Pop. by official estimate (1882) 33,365,005. Capital, Wu-Chang, on the right bank of the Yang-tse, nearly opposite Hankow, the largest trading center of Central China.

Hupfeld, hoop'felt, HERMANN CHRISTIAN CARL FRIEDRICH: biblical scholar; b. at Marburg, Mar. 31, 1796; was successively professor at Marburg (1825) and Halle, where he succeeded to the chair of Oriental Languages on the death of Gesenius, 1843. In 1865 he was violently attacked by the theologians of the Hengstenberg school, who accused him of heresy and wanted him removed. The manœuver failed, however, especially on account of Tholuck's firmness. His most important work is a *Commentary on the Psalms* (Gotha, 4 vols., 1855–62; 3d ed. by Nowack, 1888), which is remarkable for its originality and scholarship. A new edition by Riehm appeared 1865–72. Among his other works are *Die Quellen der Genesis* (Berlin, 1853) and *Ueber Begriff und Methode des sogenannten Biblischen Einleitung* (Marburg, 1844). D. at Halle, Apr. 24, 1866. See his *Life* by E. Riehm (Halle, 1867). Revised by S. M. JACKSON.

Hu'ra, or **Sand-box Tree** [*hura* is Mod. Lat., from a S. Amer. name]: a tree (*Hura crepitans*, family *Euphorbiaceæ*), native of tropical America. When the seed is ripe the woody capsule bursts with a loud report. It was once customary to make sand-boxes of the unripe woody fruit, and it is related that these boxes would sometimes spontaneously explode after being used for years. The seeds are sharply purgative.

Hurd, RICHARD, D. D.: prelate and author; b. at Congreve, Staffordshire, England, Jan. 13, 1720; was educated at Emmanuel College, Cambridge, where he took his degree of M. A. in 1742, and continued to reside till 1757, when he was appointed rector of Thurcaston, in Leicestershire. In 1765 he was chosen preacher of Lincoln's Inn, London; was promoted to the archdeaconry of Gloucester in 1767, and to the bishopric of Lichfield and Coventry in 1775, whence he was transferred in 1781 to that of Worcester, where he continued until his death, declining the offer of the archbishopric of Canterbury on the death of Dr. Cornwallis in 1783. He was the lifelong friend and admirer of Bishop Warburton, whose biographer he also was, and wrote numerous pamphlets vindicatory of Warburton's views. Of his writings, which were very numerous, the most prominent are his *Dialogues* (London, 1759); *Letters on Romance and Chivalry* (1762); *English Commentary on the Epistle of Horace on the Art of Poetry* (1749); *Twelve Discourses on the Prophecies* (1772; 6th ed. 1839); his collected

works (1811, 8 vols.). D. in Hartlebury Castle, the official residence of the Bishop of Worcester, May 28, 1808.

Revised by S. M. Jackson.

Hurdwar: a variation spelling of Hardwar (*q. v.*).

Hurdy-gurdy: a musical instrument of the stringed kind, at one time much used by the European peasantry, but now seldom seen except in the hands of Savoyard boys, who play it in the streets. It consists of a flat sounding-board, connected by tolerably deep ribs to a back of the same size and shape. It has four strings of gut, which are put into vibration by the edge of a wooden wheel turned by a handle. It is suited only to very simple melodies.

Hurlbert, William Henry: journalist; b. in Charleston, S. C., July 3, 1827. He was educated at Harvard College, Harvard Divinity School, Harvard Law School, and the University of Berlin; in 1855 joined the staff of *Putnam's Magazine* and *The Albion*; in 1857 joined the staff of *The New York Times*; in 1862 joined the staff of *The New York World*; from 1864 to 1867 was a proprietor of *The Commercial Advertiser*. Subsequently he traveled extensively as correspondent for *The New York World*; from 1876 to 1883 he was editor-in-chief of that journal. From 1883 he resided in Europe. Wrote *Gan Eden* (Boston, 1854); *Gen. McClellan and the Conduct of the War* (New York, 1864), and other works. D. at Cadenabbia, Italy, Sept. 4, 1895.

Hurlbut, Jesse Lyman, D. D.: clergyman and author; b. in New York city, Feb. 15, 1843; was educated at Wesleyan University; entered Newark Conference 1865; stationed at Newark, N. J., Montclair, N. J., Paterson, N. J., West New Brighton, Staten Island, Hoboken, N. J.; agent of Methodist Episcopal Sunday-school Union 1879; assistant editor of Sunday-school literature, Methodist Episcopal Church, 1884; principal of Chautauqua Literary and Scientific Circle 1882; corresponding secretary of Sunday-school Union and Tract Society of the Methodist Episcopal Church and editor of Sunday-school books and periodicals, 1888; general secretary of the Epworth League of the Methodist Episcopal Church 1889-92; author of *Manual of Biblical Geography* (1882); *Outline Normal Lessons* (1883); *Supplemental Lessons for the Sunday-school* (1887); *Studies in the Four Gospels* (1889); *Outlines in Old Testament History* (1890). C. H. Thurber.

Hurlbut, Stephen Augustus: soldier; b. at Charleston, S. C., Nov. 29, 1815; received a liberal education, studied law, and was admitted to the bar in 1837; removed to Illinois and settled in Belvidere. In 1847 he was elected to the State constitutional convention as a Whig; presidential elector on the Whig ticket 1848; member of the State Legislature 1859, 1861, and 1867, and presidential elector on the Republican ticket 1868. During the civil war he was appointed in May, 1861, a brigadier-general of volunteers, commanding a division at the battle of Pittsburg Landing; was promoted to be major-general of volunteers Sept., 1862, and commanded the Sixteenth Army-corps and department of the Gulf. In 1869 he was appointed minister resident to the U. S. of Colombia, and held office till 1872; elected member of the Forty-third Congress from the Fourth District of Illinois. Became U. S. minister to Peru May 19, 1881. D. in Lima, Mar. 28, 1882.

Hurley: village; capital of Iron co., Wis. (for location of county, see map of Wisconsin, ref. 2-C); on the Montreal river, and the Mil., Lake S. and W. and the Wis. Cent. railways; opposite Ironwood. It is in the famous Gogebic iron-mining region, and has a national bank with capital of $50,000, a State bank with capital of $25,000, and two weekly newspapers. Pop. (1890) 2,267.

Huron: city; capital of Beadle co., S. Dak. (for location of county, see map of South Dakota, ref. 6-F); on the Chi. and N. W. and the Gt. North. railways; 119 miles E. of Pierre. It is in a prairie region; contains railway car-shops, U. S. land-office, U. S. weather service station, surveyor-general's office, 5 artesian wells with 6 to 10 inch pipes supplying water for domestic use and power for milling and manufacturing, and 7 periodicals; and has manufactures of ornamental woodwork, flour, carriages and wagons, and cigars. Pop. (1880) 164; (1890) 3,038; (1895) 2,514. N. T. Smith.

Huron, Lake: one of the Great Lakes of North America, drained by the St. Lawrence river. It is bounded on the N., E., and S. by the Province of Ontario, Canada, and on the S. and W. by the State of Michigan. It has an area of 22,322 sq. miles, as determined from the maps of the U. S. Lake Survey; this is inclusive of Georgian Bay, 5,626, and North Passage, 1,556 sq. miles, respectively. It is somewhat larger than Lake Michigan, and only second in area to Lake Superior. Its mean level is 582 feet above the sea, the same as the level of Lake Michigan, with which it is connected by the Straits of Mackinac, 3½ miles broad and 135 feet deep. It receives the discharge of Lake Superior, which is 20 feet higher, through St. Mary's river, and is also supplied by Lake Michigan and by numerous streams, especially from the Canadian side. It overflows through St. Clair river into Lake St. Clair and thence to Lake Erie. Its discharge is estimated at 217,000 cubic feet per second. The average depth of water is about 200 feet, and the maximum depth 750 feet. Its annual variation of level, dependent on rainfall and evaporation, sometimes amounts to between 4 and 5 feet, but much greater local variations are produced by strong winds. In summer the surface temperature varies from 52° to 58° F., and the bottom temperature from 42° to 52° F. The main body of the lake is unbroken by islands, but the northeast shore, including Georgian Bay, is diversified by many low islands, composed of limestone and glacial *débris*. These islands and the adjacent mainland are densely wooded, and have but few settlements. The shores throughout are low and lacking in picturesque features, although the southeastern border frequently rises in a sea-cliff from 100 to 150 feet high, and furnishes agreeable sites for many pleasant towns and villages. Most of the harbors on this coast are protected by breakwaters. Ancient lake beaches far inland from the present water-margin show that Lake Huron, in common with the rest of the Great Lakes, was formerly of much greater extent and depth than at present. See St. Lawrence River. Israel C. Russell.

Huronian Series: in geology, a division of the pre-Cambrian rocks. The rocks first described under this name (William Logan, 1858) occur on the north shore of Lake Huron, and consist of unaltered and little altered sandstones, conglomerates, shales, and limestones, with interbedded igneous rocks. These were held to rest unconformably upon the Laurentian granites and gneisses of the region, and thus were separated primarily upon a structural basis, and only secondarily upon lithologic character. Metamorphic rocks of other districts were afterward correlated with the Huronian of Lake Huron, and the term has been widely used to indicate dark-colored rocks in all parts of the earth. In the system of classification to which this use pertained the gneisses and many granites were termed Laurentian, and all pre-Cambrian schists and partly metamorphosed rocks were grouped on petrographic grounds as Huronian. The classification of pre-Cambrian rocks by lithologic characters was carried to an extreme by T. S. Hunt, whose system has six divisions: Laurentian (oldest), Norian, Arvonian, Huronian, Montalban, and Taconian. The Huronian in this classification comprises quartzose, epidotic, chloritic, and calcareous schists, with masses of serpentine and lherzolite. Most geologists, believing that a satisfactory chronologic classification of the older rocks must be founded on structural relations, incline to regard purely petrographic classifications as artificial and temporary; and this tendency has received definite expression in the term Algonkian (*q. v.*), which is applied to all the later systems of pre-Cambrian rocks, and thus includes among others the rocks originally described as Huronian. G. K. Gilbert.

Hurons: See Iroquoian Indians.

Hurricanes [: Germ. *orkan* : Fr. *ouragan*, from Span. *huracan*, from Caribbean *hurakan*, hurricane]: tropical cyclones of great intensity which pass over the West Indies. They originate to the E. of the West Indies on the Atlantic Ocean, travel at first westward until they strike the islands. From here they usually turn first northward, then northeastward, skirting the Atlantic coast of the Southern States. By the time they have reached the mid-Atlantic on this arm of their path they have so far lost their intensity that they differ little from other storms. A few, instead of striking northeastward, continue westward in tropical latitudes, striking the continent anywhere from Honduras to Texas. Their violence is apparently greatest near where they originate, and their diameter is smallest at that time. As they advance they expand in size and decrease in violence, though this change is at first slow. They are storms of the same order as the typhoons of the China Sea, and the tropical cyclones of the Mascarene islands of the Indian Ocean and of the Samoan and Fiji islands of the South Pacific. They differ from the cyclones or storm-areas of temperate regions in their smaller size, slower motion, and greater intensity,

characters all due, probably, to their origin over tropical seas.

They are whirlwinds of terrific violence. The winds blow about the center of the storm with such speed as to leave a larger or smaller calm center, which is often clear. Ships which have been so unfortunate as to pass through the center or "eye" of the storm have been submitted to a furious wind from one quarter which has suddenly ceased. The sea was here very rough and broken, but the sky was clear, or only partly cloudy. After remaining here for some time, however, they were suddenly taken by the wind from exactly the opposite direction. These winds, as in all cyclones, turn contra-clockwise in the northern hemisphere. Observation shows that the barometer is lowest in the center of a hurricane, and rises steeply in every direction. The difference in air-pressure between center and circumference of a hurricane is sometimes as much as 2 inches of the mercurial column.

The season of hurricanes is from July to October. Out of a total of 355 hurricanes recorded in 300 years, 42 occurred in July, 96 in August, 80 in September, 69 in October. The rate of speed averages 300 miles daily among the islands. The usual signs of their approach are an ugly and threatening appearance of weather, sharp and frequent puffs of wind which increase in force, a long heavy swell coming from the direction of the storm. The barometer, however, is the best guide, and, during the hurricane months, a decided fall of the mercury or sharp and irregular oscillations are indications of the approaching storm. A system of telegraphic warnings enables the eastern islands to notify the western ones and the U. S. when the storm is at hand. When it arrives it is accompanied by intense electric phenomena, very heavy rain, and often by a storm-wave, which in harbors and on low coasts completes the destruction which the hurricane has begun.

A knowledge of the character and course of these storms makes it possible for a ship at sea generally to avoid them when approaching, or to escape from their violence, if once involved, with a minimum of damage. To aid in manœuvering for the latter purpose navigators often use a "horn-card," that is, a transparent card on which is marked the direction of winds about the center of a hurricane. By placing this on the chart with the proper direction of wind over the spot occupied by the ship, conclusions can be drawn as to the direction and distance of the storm-center. If an observer is imagined to be standing at the center of the storm, and looking in the direction toward the point to which the storm is moving, the right-hand half of the hurricane is the most dangerous, and the preceding half of this (that is the right-hand, forward quadrant) is more dangerous than the other. With these facts in mind, and with the knowledge gained by the horn-card, the navigator is in position to plan his escape in the most favorable manner possible.

The rotation of the winds in hurricanes had apparently been suspected and suggested several times before, but it was first fairly proven by William C. Redfield in his *Theory of Storms*, published in 1831. His views were strongly contested, but he was strongly supported by Sir William (then Colonel) Reid about fifteen years later. Eventually his views on hurricanes were found to be applicable to the general storms of higher latitudes, and the modern cylonic theory was worked out.

References.—Redfield: the first paper was in *Silliman's Journal*, xx. (1831); it was followed by many others, which were largely controversial; Reid, *Law of Storms* (1st ed. 1838); Espy, *Philosophy of Storms* (1841); Birt, *Laws of Storms* (1853); Poey, *Chronological Table and Bibliographical List* (*Journ. Geog. Soc.*, xxi., 1855), and *Bibliographie Cyclonique* (2d ed. 1866); Piddington, *Sailor's Horn-book* (6th ed. 1876); Reye, *Würbelstürme* (1880); Davis, *Whirlwinds, Cyclones, and Tornadoes* (1884); Van Bebber, *Die Würbelstürme* (*Deutsche Revue*, 1878); Finley, *Storm-track, Fog, and Ice-charts of the North Atlantic Ocean*, and *Hurricane Tracks of the Gulf of Mexico* (1889).

Mark W. Harrington.

Hurst, John Fletcher, D. D., LL. D.: Bishop of Methodist Episcopal Church; b. near Salem, Md., Aug. 17, 1834; graduated at Dickinson College 1854; teacher of Ancient Languages in Hedding Institute 1854–56; student of theology in Universities of Halle and Heidelberg 1856–57; joined Newark conference 1858; served in pastorates 1858–66; Professor of Theology in the Mission Institute, Bremen, Germany, 1866–68, and in the Martin Mission Institute, Frankfort-on-the-Main, 1868–71; traveled through the principal European countries, and made a tour through Egypt and Syria, 1868–71; Professor of Historical Theology in Drew Theological Seminary 1871–80, and president of the same 1873–80; elected bishop 1880; chosen as chancellor of the American University May 28, 1891. He has written and published *History of Rationalism* (New York, 1865; London, 1866); a translation of Hagenbach's *History of the Church in the Eighteenth and Nineteenth Centuries* (New York, 1869); a translation of Van Oosterzee's *Apologetical Lectures on John's Gospel* (Edinburgh, 1869); a translation, with additions, of Lange's *Commentary on the Epistle to the Romans* (New York, 1870); *Outline of Bible History* (1872); *Martyrs to the Tract Cause* (1873); *Life and Literature in the Fatherland* (1874); *Outline of Church History* (1875); *Our Theological Century: a Contribution to the History of Theology in the United States* (1876); with Henry C. Whiting, Ph. D., *Seneca's Moral Essays*, with notes (1877); *Bibliotheca Theologica* (1883); with George R. Crooks, D. D., LL. D., *Theological Encyclopædia and Methodology* (1884); *Short History of the Early Church* (1886); *Short History of the Mediæval Church* (1887); *Short History of the Reformation* (1884); *Short History of the Modern Church in Europe* (1888); *Short History of the Church in the United States* (1890); *Indika: the Country and People of India and Ceylon* (1891); *Short History of the Christian Church* (1892). Associate editor *Johnson's Universal Cyclopædia*.

C. H. Thurber.

Hurtado de Mendoza, oor-taa dō-dā-mān-dō thaā, Andres, Marquis of Cañete: administrator; b. at Cuenca, Spain, about 1490. After being governor of Cuenca he was appointed Viceroy of Peru, entering Lima June 29, 1556. He at once took vigorous measures to rid the country of those who had engaged in the late rebellions, and established the government on a sound footing. The Inca chief, Sayri Tupac, who had maintained a precarious sovereignty in the mountains, was induced to resign it for a palace and pension at Cuzco. D. at Lima, Mar. 30, 1561.

Herbert H. Smith.

Hurtado de Mendoza, Garcia, Marquis of Cañete: soldier and administrator; son of Andres Hurtado de Mendoza; b. at Cuenca, Spain, July 25, 1535. He served in Germany and Italy, and in 1556 went to Peru with his father, who in 1557 appointed him governor of Chili; he there carried on a successful war with the Araucanians, repeatedly defeating the *toqui* Caupolican, who was at length captured and killed. Superseded in 1560, he returned to Spain, took part in the Portuguese war, and in 1589 was appointed Viceroy of Peru, reaching Lima Jan. 6, 1590. He was an active and efficient ruler, but the constant demands from Spain for gold and silver forced him to add to the burdens of the Indians at the mines. The English corsair, Richard Hawkins, was captured on the Peruvian coast in June, 1594; in 1595 the viceroy sent out an expedition which discovered the Marquesas islands, so named in his honor. Relieved at his own request, he returned to Spain July 24, 1596. D. in Madrid, Oct. 15, 1609. His biography, by Christoval Suarez de Figueroa, was published in 1613. Herbert H. Smith.

Hurter, hoor'ter, Friedrich Emanuel, von: historian; b. at Schaffhausen, Mar. 19, 1787; studied theology at Göttingen; was appointed minister at Schaffhausen in 1824, but resigned his office in 1841, and embraced Catholicism in 1844. In 1846 he settled at Vienna, and was appointed historiographer to the Emperor of Austria. The principal of his works are *Geschichte des ostgothischen Königs Theodorich und seiner Regierung* (Schaffhausen, 1807); *Geschichte Papst Innocenz III. und seiner Zeitgenossen* (Hamburg, 1834–42); *Geschichte Kaiser Ferdinands II. und seiner Eltern* (1850–62, 10 vols.); *Die Befeindung der katholischen Kirche in der Schwetz seit dem Jahre 1831* (Schaffhausen, 1842–43); and *Geburt und Wiedergeburt* (1845, 2 vols.; 2d ed. 1846–47). D. at Gratz, Aug. 27, 1865. His *Life* was written by his son (Gratz, 1876, 2 vols.).

Revised by S. M. Jackson.

Hus, John: See Huss, John.

Husband and Wife: See Marriage.

Husbandry, Patrons of: See Patrons of Husbandry.

Hush, hoosh, or **Hu'si**: town of Roumania (Moldavia), near the Pruth river; 38 miles S. E. from Jassy (see map of Turkey, ref. 1–D). It has a Greek bishop, a normal school, and is a place of commercial importance. A fine wine is

produced in the vicinity. The treaty of 1711 between Turkey and Russia was signed here. Pop. 18,500. M. W. H.

Hushiarpur, hoosh-yaar-poor': a British district and town in the Jalandhar division, Punjaub, India; between the river Sutlej and the Himalaya Mountains, and between meridians 75° 31' and 76° 41' E. Area, 2,180 sq. miles. The Bias river runs along the northwestern border. The western part of the district is a rich alluvial plain, the eastern is mountainous and wooded. A considerable area is covered by government woodlands. Rice is largely grown along the Bias. The other products are cereals, tobacco, cotton, and sugar-cane. Agriculture is backward and transportation poor. The climate is cool and humid, the rainfall is 30 or 35 inches per year. Pop. about 900,000, and decreasing. There is a considerable surplus of males. The towns are all small. Hushiarpur, administrative headquarters, has a population of 13,000 (see map of Northern India, ref. 4–D). It was founded in the fourteenth century, and has suffered much damage from floods. With one exception, the other towns have less than 10,000 inhabitants.

MARK W. HARRINGTON.

Hus'kisson, WILLIAM: statesman and financier; b. at Birch-Moreton, Worcestershire, England, Mar, 11, 1770; resided as a student in Paris 1783–92, where he was a member of the Société de 1789, a moderate republican club, and at the same time was private secretary to Lord Gower, the British minister. He witnessed the destruction of the Bastile and opposed the issue of the assignats. In 1795 Pitt appointed him an Under Secretary for War and for the Colonies; in 1796 he entered Parliament; became Secretary of the Treasury 1804; commissioner of woods and forests 1814; member of the finance committee 1819; president of the Board of Trade and treasurer of the navy 1823; was Colonial Secretary 1827–29. His administration was characterized by the removal of many restrictions on trade through the reform of the Navigation Acts and by the reduction of the duties on manufactures and imported goods. On the occasion of the opening of the Liverpool and Manchester Railway (Sept. 15, 1830) he was struck by one of the engines, and died on the same day. Huskisson's brilliant state papers, his ability in public affairs, and his liberal principles, which had great influence upon the course of reform in England, entitle him to a permanent place in history; but throughout his public life he had to contend with the strong prejudices of the English people, who generally regarded him as a dangerous innovator, with deep designs against the interests of society.

Huss, HENRY HOLDEN: musician; b. in Newark, N. J., June 21, 1862. He studied at first under his father, George John Huss, and then under Otis B. Boise from 1879 till 1882, when he entered the Royal Conservatory at Munich. He graduated at the conservatory with honor in 1885, and on that occasion played his own *Symphonic Rhapsody*. This was repeated in Boston in 1886, and in New York in 1887, and also in Indianapolis in 1887. He has since lived in New York, and has composed much, chiefly for orchestra, though an *Ave Maria* for women's voices and organ was sung by the Rubinstein Club, New York, with great success. He has written songs and part songs and choruses, besides some church music. D. E. HERVEY.

Huss, or **Hus**, JOHN: religious reformer and martyr; b., according to most recent investigations, probably about 1369 (the generally received date of July 6 has been shown by Prof. Loserth to be incorrect), at Husinec, in Southern Bohemia, near the Bavarian frontier; studied at the University of Prague, where he took the degree of M. A. in 1396, and began to lecture on theology and philosophy in 1398. In 1401 he became dean of the faculty of theology, and in 1402 rector of the university. In philosophy he was a realist, and in opposition to the German professors, who were nominalists. In 1409 a royal decree, issued by his interposition, which gave the native students three votes in all discussions of university matters and the foreign only one, caused a rupture, and the Polish, Saxon, and Bavarian students, 5,000 in number, with their professors, left the university. But those remaining, consisting chiefly of native Bohemians, drew so much the more closely around him, and in his contest with the Church, which now began to grow hot, the university was his principal support. In 1400 he had taken holy orders, and in 1402 was appointed preacher at the Bethlehem chapel at Prague. He delivered his sermons in the Bohemian language, and gathered immense audiences. He was a mild and kind-hearted man, with a pure, spiritual enthusiasm, but his sympathy with the suffering and downtrodden was impassioned, and his opposition to vice, falsehood, and abuse was fierce. In a short time he became the idol of the lower classes of Prague, and at court he was in high favor; he was the confessor of Queen Sophia, and King Wenceslaus was his friend. Nor was he at first met with enmity by the Church, though his denunciations of the false doctrines in her teaching and the vices in her discipline were very loud. But by degrees Archbishop Sbynko (or Zbyňek) of Prague became frightened at the commotion which Huss's preaching caused, and as he knew the connection existing between the ideas of Huss and the writings of Wycliffe, he ordered all books by the latter to be deposited in his palace, and appealed to the pope. Alexander V. sent a bull against Wycliffe and all who held his opinions, and Sbynko had the books, 200 volumes, publicly burned. Huss protested, not against the pope, but against the measures of Sbynko, and addressed a brilliant exposition of the whole matter to the new pope, John XXIII. A committee of cardinals was appointed, and Sbynko's acts were denounced as transgressions of his legitimate power, but at the same time Huss was accused of heresy and summoned to appear before the pope. The king, the queen, the university, the magistrates of Prague, even the archbishop himself, wrote to the pope to attest the orthodoxy of Huss, but in vain; and, as he refused to appear, he was condemned and excommunicated, and a ban was placed on the city which received him within its walls. He left Prague, but the popular movements became so violent that Sbynko had to flee for his life, and Huss returned to his chapel, where his preaching against the pope and the Church became bolder and bolder; the pope was compelled to acquiesce. But in 1411 John XXIII. preached a crusade against Ladislaus, who fought with Louis II. for the possession of Naples, and the pope granted indulgences to all who would take arms against Ladislaus. Scandalized at seeing the head of the Church meddle in this way with secular affairs, Huss, in 1412, gave, in his *Quæstio de Indulgentiis sive de cruciatu papæ Joannis XXIII.* and *Contra Bullam papæ Joannis XXIII.*, an exposition of the errors, doctrinal and historical, on which the whole Church establishment rested. A new bull was issued against him, but he now appealed to a general council in open opposition to the pope. Provided with a safeguard from the Emperor Sigismund, he repaired to Constance, where (Nov. 19, 1414) the general council opened. He was well received both by the pope and the prelates, and seemed even to inspire confidence; but affairs took another turn when, on Nov. 28, he attempted to leave secretly. He was imprisoned first in the cathedral, then in a Dominican convent on an island of the Lake of Constance, then in the castle of Gottleben, where chains were put on him; and when at last (June 5, 1415) he actually appeared before the council, it was evident that he was condemned before he was heard. On July 6 he was sentenced, and the same day he was burned at the stake outside of the city, and his ashes were strewn on the Rhine. Many attempts were made to persuade him to recant, but he refused, and he died singing with loud voice the *Kyrie eleison*. Of his collected works there are two editions, Strassburg (1525) and Nuremberg (1558). Of his Bohemian writings there is an edition by Erben (1864). His letters were translated into French in 1846 by Émile de Bonnechose. See Gillett's *John Huss*. Dr. Johann Loserth of the University of Czernowitz has shown that the chief significance of Huss was as the exponent of the doctrines taught in England by Wycliffe. See Loserth, *Wiclif und Hus*, tr. by Evans (London, 1884). See also HUSSITES, BOHEMIAN BRETHREN, and CZECH LITERATURE.

Revised by H. E. JACOBS.

Hussgen, HANS: See ŒCOLAMPADIUS.

Hussites: the followers of John Huss. Immediately after his martyrdom they arose in Bohemia, and took a frightful revenge on the priests, monks, and prelates of the Roman Catholic Church. King Wenceslaus succeeded, however, in appeasing the storm by granting them religious freedom and appropriating a number of churches for their use; but when the king died in 1419, and the pope issued an order for the conversion of the Hussites by force, a civil war began. They assembled under the leadership of John Ziska on Mt. Tabor, captured Prague, pillaged and burned the monasteries, and defeated at Deutsch Brod in 1422, and in several other minor encounters, the troops of Sigismund, the German emperor and the heir of Wenceslaus. Ziska died in 1424, but his successor, Procopius, a former monk,

was still more successful. He defeated Sigismund at Miess and Tachau, and carried the war into Austria, Bavaria, Franconia, and Saxony. Meanwhile, the Hussites had separated into two parties, the Taborites and the Calixtines. The former were the most radical, and acknowledged no doctrine which was not immediately given by the text of the Scriptures; while the latter held a more moderate position. In the beginning, however, they acted in perfect concert with each other. But in 1433 the Council of Basel succeeded in coming to an agreement with the Calixtines and in drawing them out of the contest, the result of which was that the Taborites were totally defeated at Böhmisch Brod in 1434. By the treaty of Iglau (1436) the Emperor Sigismund granted to Bohemia both religious and political freedom, but the civil war did not cease until 1485, when King Ladislas, at the Diet of Kuttenberg, solemnly confirmed the treaty of Iglau. See Cochlæus, *Historia Hussitorum* (Mainz, 1549); Palacky, *Geschichte des Hussitenkriegs* (Prague, 2 vols., 1872–74); and von Bezold, *König Siegmund und die Reichskriege gegen die Hussiten* (Munich, 1872–77, 3 parts). Revised by S. M. Jackson.

Hutch'eson, Francis: philosopher; b. Aug. 8, 1694, at Drumalig, Ulster, Ireland, whither his grandfather had emigrated from Scotland; studied theology at the University of Glasgow 1710–16; lived as a public teacher in Dublin 1717–29, during which period he published *Inquiry into the Original of our Ideas of Beauty and Virtue* (1720) and *Nature and Conduct of the Passions and Affections* (1728), and was in 1729 appointed Professor of Moral Philosophy at the University of Glasgow. He died during a visit to Dublin, Aug. 8, 1746. His *System of Moral Philosophy* was published by his son in 1755. In the history of Scottish philosophy, Hutcheson occupies a conspicuous place, though his books ceased to be generally read soon after his death. He was strongly opposed to Locke and the whole empirical tendency of the English philosophy, and this may be considered as the pre-eminently Scottish element in his philosophy, as an anticipation of Dr. Reid. But by his own time he was, on the other hand, suspected as belonging to the "new lights," and intending to put a new face on Scotch theology; and the suspicion was right.

Hutch'ins, Thomas: geographer; b. at Monmouth, N. J., about 1730. At an early age he entered the British military service, and became captain in the Royal American regiment; acted as engineer in Gen. Henry Bouquet's famous expedition against the Shawnees (1764), and participated creditably in a campaign against the Florida Indians. Being in London in 1779, his known devotion to the independence of the colonies led to an imprisonment for six weeks on a charge of maintaining correspondence with Franklin. By this misfortune he is said to have lost £12,000. Soon afterward he sailed from France to Charleston, S. C., and joined the army under Gen. Greene, receiving the title of geographer-general. He furnished the maps and plates for Dr. Smith's *Account of Bouquet's Expedition* (Philadelphia, 1765; London, 1766); published *A Topographical Description of Virginia, Pennsylvania, Maryland, and Carolina, with Maps* (London, 1778; in French, Paris, 1781); *An Historical and Topographical Description of Louisiana and West Florida* (1784). His geographical works were largely used by Dr. Morse in the compilation of his *American Gazetteer*. D. in Pittsburg, Pa., Apr. 28, 1789.

Hutchinson: city (founded by Clinton C. Hutchinson in 1871); capital of Reno co., Kan. (for location of county, see map of Kansas, ref. 7–F); on the Arkansas river, here spanned by four bridges, and the Atch., Top. and S. Fé, the Chi., R. Is. and Pac., the Hutch. S., and the Mo. Pac. Railways; 168 miles W. by S. of Topeka. It is in an agricultural region, contains the largest and purest deposit of rock salt in the U. S., and has excellent water for manufacturing purposes. It is the seat of the State Reformatory, which cost $1,000,000; has the Holly system of water-works, is lighted by gas and electricity, and has street railways and 7 periodicals. In 1890 there were 7 public-school buildings, the value of public-school property was $150,000, and the expenditure for school purposes in the year was $87,402. There were 12 companies operating the salt deposits, and manufactures of sorghum sugar, barbed wire, flour, soda, soap, starch, ice, and carriages. There were also beef and hog packing establishments and several canning-works. The city is the center of a large wholesale and retail trade. Pop. (1880) 1,540; (1890) 8,682; (1895) 8,515.

Editor of "News."

Hutchinson, Anne: religious enthusiast; founder of an Antinomian sect of New England; b. in Lincolnshire, England, in 1590 or 1591; the daughter of Francis Marbury, a parish clergyman. On her mother's side she was a second cousin of the poet Dryden. About 1612 she married William Hutchinson, of Alford, Lincolnshire, and had fifteen children. In 1634 she went to Boston, Mass., to enjoy the preaching of John Cotton. Here she instituted meetings of women for the discussion of doctrinal questions, and her influence created a powerful faction and led to public disturbances. She even claimed a measure of divine inspiration—that is to say, she held that the person of the Holy Spirit dwelt in every believer, and that the inward revelations of the Spirit were of absolute authority. In 1637 she was excommunicated from Dr. Cotton's church and banished to Rhode Island, where she was the leader of a small sect until 1642, when her husband died and she removed to the Dutch colony of New Amsterdam, near Hell Gate, and there she was murdered by the Indians in Aug. or Sept., 1643. Among her followers was Rev. John Wheelwright, the founder of Exeter, N. H., who had married the sister of her husband, and Sir Harry Vane, the Governor of Massachusetts, was her defender. Even John Cotton seems to have been at one time favorably inclined to her doctrine. See her *Life* in Sparks's *Library of American Biography*, vol. xvi.; cf. C. F. Adams, *Three Episodes in Massachusetts History* (Boston, 1893, 2 vols.), pp. 363–578. Revised by S. M. Jackson.

Hutchinson, Thomas: last colonial Governor of Massachusetts; b. at Boston, Sept. 9, 1711; graduated at Harvard College in 1727; studied law, and served as representative for Boston in the general court for ten years; was three times Speaker; became Lieutenant-Governor in 1758, chief justice in 1760, acting Governor in 1769, and was commissioned full Governor in 1771. Hutchinson early became obnoxious to the patriots on account of his unwavering support of all the measures of the British ministry. In the Stamp Act riots of 1765 his house was twice attacked; on the second occasion (Aug. 26) his furniture was burned in the street and an invaluable collection of historical MSS. lost or destroyed. Brought into constant collision with the assembly and council during the stormy years preceding the Revolution, Hutchinson was the most prominent mark in the colonies for the invectives of Otis, Bowdoin, Hancock, and the two Adamses. Wearied with the conflict, he sailed for England on leave of absence June 1, 1774, and never returned. His services were rewarded by a pension from the crown. Hutchinson was an accomplished scholar, and his writings are valuable sources of information for New England history. He published in 1764 and 1767 two volumes of a *History of the Province of Massachusetts Bay*, and in 1769 a *Collection of Original Papers relative to the History of the Colony of Massachusetts Bay*. A third volume of the *History*, completing the work to 1774, appeared in 1828, edited by the author's grandson, Rev. John Hutchinson. D. at Brompton, England, June 3, 1780.

Hutten, hoo'ten, Ulrich, von: a kind of literary knight-errant, whose influence it would be impossible to realize unless his life were viewed in connection with a detailed description of his time. He was born in the castle of Steckelberg, near Fulda, in the electorate of Hesse, Apr. 21, 1488, and in 1499 he was placed in a monastery in Fulda in order to become a monk. But in 1504 he fled to Erfurt, where he conversed with poets and scholars; and when, in the next year, a pestilential disease broke out and compelled him to leave the city, he went to Cologne. Here he made acquaintance with some of the most marked specimens of the *viri obscuri*—as, for instance, Hoogstraten—and also with one of their most decided opponents, Johannes Rhagius. He allied himself with the latter, and followed him in 1506 to Frankfort-on-the-Oder, where a new university was just established. Here he received the degree of M. A. and published his first poem, *Carmen in Laudem Marchiæ*, but in 1508 he was attacked himself by the pestilence, and for several years he wandered about in Northern Germany, experiencing many turns of fortune, courted to-day and beaten to-morrow. In 1511 he was in Wittenberg, where he published his *Ars versificatoria*, and in 1512 he went through Moravia and Bohemia, through Vienna, to Pavia, in order to study law. But after the conquest of Pavia he was plundered of all he owned, and was at last compelled by the danger of starvation to enlist in the imperial army. He left it very soon, however, and returned home to Germany. His denunciations of Ulrich, Duke of Würtemberg, who

had wantonly murdered Hutten's cousin Hans (May 8, 1515), and especially his defense of Reuchlin, made his name quite famous. The publication of *Epistolæ obscurorum virorum*, in the writing of which he probably bore a part, is generally considered as having furthered the cause of the Reformation. In 1515 he once more went to Italy, professedly to study law, but returned again in 1517; was knighted by the emperor at the Diet of Augsburg, in recognition of his work as poet, and entered the service of the Archbishop of Mentz. Next year, however, he retired from the court, and at this time he began the publication of the severest attacks on the pope and the clergy, written in German. The pope demanded his surrender as a prisoner, and Hutten fled, first from his own castle, and then from that of Franz von Sickingen, where he found refuge. He went to Switzerland, and here, again attacked by his old disease, he died, last of August or first of September, 1523, in Ufnau, an island in Lake Zurich. A collected edition of his works was published by Böcking (7 vols., Leipzig, 1859–70), and a biography by D. F. Strauss (2 vols., Bonn, 1857; 4th ed. 1878; Eng. abridged trans., London, 1874).

Revised by S. M. Jackson.

Hutter, hooter, Leonhard: theologian; b. at Nellingen, Bavaria, in Jan. 1563; studied theology at Strassburg, Leipzig, Heidelberg, and Jena, and was appointed in 1596 professor in Wittenberg, where he died Oct. 23, 1616. Among his works are *Concordia concors* (1614), written in defense of the *Formula of Concord*, which had been attacked by Hospinian in his *Concordia discors*; and *Compendium locorum theologicorum* (Wittenberg, 1610; n. e. Berlin, 1863), a Lutheran dogmatic treatise, of which a translation into English by H. E. Jacobs and G. F. Spieker was published in Philadelphia in 1867 (4th ed. 1882). He also wrote a much more elaborate treatise on dogmatic theology, *Loci Theologici*. He was one of the most prominent representatives of the old Lutheran orthodoxy in its polemical stage, before it became scholastic.

Revised by H. E. Jacobs.

Hutton, Charles: mathematician; b. at Newcastle-on-Tyne, England, Aug. 14, 1737; lived at Newcastle as teacher from 1760 to 1773, during which period he wrote his *Treatise on Arithmetic and Book-keeping* (1764); *Treatise on Mensuration* (1771); and *Principles of Bridges and Mathematical Demonstration of the Laws of Arches* (1772); in 1773 became Professor of Mathematics at the Royal Military Academy, Woolwich, and in 1774 was elected a member of the Royal Society. Besides a number of papers in the *Transactions* of the Royal Society, in the *Philosophical Transactions*, and *The Ladies' Diary*, he published *Tables of Products and Powers of Numbers* (1781); *Mathematical Tables* (1785); *Course of Mathematics* (1798–1801), and *Recreations in Mathematics and Natural Philosophy* (4 vols., 1803). D. Jan 27, 1823.

Hutton, Frederick Remsen, A. B., A. M., C. E., M. E., Ph. D.: mechanical engineer; b. in New York city, May 28, 1853. He was educated at Columbia College, New York, and the School of Mines of that institution. After graduation he began as an assistant in the college, was given an instructorship, and later promoted to the position of assistant professor and to adjunct professorship, and finally, in 1891, to the professorship of Mechanical Engineering in the School of Mines. He prepared the whole of the U. S. census monographs on machine tools and wood-working machines, and on steam-pumps and pumping-engines 1880–82. He has had a large amount of professional work in the designing and construction of apparatus and machinery for his own department, for Columbia College, and for other institutions. Since 1883 he has been second secretary of the American Society of Mechanical Engineers, which owes its flourishing condition largely to his efforts.

R. H. Thurston.

Hutton, James: geologist; b. in Edinburgh, Scotland, June 3, 1726; studied medicine there, in Paris, and at Leyden, where he took the degree of M. D.; engaged after his return to Scotland, first in the manufacture of chemicals, then in agricultural pursuits, concentrating his studies on the fields of natural science, especially geology. The principal results of his researches were a *Theory of Rain*, communicated to the Royal Society of Edinburgh and published in their *Transactions* in 1784. It explained rain as due to the commingling of two masses of air of different temperatures and vapor contents—a theory which held sway for a century, but is now exploded. To the same society he presented a *Theory of the Earth* (1785; expanded into a book of two volumes in 1795), in which he claimed that many geological phenomena which by Werner and his school were explained as effected by aqueous influences were produced by igneous fusion. D. in Edinburgh, Mar. 26, 1797.

Mark W. Harrington.

Hutton, Lawrence: author and journalist; b. in New York city, Aug. 8, 1843. After a mercantile career of some years he began to interest himself in the history of the stage, became dramatic critic of the New York *Evening Mail*, published *Plays and Players* (1875), and edited the American Actor Series (1881–82). Others of his books are *Literary Landmarks of London* (1885) and *Literary Landmarks of Edinburgh* (1890). Since 1886 he has edited the *Literary Notes* in *Harper's Magazine*. H. A. Beers.

Hutton, Richard Holt: English critic; b. in 1826. He is editor of the London *Spectator*, and is one of the most authoritative of literary critics. His most valuable book is *Essays, Theological and Literary* (1871). His other writings include *Essays on some Modern Guides of English Thought* (1887) and a *Life* of Scott, contributed to the English Men of Letters Series. See article by Noah Porter in *The New Englander* (vol. xlviii.). H. A. Beers.

Hutton, William Rich, M. A. S. C. E., M. I. C. E.: civil engineer; b. at Washington, D. C., Mar. 21, 1826; was educated in private schools in Washington; chief engineer of Washington aqueduct 1862–63; chief engineer Chesapeake and Ohio Canal 1869–71; consulting engineer of same to 1880; chief engineer Western Maryland Railroad 1871–74; designed locks and movable dams for Kanawha river; in 1880 removed to New York. He was consulting engineer of the New Aqueduct of New York city, of the Colorado Midland Railway, and of Harlem river (Washington) bridge to 1889; chief engineer Hudson River Tunnel; member U. S. board of engineers on obstructions in the Columbia river; member of the Society of Civil Engineers of France.

C. H. Thubber.

Huxley, Thomas Henry, M. B., Ph. D., LL. D., F. R. S.: biologist; b. at Ealing, Middlesex, England, May 4, 1825; became a student at Charing Cross Hospital 1842; graduated M. B., with honors, from the University of London 1845; was assistant surgeon of the royal navy 1846–53; sailed around the world in H. M. S. Rattlesnake, which then performed surveying service in Australasia 1846–50; became F. R. S. 1851, in acknowledgment of the value of the observations in natural science made by him while in the navy, concerning which he had from time to time sent papers to the Royal Society; became in 1854 Professor of Natural History in the School of Mines, and Fullerian Professor of Physiology; Hunterian Professor in the Royal College of Surgeons 1863–69; president of the Geological and the Ethnological Societies 1869–70; was appointed one of the royal commissioners on scientific instruction and the advancement of science 1870; was on the London school board 1870–72; secretary of the Royal Society 1872; lord rector of the University of Aberdeen 1872; president of the Royal Society 1883; was twice named Fullerian professor in the Royal Institution, and was made a privy councilor in Aug., 1893. Prof. Huxley was for many years one of the most laborious workers in biological science. The comparative anatomy of both vertebrate and invertebrate animals, and the systematic arrangement of organisms, were the fields in which he was chiefly distinguished. He proposed several bold rearrangements of animals into new classes and orders, and discovered some remarkable homologies in the development of vertebrate and invertebrate animals. His theory of protoplasm, his able advocacy of the views of Darwin, and the doctrine boldly advanced by him in his address before the physiological section of the British Association at its Belfast meeting in 1874, that the seemingly voluntary movements of animals, and even of men, are automatic and independent of the will, attracted much attention. Prof. Huxley's vigorous and epigrammatic use of the English language gave him a place in English literature independent of that won by his scientific researches. He showed great skill in bringing the conclusions of science into simple language to be understood by unscientific people, and the freedom of scientific thought has had no stouter champion. Author of *The Oceanic Hydrozoa* (1857); *Man's Place in Nature* (1863); *On the Physical Basis of Life* (1868); *Elementary Physiology* (1866); *Introduction to the Classification of Animals* (1869); *Anatomy of the Vertebrate Animals*, *Anatomy of the Invertebrate Animals*, two standard treatises which have

gone through several editions; *Lay Sermons*, etc. (1870); *Critiques and Addresses* (1873); *Physiography* (1877); *Science and Culture* (1882); *Essays on Some Controverted Questions* (1892); *Evolution and Ethics* (1893), etc. D. at Eastbourne, June 29, 1895. Revised by D. S. JORDAN.

Huy, hoi: town; in the province of Liège, Belgium; at the confluence of the Hoyoux and the Maas; 19 miles S. W. of Liège by rail (see map of Holland and Belgium, ref. 11–F). It is strongly fortified and has rich coal and iron mines in its vicinity, which is mountainous, almost alpine, in its character. It is the center of the manufacture of paper in Belgium. Pop. (1891) 14,486.

Huydecoper, BALTHASAR: poet and scholar; b. in Amsterdam, Holland, in 1695. The son of patrician parents, he had a remarkably successful life, holding several distinguished offices in Amsterdam. He is chiefly notable, however, as the best representative of the school of writers who were trying in the first half of the eighteenth century to enrich and at the same time purify the Dutch tongue. The study of the older language and the critical publication of the older texts may almost be said to date from him. In 1730 he published his *Proeve van Taal- en Dichtkunde, in veijmoedige aanmerkingen op Vondels vertaalde Herscheppingen van Ovidius*, from the linguistic point of view an epoch-making book. In 1772 appeared his edition of the *Rijmkronijk van Melis Stoke, met Historie- Oudheid- en Taalkundige Anmerkingen*, which has remained a monument of erudition. As a poet he was less remarkable. In 1737 he published a rhymed translation of Horace; and throughout his life he wrote numerous occasional poems (collected and published after his death in 1788). He also tried his hand at the drama—on the one hand with a translation of Corneille's *Œdipe*, on the other with original plays: *De Triumpheerende Standvastigheid* (1717); *Achilles* (1719); *Arsases of het edelmoedig verraad* (1722). Of these the *Achilles* was far the most successful, and, partially because of a series of remarkable actors who played the title *rôle*, was long a favorite on the Dutch stage. It must be said, however, that as an imaginative work it is very weak. Its strength is, after all, chiefly rhetorical. D. in Amsterdam, Sept. 21, 1778. A. R. MARSH.

Huyghens, hī'gens, CHRISTIAN: philosopher; b. at The Hague, Apr. 14, 1629, and educated at the Universities of Leyden and Breda, where he studied law and mathematics. He made several journeys to Denmark, France, and England, and resided from 1665 to 1681, at the invitation of Colbert, at Paris, where he was made a member of the Academy of Science and had apartments assigned him in the royal library. The latter part of his life he spent at The Hague, where he died July 8, 1695. His field of investigations comprised geometry, astronomy, and optics, in all of which he won enduring fame. He was more than any other one person the founder of the undulatory theory of light, which he developed in 1678. It was not generally adopted, by reason, probably, of the great authority of Newton, who adopted the emission hypothesis. By the later labors of Young, Fresnel, and others, the doctrine of Huyghens was restated, and is now universally received. But it was more especially his astronomical discoveries which made his name celebrated. At different times in his life he was much occupied in making improvements in the construction of telescopes, and in 1656 he discovered the first satellite of Saturn, and in 1659 the ring; these discoveries he described in his *Systema Saturnium* (1659). He is also celebrated as the inventor of the pendulum clock, which he described in his *Horologium Oscillatorium* (1658). His works were published in various collections, *Opuscula postuma* (1703); *Opera varia* (1724); *Opera reliqua* (1728); and *Opera mechanica, geometrica, astronomica et miscellanea* (1751). An edition of his complete works, including correspondence, is now (1894) being brought out by the Haarlem Society of Sciences of Holland. Revised by S. NEWCOMB.

Huyghens, CONSTANTIJN: poet; b. at The Hague, Sept. 4, 1596; d. on his estate, Hofwijk, near The Hague, Mar. 28, 1687. He is one of the most remarkable figures of Holland in the first half of the seventeenth century. The son of Christian Huyghens, secretary of William the Silent, he was all his life familiar with the finest society of Holland, and indeed of Europe. His education was extensive; he wrote as well as spoke most of the European languages, was an amateur in music and the fine arts, and was profoundly versed in all the accomplishments of a gentleman and courtier. Immediately on leaving the University of Leyden he went to England with the English ambassador, Carleton, and mingled with the highest circles. In 1620 he went as secretary of legation to Venice, then twice in the same capacity to England, where in 1622 James I. dubbed him knight. In 1625 he became secretary to Prince Frederick Henry, and when the prince died he remained in the service of William II. and William III. of Nassau. For sixty-two years he served this house, holding many offices of dignity and trust, leading a life full of affairs, and yet preserving his love of poetry, his devotion to art, his passion for his country and for his native city. It was he who urged the adornment of The Hague, and particularly the creation of the famous Linden-Allee. In spite of his public duties he had a true Dutch love of home; and his house was noted for a hospitality always generous, always thoughtful, refined, without trace of religious or political animosities. His particular intimacies, however, were with Hooft and the Muiden circle. (See HOOFT.) Between him and the men of this group there was a constant interchange of letters and of works, with mutual praise and criticism. As was necessary, the poetical work of Huyghens was chiefly done in the intervals of other business. He said himself that most of his poems were born "in the field, the ship, the coach, or on horseback." He wrote much, however, not only in Dutch, but also in Latin, French, and Italian. Despite his wide culture he remained at heart a Dutchmen, and what is best in his work is of the Dutch manner, essentially "domestic," realistic, shrewd, rather than elevated, imaginative, or penetrating. In 1625, urged by his friends, he published a collection of Dutch and Latin poems together, with the title *Otia, of Ledighe uren*. Later the Latin poems were issued separately as *Momenta desultoria*, and the Dutch poems gradually grew into the collection called by the poet *Korenbloemen* (1658–72). The latter when completed consisted of twenty-seven books, of which the most interesting are book iii., entitled *Zedeprinten*, a series of realistic pictures in true Dutch style; iv., *Daghwerck*, reminiscences of his daily life with his wife; vi., *Hofwijck*, scenes from his favorite estate. The poems of his old age, autobiographical in the main, entitled *Cluyswerck*, were first published in 1841. His Latin *De vita propria sermones* were edited by H. Peerlcamp (Harlem, 1817).

A. R. MARSH.

Huysmans, JORIS KAHL: b. in Paris, Feb. 5, 1848. He studied law and occupied for some time a position in the Department of the Interior, but gave it up to devote himself wholly to literature. He has cultivated the field of the novel and short story. His beginnings were made with *Le Drageoir aux épices* (1874) and *Marthe* (1876). The clearly naturalistic tendencies of these works became even violent later, and in his short story *Sac au dos* (in the collection by disciples of Zola, *Les Soirées de Médan*) and the novel *Sœurs Vatard* (1879) he is frank and brutal in his devotion to the physiological naturalism of Zola. In *Les Croquis parisiens* (1880), *En ménage* (1881), and *À vau-l'eau* (1883), he continues his vigorous descriptions of low life in a style marked by a weakness for rare words. With *À rebours* (1885), a study of the state of mind of the young generation recoiling vaguely from naturalism toward an uncertain spiritualism and in search of new and refined sensations, he began a movement which he has since followed in *En Rade.* (1887) and *Là-bas* (1889). A. G. CANFIELD.

Huysum, hoi'sŭm, JOHN, van: a flower and fruit painter of great skill; b. in Amsterdam, Holland, in 1682; his father and brothers also followed the same profession, but were far less successful. John von Huysum's work is distinguished by being extremely minute and true to nature. He obtained great brilliancy of color by some particular method, the secret of which he jealously kept even from his own family. He was patronized by William of Hesse and all the great collectors of the time in France and Germany. He painted, besides flower pictures, landscapes with figures and studies in black and white and water color. D. in Amsterdam in 1749. W. J. STILLMAN.

Huzvaresh: See PAHLAVI.

Hvitfeld, ARILD: Danish historian; b. Sept. 11, 1546. He filled many important state offices, finally becoming chancellor (1595). Between 1595 and 1604 he compiled the *Lives* of the Danish kings, beginning with that of Christian III. and working back to the earliest times. The *Danmarks Riges Krönnike samt Bispekrönniken*, while awkward in its style and prejudiced in its judgments, is of inestimable value to the student of Danish history, as it reproduces many documents that have since been lost. D. Dec. 16, 1609. D. K. D.

Hwang-Hai: The Yellow Sea (*q. v.*).

Hwang-Ho: The Yellow River (*q. v.*).

Hwei-shin, or **Hwui-shin**: a Buddhist mendicant monk, apparently a Chinese, who in the year 499 arrived at Kingchow in China as an envoy to the Chinese court from a country he called Fusang, which, he stated, lay over 20,000 *li* (Chinese miles) to the E. of a kingdom called Tahan, directly E. of the Middle Kingdom. The country received its name, he said, from a tree called *fusang*, which grew there in great abundance. The leaves of this tree resembled those of the T'ung tree of China, but it sprouted like the bamboo, and the people ate the shoots. Its fruit resembled a pear, but was red, and its bark was spun into cloth and made into paper. Houses were of planks; the people never made war, and consequently there were no soldiers; there was a prison for light offenses, and another for more grievous ones. Prisoners in the former might marry, but their boys became bondmen at eight and their girls at nine. When the king went abroad he was preceded and followed by drummers and trumpeters, and the color of his robes varied according to the years of a cycle of ten. Vehicles were in use and were drawn by oxen, horses, and deer. The oxen had long horns, big enough to hold five pecks each. The people reared deer just as the Chinese reared cattle. Copper was found there, but no iron; and gold and silver were unprized by the people. In olden times the people knew nothing of Buddhism, but in 458 A. D. five bikshus or Buddhist mendicants had gone there from Kipin (Baluchistan), and through their preaching the customs of the people became reformed.

This, in the main, is Hwei-shin's account of Fusang, as recorded in the Chinese histories of the period, and as recited by Ma-twan-lin, a distinguished scholar of the fourteenth century and a contemporary of Marco Polo.

The account of Fusang was first introduced to Europe by a learned Sinologist, de Guignes, who in 1761 published a memoir on the subject in vol. xxviii. of the *Mémoires de l'Académie des Inscriptions et Belles-Lettres*; and but for his identification of Tahan with Kamchatka and Fusang with Mexico, Hwei-shin, described by Père Hyacinthe as a "consummate humbug," would never have been heard of.

De Guignes's memoir was attacked by Klaproth in his *Annales des Empereurs du Japon*, pp. iv.–ix., published in London and Paris in 1834, in which he showed the absurdity of identifying Fusang with any part of America, and contended that Tahan is Saghalin, that Fusang is Japan, and the fusang tree the paper-mulberry, or *Morus papyrifera*, which corresponds much more closely with Hwei-shin's tree than any other; that there were no horses in America prior to the arrival of Europeans there, whereas the horse has always been known in Japan; that copper abounds in Japan, while iron is rare; that though, according to the Japanese annals, Buddhism was not introduced into Japan until 552 A. D., it is possible that Buddhist missionaries may have reached the country from Korea long before that, as it is known that Buddhism entered Korea in 372, and Hoku-sai in 384, and Japan had relations with both; and that generally the details of Hwei-shin's story apply better to Japan than to any other country. Klaproth was in turn assailed by Gustave d'Eichthal in a series of articles in the *Revue Archéologique* (Paris, 1862–63), and by several other writers who held that America was known in Asia, under the name Fusang, in the fifth century of our era. Among the other supporters of de Guignes are Prof. Karl Neumann, of Munich, and Charles G. Leland. In 1841 the former had made a more accurate translation of Hwei-shin's narrative from the original Chinese, and to it added copious comments of his own. This was translated into English by Leland with the aid and under the superintendence of Prof. Neumann himself, and published in vol. xxxvi. (pp. 301–330) of the New York *Knickerbocker Magazine* (1850). Later, Mr. Leland published a work of his own, *Fusang, or the Discovery of America by Chinese Buddhist Priests in the Fifth Century* (London and New York, 1875). He identifies the fusang tree with the maguey or Mexican aloe (*Agave americana*), and thinks that many of the particulars of Hwei-shin's narrative apply accurately to what is known in part of Mexico and in part of Peru, and endeavors to "explain the coincidence of the details of the narrative with what is known of Peru by the probability that Peruvian customs derived from Mexico descended to the south subsequent to the fifth century."

For a refutation of the claims of de Guignes, Neumann, d'Eichthal, Leland, etc., see the essay of Dr. Bretschneider, of Peking, published in vol. iii. of *The Chinese Recorder* (Fuh-chow, 1870), or his pamphlet *Ueber das Land Fu-sang*, reprinted from *The Journal of the Asiatic Society of Japan* (Yokohama, 1876); and Dr. S. Wells Williams's *Notices of Fusang* in vol. xi., pp. 89–116, of *The Journal of the American Oriental Society* (New Haven, 1885). R. Lilley.

Hyacinth [readapted to Lat. form from older Eng. *jacinth*, from O. Fr. *hyacinthe* < Lat. *hyacinthus* = Gr. ὑάκινθος, hyacinth (perhaps not the modern flower), also the name of a precious stone, whence Eng. *hyacinth*, a precious stone]: a genus of bulbous-rooted flowering plants of the family *Liliaceæ*. Several species are natives of the Old World. Besides these, some species of *Muscari* (globe-hyacinths) and *Scilla*, or squill, are called hyacinths by florists. The true hyacinths of cultivation are varieties of *Hyacinthus orientalis*. There are a great many kinds produced from seed, but for ordinary culture the bulbs are planted. These bulbs come chiefly from Haarlem in the Netherlands. They do best in a rich but sandy soil. They are often planted in pots, and for house-culture they do tolerably well in hyacinth-glasses with water only. According to tradition, the petals of the hyacinth are inscribed with the Greek letters αι, αι, Apollo's exclamation of grief when he found that he had slain the beautiful Hyacinthus; or να, the first two letters of his name. Hence Milton calls it "that sanguine flower inscribed with woe." Most people fail to find any such mark upon the hyacinth, and it is not certain that the hyacinth of the ancients was identical with ours. But Sprengel and others profess to have seen hyacinths with the inscription. *H. non-scriptus* is the bluebell of Great Britain. See Bluebell.

Hyacinth: See Garnet and Zircon.

Hyacinthe, Charles Loyson: ecclesiastic; b. at Orleans, France, Mar. 10, 1827; after his regular course of studies in the college of Pau he entered the ecclesiastical college of St. Sulpice. Four years later he was ordained priest, and was professor of theology in several schools. Hyacinthe was then attached, as a working priest, to the parish of St. Sulpice in Paris, but he soon entered the convent of the Carmelite monks in Lyons. From 1864 till 1869 he was one of the most celebrated preachers ever heard, at Bordeaux, Nantes, and in Notre Dame of Paris. But he was then suspected of uttering too liberal religious doctrines, severely attacked by the Ultramontane papers, and finally excommunicated by the pope. Father Hyacinthe soon after (1869) made a voyage to the U. S., where he was warmly received. On his return to France (1872) he married a native of the U. S., who bore him a son. Persecution, open and concealed, compelled him to take refuge in Switzerland, where he established an Old Catholic church at Geneva; but here he was assailed by some dissenters of his own Church, who thought he was not sufficiently radical in his doctrine. In 1878 he opened an independent church in Paris under the name Église Gallicane. He published *Le Dimanche et les classes laborieuses*, *L'Église catholique en Suisse*, *La Réforme catholique*, *L'Ultramontanisme et la Révolution*, all bearing his family name, Loyson, while his earlier works bore the name Père Hyacinthe.

Hyæ'na [Mod. Lat. = Lat. *hyæ'na* = Gr. ὕαινα, hyena, liter., hoglike beast (from its bristly mane like a hog's); deriv. of ὗς, hog, pig: Lat. *sus*: Eng. *sow*]: the common as well as generic name of several digitigrade carnivorous mammals of the family *Hyænidæ*. The dental formula is I. $\frac{3}{3}$; C. $\frac{1}{1}$; P. M. $\frac{4}{3}$; M. $\frac{1}{1} \times 2$. The last upper tooth, or true molar, is small, transversely elongated, and tubercular; the last premolar, or successional tooth, being the sectorial or flesh tooth. In the lower jaw the true molar is the sectorial tooth. All the teeth, especially the molars, are large and strong, and set in powerful jaws, which are worked by muscles of corresponding development. The hyæna is thus fitted to obtain its living by devouring the cartilages, and even gnawing and crushing the bones of animals killed by the lion and other active predaceous beasts; and most of its subsistence is thus obtained, although it sometimes captures living prey by the chase. The auditory bullæ are destitute of the septum found in the cats. The toes are straight, with blunt, non-retractile claws. The hind legs are usually short, the tail short and bushy, and the neck provided with a short, bristly mane. Three living species are known; two of these are from Southern Africa—viz., the brown hyæna (*H. brunnea*), with the fur clouded, rather long, brain-case compressed, a large and deep sub-caudal gland, and the legs of nearly equal length; and the spotted hyæna (*H. crocuta*), with no sub-caudal gland, and having

the hinder legs short. The striped or banded hyæna (*H. striata*) ranges over Africa and Southern Asia. The fur is striped, and there is a sub-caudal gland. The brain-case is larger than in *H. brunnea*. The cave hyæna was a large

Striped hyæna.

and fierce species that roamed over the continent of Europe during the Quaternary, and left, especially in the cave-deposits of England, abundant fossil remains of its own bones, mingled with those of other animals bearing unmistakable marks of its powerful teeth. This species, notwithstanding its large size, is now regarded as identical with the spotted hyæna of South Africa. No species of hyæna, recent or fossil, is yet known from the continent of America.

O. C. Marsh.

Hyæn'odon [from Gr. *ὕαινα*, a hyæna + *ὀδούς, ὀδόντος*, a tooth]: an extinct genus of mammals, the type of an extinct family, *Hyænodontidæ*, partaking of characters of the true carnivores, but representing another order. The name was first used for a species from the Lower Miocene of France, and the genus also occurs in the Upper Eocene of that country. Dr. Leidy has also described three species from the Miocene of Dakota. The largest of these, *H. horridus*, is the largest known species of the genus, and equaled in size a large black bear. The form of the skull is intermediate between that of the wolf and that of the opossum, the brain-case being small, as in the latter animal. The temporal fossæ are large, and the lower jaw is strong. The dental formula is—incisors $\frac{3—3}{3—3}$, canines $\frac{1—1}{1—1}$, premolars $\frac{3—3}{4—4}$, molars $\frac{3—3}{3—3}$. All the true molars, both above and below, are sectorial in character, the posterior one being much larger and stronger than the other two, and the series is remarkable for the entire absence of the posterior tubercular molars usually found in Carnivores. The canines resemble those of the wolf. The *H. cruentus* and *H. crucians* are smaller species, the latter a little larger than the red fox.

O. C. Marsh.

Hya'lea [Mod. Lat., in form = Gr. *ὑαλέα*, fem. of *ὑάλεος*, glassy, deriv. of *ὕαλος*, glass, from an Egyptian word]: a genus of transparent pteropod molluscs found swimming at the surface of the water in the warmer oceans.

Hyalite, or **Muller's Glass** [from Gr. *ὕαλος, glass*; in Germ. *glasopal*]: a form of opal or hydrated silica, transparent and colorless, with glassy luster. It occurs as an incrustation in igneous rocks, generally in the form of pellucid drops, but has no commercial value. See Opal.

Hyaloplasm: See Cell and Histology.

Hyapurá: See Japurá.

Hyatt, Alpheus, B. S.: naturalist; b. in Washington, D. C., Apr. 5, 1838; spent his early life in Baltimore and other parts of Maryland; entered Yale College in class of 1860, but did not graduate; entered Lawrence Scientific School in 1859, and graduated (1862) B. S.; spent some time in the army, then at Salem, Mass., as one of the curators of Essex Institute and Peabody Academy of Science; elected custodian of the Boston Society of Natural History 1870, and curator of the same 1881; became a fellow of American Academy of Arts and Sciences 1869, of National Academy of Sciences 1875; is a member of most of the scientific societies in the U. S. He has written a large number of scientific memoirs and papers. His most important works are *Fresh-water Polyzoa*, various papers on the laws of evolution of Cephalopoda, showing the exact parallelism of all the stages of life in the individual and whole group; *Genera of Fossil Cephalopods* (1883); *Larval Theory of the Origin of Cellular Tissue* (1884); and *Genesis of the Arietidæ* (1889), mostly printed in the *Proceedings* or *Memoirs* of the Boston Society of Natural History or of the Essex Institute. Prof. Hyatt's principal work has been upon the fossil Cephalopoda, concerning which he has brought out many theories as regards their evolution, all of which are of great value to the evolutionist. His *Revision of the North American Poriferæ* is the first and only monograph on American sponges. Aside from his more scientific papers, he is the author of a series of small books entitled *Guides to Science-teaching*, for use in the public schools.

Hybernation: See Hibernation.

Hy'bridism, or **Hybrid'ity** [deriv. of *hybrid*, from Fr. *hybride* < Lat. *hybrida*, for *hibrida*]: the state or quality of being hybrid. A hybrid is the issue of dissimilar kinds of animals and plants, or, in other words, the offspring of parents which belong respectively to different species. Few subjects have been so much misunderstood or have given rise to so many superstitions as hybridism, and among the educated as well as among the ignorant the grossest credulity long prevailed respecting the possibility of offspring between the most dissimilar forms. Nor was this credulity always an innocent one: it has even affected the laws and customs of states.

Under the general designation of hybrids are popularly embraced all those forms whose parents belong to different varieties or species, whether the offspring is fertile or not. The word *hybrid* is thus essentially similar in its meaning to the Anglo-Saxon term *mongrel*, but for present use it has superseded that term, leaving the latter for the offspring between *varieties*, and, to a considerable extent, for figurative expressions. French writers have classified the forms embraced under this general term under three categories—viz., (1) Métis (mestizoes); (2) Hybrides (hybrids); and (3) Mulets (mules). (1) Métis, originally especially employed to designate the offspring of an Indian mother by a white father, has been extended, as a generic term, to animals and plants of mixed origin—i. e. to the offspring of two races or *varieties* of the same species, as well as of two distinct *species*—and consequently to every organized being owing its origin to dissimilar parents, or to every product of a cross. (2) Hybrid is, in general terms, any animal or plant engendered of two different *species*. (3) Mulet, originally applied to the offspring of a mare by a jackass, is extended to embrace all those organized beings which are analogous to it, as well in mixed origin as in *sterility*, and also to forms characterized by their sterility, even though their origin may not be mixed, as in the case of bees, wasps, etc.: thus infecundity is the prime element. Such are the distinctions employed by French authors, and followed in the dictionary of the French Academy; but they are not recognized by English writers, and indeed scarcely seem to be definite enough to warrant recognition. It is only necessary to indicate that we commonly use the word *hybrid* in the same sense as the French do *métis*. A distinctive term is, however, needed for the offspring of hybrids *inter se*, and the word *mongrel* might be extended, in accordance with analogy, to such forms. The term *derivative hybrid* or *secondary hybrid* is used for hybrids of hybrids or hybrids between a hybrid and one of its parents, among plants.

Repeated and prolonged critical observations and experiments have amply demonstrated that fruitful union is impossible between animals or plants of widely different species (i. e. belonging to decidedly different families), and that such is only possible within comparatively narrow although uncertain limits. We may therefore at once dismiss, as utterly unworthy of belief, the many reports of offspring from such forms which have been published by even accredited writers of natural history in past times, such, e. g., as the alleged cases of hybrids between a hen and a duck; an opossum and a cat; a boar and a camel; an otter and a rabbit; an otter and a sheep; an otter and a cat; a raccoon and a cat; a bear and a hog; a bear and a dog; a cat and a rat; a monkey and a slut; and especially women and apes, dogs,

or other animals. Whatever the details given, they have been found to lack essential requisites, and in almost all cases the belief has had its origin in some vague external characteristics which suggested a similarity which had, however, no real existence in structure. In the name *camelopard* we have a term which is the expression of a past belief that the animal in question was a hybrid between the camel and the leopard; and such was actually claimed to be the origin of that animal by some old writers—e. g. Matthieu in the eleventh century. In the case of an alleged hybrid between a cat and a raccoon, seen at Taunton, Mass., an Angora cat was the supposed hybrid: the explanation lay in the fact that the Angora cat is a large animal with a bushy tail and color somewhat resembling the raccoon, and thus it received the name of raccoon cat; the step thence to the belief that it was the offspring of a raccoon and cat was natural; this belief at a distance became embodied in the assertion of such origin as a matter of fact: such was the basis of a statement which was fully examined by Theodore Gill. Another case was simply the result of a misconception of the meaning of authors. Geoffroy Saint-Hilaire and Hyrtl refer to an alleged hybrid between the axis deer and hog, said to have been recorded by Hamilton Smith and Morton, and properly urge that such an offspring would be impossible. On referring to the two authors mentioned, however, it is evident that they simply alluded to supposed hybrids between the axine buck (*Cervus axis*) and the hog deer (*Cervus porcinus*), designating the latter under the name "porcine species" (i. e. of deer). Geoffroy Saint-Hilaire interpreted the words "porcine species" to mean hog, and hence a belief quite venial (whatever may have been its basis in truth) was exaggerated into one entirely unpardonable in a scientific man. The alleged cases of hybrids between otters and other animals are doubtless the expressions of another series of facts. There is somewhat of a tendency among animals toward a diminished size or an offturned position of the legs which recalls the form of an otter, as is exemplified, e. g., in the turnspit dog and Ancon sheep. These Ancon sheep (which have been especially referred to by Darwin in his *Origin of Species*) were also called, on account of this peculiarity, "otter-sheep," and from this name was doubtless developed the report of hybrids between sheep and otters. Such has doubtless been the origin of the belief in the other otter-like animals.

Hybrids partake of the characteristics of their parents, and the extent to which they do so is, within a certain range, definitely fixed for those of each kind among animals; further, the degree in which the hybrid shares the characters of the parent in animals is determined by the sex of each species contributing to the hybrid. Thus in the case of hybrids between horses and asses, which are the best known, we have in the mule the offspring of the mare and jackass, and in the hinny that of the stud-horse and she-ass: the mule resembles in many of its characters the ass most, but is larger, while the hinny more resembles the horse, but is smaller than the mule. These conditions will be found to affect the internal organization and external appearance, and the like is the case respecting other hybrids. Therefore every alleged animal hybrid should exhibit positive evidences in its organization, as well as its external appearance, of the parentage on both sides; and if such evidences are not afforded, or if only a vague superficial similarity to some alleged species exists, while the fundamental characters are all those of another species, we are necessarily forced to conclude that the allegation as to hybridity has no real foundation, and that the external indications are illusive.

In plants it is pretty generally agreed that the sex of the parent does not determine its influence upon the hybrid. It was at one time held that the pistillate or female parent determines the constitution of the offspring, while the staminate or male parent gives the external attributes, as form and color. The characters of hybrid offspring among plants are classified as follows by Focke:

1. "All individuals which have come from the crossing of two pure species or races, when produced and grown under like conditions, are usually exactly like each other, or at least scarcely more different from each other than plants of the same species are." This proposition, although perhaps true in the main, appears to be too broadly and positively stated."

2. "The characters of hybrids are different from the characters of the parents. The hybrids differ most in size and vigor and in their sexual powers."

3. "Hybrids are distinguished from their parents by their powers of vegetation or growth. Hybrids between very different species are often weak, especially when young, so that it is difficult to raise them. On the other hand, crossbreeds (or crosses between forms of the same species) are, as a rule, uncommonly vigorous; they are distinguished mostly by size, rapidity of growth, early flowering, productiveness, longer life, stronger reproductive power, unusual size of some special organs, and similar characteristics."

4. "Hybrids produce a less amount of pollen and fewer seeds than their parents, and they often produce none. In cross-breeds this weakening of the reproductive powers does not occur. The flowers of sterile or nearly sterile hybrids usually remain fresh a long time."

5. "Malformations and odd forms are apt to appear in hybrids, especially in the flowers."

Hybrids have been classed in various categories—e. g. (1) according to general affinities as expressed in their structure; (2) according to the degree of affinity of the parents—i. e. whether congeneric with each other or bigeneric (i. e. representatives of distinct genera); (3) according to the fertility of the progeny of the hybrids or otherwise; (4) according to the degree of prolificness of the hybrids; and (5) according to the frequency or rarity of their occurrence. Our present purpose will be best subserved by the consideration of the species arranged according to their affinity.

Among the primate mammals, or monkey order, numerous hybrids have been obtained by congeneric species of monkeys—e. g. (1) the common macaque or kra (*Macacus cynomolgus*) and bonnet monkey (*Macacus sinicus*); (2) the macaque and maimon or brah (*M. nemestrinus*); and (3) the papion and chacma baboons (*C. sphinx* and *C. porcarius*). Among the carnivores also numerous hybrids have been obtained, the chief of which are those (1) between domestic or feral common cats and the smaller species of the countries into which they have been introduced; (2) the lion and tiger; (3) the jaguar and panther; (4) common dogs and native wild species—e. g. wolves, jackals, etc. Among seals several cases have been reported of hybrids between the sea-lion (*Eumetopias stelleri*) and fur-seal (*Callorhinus ursinus*), but these require confirmation. Among the ungulates numerous hybrids have also been produced, among which may be especially enumerated of the horse family (*Equidæ*) (1) the mule between the ass and mare; (2) ass and zebra; (3) ass and dauw; (4) quagga and horse; (5) kiang and zebra; (6) kiang and dauw; (7) kiang and ass; (8) horse and zebra; and (9) quagga and horse. Of the ox family (*Boridæ*), hybrids have been raised from the domestic cattle and almost all other well-known species and representatives, even of different genera (e. g. buffalo, yak, and bison), and also between these and so many other forms that specification is unnecessary. Hybrids have also been obtained from sheep and goats, and various species of each group. Among the rodents successful intercourse has been effected between the hare and rabbit; and their offspring have been advantageously raised even for the market. Among the birds hybridity is so frequent, and has been effected between such widely distinct species, and representatives of even markedly distinct genera, that inability to hybridize is rather the exception than the rule. The most notable cases are those between different generic types of the *Phasianidæ* (common fowl, pheasants, etc.) and *Anatidæ* (ducks, geese, etc.). Little is known respecting hybridity in reptiles or amphibians; and the only case that need be specifically alluded to is one that has been procured, by Prof. Paul Gervais, between the siredon of Mexico and the triton (*Triton cristatus*) of Europe, members of two different families. In this case young were hatched from the eggs of females of siredon impregnated by the triton, but did not live to maturity, all having died within a short time after hatching. Among the fishes also hybrids between diverse genera have been obtained—e. g. between various species of Salmonoids and Cyprinoids. A number of very distinct forms, existing in a state of nature, have been declared by certain authors of high reputation (e. g. Siebold and Günther) to be hybrids between representatives of different genera: such are especially (1) *Carpio kollarii*, between *Cyprinus carpio* and *Carassius vulgaris*; (2) *Abramidopsis leuckartii*, between species of *Abramis* and *Leuciscus*; (3) *Blicca bjoerkna*, between a species of *Abramis* and *Scardinius erythrophthalmus*; (4) *Leuciscus dolabratus*, between *Alburnus lucidus* and *Squalius cephalus*; and (5) *Chondrostoma rysela*, between *Chondrostoma nasus* and *Telestes agassizii*. These, however, have not been experimentally determined to be

hybrids (except, perhaps, in the case of the first), and there is still ground for skepticism. Such are some of the best known and most characteristic cases of hybridity among the vertebrates. Among the invertebrates there are less known and determined cases, but hybrids have been obtained between different species of bees, bufterflies, etc., and many intermediate forms found in a state of nature have been supposed to be hybrids.

Among plants, hybrids are very numerous, as their production is encouraged by gardeners. Hybrids are most abundant among those plants which are habitually propagated by means of buds—that is, by cuttings, layers, and grafts. Such plants are mostly confined to greenhouse cultivation, as begonias, pelargoniums, and orchids. The frequency of hybrids in these plants is not due to any unusual facility with which they can be hybridized, but to the simple fact that the hybrids can be more surely perpetuated by buds than by seeds. Each seed from a hybridized capsule is likely to give a plant unlike every other one from the same pod, while a bud nearly always reproduces its parents. While the general laws which govern hybridity are the same in both animals and plants, care must be taken not to draw too many analogies between them. Individuality is very different in the higher representatives in the two. In all the higher animals the individual is a definite organism, with a single sex and a single set of organs; the plant is a colony of individual parts or branches, each of which has its own complete organs and performs its own functions, ripens its own seeds, and usually bears two sexes. The sexual relations of flowering plants must be very different, therefore, from the sexual relations of the higher types of animals. In the lower classes of flowerless plants, as in the lower classes of animals, practically nothing is known about hybridism.

The results thus far obtained from both animals and plants may be summarized as follows: (1) Allied species are capable, as a rule, of pairing and producing offspring, and this capability is in indefinite ratio to the degree of their likeness. (2) Hybrids are frequently fertile with their parents when those parents are closely related to each other. (3) Hybrids are more rarely fertile among themselves in animals, and mostly (but not always) in cases where the parents are very closely and even suspiciously related. Fertile hybrids are common in the vegetable kingdom. The degree of fertility between original species and their hybrids need not be in ratio to each other—e. g. offspring between certain species is very difficult to be obtained, but hybrids which have been once obtained may be fertile among themselves. On the other hand, certain species will pair and have progeny without difficulty, but the hybrid offspring may be nearly or absolutely infertile: and this case may even occur in the same genus. Types which are fertile with each other were once thought to belong necessarily to the same genus, but the acquiescence or refusal to hybridize is now little considered in schemes of classification.

From all these facts it is plain that there is every degree of difference between absolute sterility and perfect fertility in the intercourse between different species; that, however, infertility to some degree attends sexual intercourse between different species; that fertility is certainly no evidence of specific unity. Fertility, it is equally plain, is almost impossible between species of different families, and all popular accounts to the contrary may be at once set down as destitute of a real foundation. The explanation of this want of fertility between forms that are very dissimilar is doubtless to be found in some difference of structure in the genital organs, although the differences may be so obscure as to have escaped detection. These differences at the same time need not necessarily be co-ordinated with other differences, at least to a greater extent than in other parts of the animal economy; and hence we may find species that differ considerably in appearance quite fertile, while others that resemble each other much more closely may be less so. There must, however, be some degree of co-ordination between the modification of the genital organs and those of the other organs and parts, and hence fertility is only possible within a certain limited range.

A noteworthy fact is that domestication and cultivation exercise an appreciable effect upon the intercourse between animals and plants of different species, and increase the degree of fertility; in a state of nature members of different species rarely pair, and hence hybrids are exceptional, and thus specific forms are perpetuated pure and undefiled; under the influence of man, however, mongrel races readily arise and are indefinitely sustained.

Before dismissing the subject it is advisable to allude to some very curious and, at first sight, inconsistent phenomena exhibited by cross-breeding. Many plants depend for impregnation upon pollen brought by insects from other individuals; and although the sexes may be combined in the same individual flower, the pollen of its stamens appears to be insufficient to impregnate its ovary. Even making allowance for the disturbing effects of manipulation, enough is known to at least indicate that there is a less degree of fertility between closely related individuals than more distant ones. The evils of close breeding are even recognized by man in the laws affecting the marriage state, as well as in his usage in the rearing of his domestic animals. But while infertility may result from both too close and too violent crossing, it must not be thought that it is not governed by definite laws. We now know that sex exists in nature for the purpose of strengthening specific types by the union of the strong points of two parents. Crossing between consanguineous parents contradicts this purpose, and the ban of infertility has been put upon it in the struggle for existence. On the other hand, crossing between very widely different types tends to destroy specific unity and to dissipate the advantages gained in the struggle. Nature avoids hybridity, therefore, in the same manner in which she avoids close in-breeding. Revised by L. H. Bailey.

Hydas'pes: the name by which the Greeks and Romans designated the present Behat or Jhilum river, an affluent of the Ganges. On its banks was fought the great battle between Alexander the Great and Porus in 327 B. C., and on its banks Alexander founded the cities Nicæa and Bucepala. Revised by J. R. S. Sterrett.

Hy'datid [from Gr. *ὑδατίς*, drop of water, water-vesicle, hydatid, deriv. of *ὕδωρ, ὕδατος*, water]: a cystic growth due to the invasion of various tissues or organs by the larval form of the *Tænia echinococcus*, a small tapeworm which in its adult form occurs in the intestines of the dog, as other tapeworms are found in the human intestines. The cysts, or cysticerci, are the larval form, and are the only form which occurs in the human subject. The name was for a long time applied to other cysts, but is now restricted as stated. The echinococcus cyst contains clear watery fluid, in which, in the case of large cysts, there may often be seen very numerous small or daughter cysts, which, shining through the outer wall of the mother cyst, give the latter a speckled appearance. Each of the small daughter cysts contains a larval head and neck, the former provided with a circle of chitinous hooklets, and all are inclosed in a delicate membranous outer covering. Hyatids occur in the liver, the spleen, the eye, the brain, or in various other organs, and may occasion serious symptoms. See also Parasites, Human. William Pepper.

Hyde: town; in the county of Chester, England; 7 miles E. S. E. of Manchester (see map of England, ref. 7-G). It is a rapidly growing place, with numerous cotton-factories, and in the neighborhood are extensive coal mines. The town is very old. It is mentioned in the reign of King John as a possession of the family of Hyde, to which, also, the Earls of Clarendon belonged. But it was a mere village until the development of the cotton industry, in the beginning of the nineteenth century, brought it into a new career of great prosperity. The Hyde electoral division returns one member to Parliament. Pop. (1891) 31,682.

Hyde, Anne: a daughter of Edward Hyde, Earl of Clarendon; b. in 1637. She lived at The Hague as maid-of-honor to the Princess of Orange, sister to Charles II. and James II. Here James, at that time Duke of York, formed a *liaison* with her, and shortly after the restoration of his family to the throne of England in 1660 he married her clandestinely. For some time the royal family would not recognize her, and there was much intriguing for the purpose of breaking the marriage; but Anne's perseverance at last conquered all difficulties. She was not handsome, but very prepossessing, spirited, and dignified, and she exercised a great influence on her husband. She was a Roman Catholic, and converted him. Her two daughters, however, Mary and Anne, who both became Queens of England, were educated in the Protestant religion. Anne died Mar. 31, 1671.

Hyde, Edward: See Clarendon.

Hyde, Thomas: Orientalist; b. at Billingsly, Shropshire, England, June 29, 1636. He studied Oriental languages at

Cambridge, and in his seventeenth year was already so proficient in Persian, Arabic, and Syriac, that he proved a most valuable assistant in editing the Polyglot Bible of Walton. In 1658 he was made Hebrew reader in Queen's College, Oxford, in 1659 underkeeper of the Bodleian Library, and in 1665 librarian-in-chief. After the death of Pocock, in 1691, he obtained the chair of Arabic, and in 1697 also that of Hebrew, besides acting as Eastern interpreter to the court during the reigns of Charles II., James II., and William III. His principal work is his *Historia religionis veterum Persarum* (Oxford, 1700; republished by Hunt and Costard in 1760). Of his other works a collected edition, including his posthumous works in two volumes, appeared in 1767 by Dr. Gregory Sharpe, also containing his *Life*. D. at Oxford, Feb. 18, 1703.

Revised by S. M. Jackson.

Hyde Park: an inclosure comprising 400 acres, and extending westward from the district of Mayfair to Kensington Gardens, London. It was originally part of the manor of Hyde, which was attached to Westminster Abbey. When the monasteries were dissolved under Henry VIII., these grounds became the property of the crown, and after the Restoration became the favorite drive and promenade of Londoners.

Hyde Park: town; Norfolk co., Mass. (for location of county, see map of Massachusetts, ref. 5–I); on the Neponset river, and the Old Colony and the N. E. Railroads; 7 miles S. by W. of Boston. It has water-works, electric lights, public library, a monthly, a quarterly, and three weekly periodicals, and manufactures of iron goods, paper, cotton and woolen goods, chemicals, rubber, curled hair, edge tools, morocco, milling-machines, etc., and contains the residences of many Boston business men. Pop. (1880) 7,088; (1890) 10,500; (1895) 11,826. Editor of "Gazette."

Hyde Park: village; capital of Lamoille co., Vt. (for location of county, see map of Vermont, ref. 3–C); on the Boston and Maine Railroad; 28 miles N. of Montpelier. It is in an agricultural and lumber region; has a copper mine, a limestone quarry, beds of mineral paint, sawmills, excellent water-power, and large calfskin interests, and is the seat of Lamoille Central Academy. The township has fourteen small natural lakes and numerous streams affording good fishing. Pop. (1880) village 331, township 1,715; (1890) township 1,633. Editor of "News and Citizen."

Hyderabad: See Haidarabad.

Hy'der A'li: Indian prince; b. about 1728, at Bangalore, which his father held as a fief of the Rajah of Mysore. In 1756 he inherited the fief at the death of his elder brother, and in 1759 he made himself actual ruler of Mysore, leaving to the rajah nothing but his title and a portion of the revenues. Hyder was one of the most prominent of the Mohammedan princes of India, with respect both to talent and to character. He was mild and just, and had great respect for all the inventions of a higher civilization. He encouraged agriculture, manufactures, and commerce. His army he organized on the Prussian plan, and had it commanded chiefly by European officers, but he was himself possessed of great military talent, and was eminently successful in his wars. He conquered Calicut, Bednor, Onor, and Cananor, and threw off the supremacy of the Mahrattas over Mysore. In his first war with the British he dictated peace under the walls of Madras, Apr. 15, 1769, and in the war between the British and French he sided with the latter, and fought with various success, but died at Chitore, Dec. 7, 1782, before the war was over; his son Tippoo Sahib, succeeded him. Hyder Ali is regarded as the ablest enemy that the British ever encountered among the natives in India.

Hy'dra (in Gr. *ὕδρα*): an island off the east coast of Morea, Greece; 11 miles long and 3 miles broad. It is high, rocky, and bare, and almost all its inhabitants live in the town of Hydra, situated on the northern coast of the island. The island was uninhabited in ancient times. In the fifteenth and sixteenth centuries fugitives from Albania, Argolis, and Attica, who fled from Turkish oppression, founded the city, and it soon became an important commercial center. The Hydriotes did valiant service in the war for independence, and their bravery has been extolled by many poets. The prosperity of Hydra was brief, and the population, which in 1813 was estimated at 50,000, is now less than 7,000.

Hydra: in Greek mythology, a monster begotten by Typhon and Echidna, and reared by Hera in the Lernæan swamp, a few miles S. of Argos. The Hydra was a water-serpent with many heads, usually given as nine in number, of which the middle one was immortal. The lair of the Hydra was under a plantain-tree, near the fountain Amymone. Heracles drove the serpent from its lair by means of hot arrows, and then, with the help of his friend Iolaos, succeeded in killing it. As he cut off the several heads, each wound was seared with a firebrand. Lastly the immortal head was cut off and buried beneath a ponderous rock. Heracles dipped in the poisonous blood of the Hydra his arrows, which thereby became deadly, for the very breath of the Hydra was fatal, and the Anigrus river in Elis stank forever because a centaur, that had been wounded by one of Heracles's poisoned arrows, had washed his wound in the river. Heracles was himself wounded in the combat with the Hydra, and was healed only by a plant that grew in Phœnicia, and at last he himself found his death through the blood of Nessus, which had been infected by the poison of the Hydra. The poisonous water-serpent is the swamp of Lerna, whose deadly miasmas are overcome by the sun-god Heracles. See Curtius, *Peloponnes*, ii., 369; Bursian, *Geographie von Griechenland*, ii., 67. J. R. S. Sterrett.

Hydra: one of the few fresh-water cœlenterates belonging to the order Hydroida (*q. v.*), and receiving its name from the fact that it is frequently found with buds, recalling the Hydra of mythology. Hydra occurs in fresh water in various parts of the globe. It consists of an extensible body, the terminal mouth being surrounded by a varying number of tentacles. It is about the simplest form of many-celled animals. J. S. K.

Hydran'gea [Mod. Lat.; Gr. *ὕδωρ* + *ἀγγεῖον*, vessel, perhaps from the fondness of the plants for water]: a genus of shrubs of the family *Saxifragaceæ*. The U. S. have three (Southern) species, all elegant shrubs in cultivation—*H. radiata*, *arborescens*, and *quercifolia*. The common hydrangea of the greenhouse is *H. hortensia* of China. It is remarkable for the mutable color of its flowers. It requires peaty earth and plenty of water, and is very hardy. *H. thunbergii* furnishes leaves which are highly prized in Japan as a substitute for tea. *H. haniculata*, of China, is the common hardy species. There are other species.

Hydrarthrus: See Dropsy.

Hydras'tis canaden'sis [liter., Canadian Hydras'tis. *Hydrastis*, irregularly for *hydro-drastis*; Gr. *ὕδωρ*, water + *δρᾶν*, do, act, in allusion to the active properties of its juice]: the only known species of its genus, a ranunculaceous plant of the U. S., common in many parts, and known as puccoon, yellow root, golden seal, etc. It is used to a considerable extent in medicine, and has the power of dyeing a rich and permanent yellow. Its valuable tonic powers depend in part on the presence of berberine and hydrastine. Much difficulty is sometimes experienced in obtaining pure hydrastine, as it often is supplanted in commerce by hydrastine, an amorphous substance containing berberine and a resin. Revised by H. A. Hare.

Hydrate of Chloral: See Chloral.

Hydrates [from Gr. *ὕδωρ*, water + chemical suffix *-ate*]: compounds that are derived from water, or that are formed by direct combination with water. Water consists of hydrogen and oxygen in the proportions represented by the formula H_2O. If half of the hydrogen is replaced by something else, the product is called a *hydrate* or a hydroxide. A simple example of such a replacement is that which takes place when sodium acts upon water. Hydrogen is given off, and a compound of the formula NaOH is formed. Or half the hydrogen is replaced by sodium, and the compound formed is called sodium hydrate or sodium hydroxide. Now, there are many compounds that resemble sodium hydrate, and it is believed that they, too, bear this simple relation to water, and they are called hydrates. Other examples are potassium hydrate, KOH; calcium hydrate, $Ca(OH)_2$, or slated lime; ferric hydrate, $Fe(OH)_3$, sometimes called hydrated oxide of iron. The examples given all belong to the class of compounds known as bases (see Base), which consist of a metal in combination with hydrogen and oxygen. Most acids (see Acid) are also hydrates or derivatives of water, but they contain, in place of the metal which is characteristic of the bases, a group of elements one of which is generally oxygen. Thus nitric acid has the formula NO_2–OH, or it is derived from water by replacing half of the hydrogen by the group NO_2. Sulphuric acid is represented by the formula $SO_2(OH)_2$, or it is derived from

water by replacing half of the hydrogen of two molecules (see article CHEMISTRY) of water by the group SO_2, thus $\begin{matrix}HOH\\HOH\end{matrix}$ gives $SO_2\begin{matrix}OH\\OH\end{matrix}$. This is similar to calcium hydrate or slaked lime, $Ca\begin{matrix}OH\\OH\end{matrix}$. Similarly, phosphoric acid is derived from three molecules of water by the replacement of half of the hydrogen by the group PO:

$$\begin{matrix}HOH\\HOH\\HOH\end{matrix} \text{ gives } \begin{matrix}OH\\PO{-}OH\\OH.\end{matrix}$$

ALCOHOLS (*q. v.*) are hydrates in the same sense as acids and bases, and, as is pointed out, they resemble the metallic bases in their chemical conduct. Some substances unite with water directly and form well-defined products, the nature of which is not understood. The numerous cases of salts with water of crystallization furnish illustrations of this class of compounds. They are sometimes called hydrates. Thus alum has the formula $KAl(SO_4)_2.12H_2O$; gypsum is $CaSO_4.2H_2O$; copper sulphate is $CuSO_4.5H_2O$, etc. The water in combination is here represented as water for the simple reason that the nature of these compounds is not understood. (See *Water of Crystallization* in article WATER.) Again, there are some compounds called hydrates and represented as containing water which, nevertheless, are probably derivatives of water of the same kind as the bases and acids. Chloral hydrate is an example. This is commonly represented by the formula $CCl_3.COH.H_2O$, as if it contained water, while it appears from a study of its reactions that it is a compound like calcium hydrate derived from two molecules of water, and should be represented by the formula $CCl_3.CH(OH)_2$. IRA REMSEN.

Hydraulic Crane [*hydraulic* is from Gr. *ὑδραυλικός*, deriv. of *ὕδραυλις*, water-organ; *ὕδωρ*, water + *αὐλός*, pipe, flute]: a device by which the enormous power of the hydrostatic press is utilized in the working of derricks, cranes, etc. It is largely employed in iron-works and heavy machinery construction. In unloading and loading ships, and in filling railway cars with heavy goods, it is sometimes convenient to have a considerable number of cranes, which if managed by the direct application of steam-power would require complicated and cumbrous machinery; but a steam-engine working a hydrostatic press, with an accumulator attached, is made to work the cranes by simple means, the necessary rapidity of motion being gained by long leverage and the use of pulleys.

In construction it usually consists of a vertical cylinder of sufficient height to give the needed range of motion of a "plunger" or piston working within it, beneath which plunger water is introduced under pressures rising, in some cases, to 2,000 or 3,000 lb. per square inch under maximum loads. The water comes from an "accumulator" in which it is kept in store and under maximum pressure by steam-pumps properly designed for that duty. The supply of water and the speed of operation are controlled by means of a cock at the entrance of the cylinder. It is easy to so construct these cranes as rapidly and handily to raise and to lower the most ponderous weights, and to swing around a complete circle, so as to cover an area as large as may be found desirable. These cranes are especially useful in foundries and in steel-works. R. H. THURSTON.

Hydraulic Elevators: See ELEVATORS.

Hydraulic Engines: engines operated by water under pressure. The usual, and generally the most eligible, mode of employing water-power is to apply it to the circumference of a wheel. (See WATER-WHEEL and TURBINE.) Occasionally, however, it may be more advantageous to use it as steam is used, acting on a piston in a cylinder. This mode of application is especially adapted to the case of a small supply of water having a large fall. Hydraulic engines, like steam-engines, may be either reciprocating or rotary. Some modifications are necessary in the construction of the parts, to accommodate them to the different physical properties of the denser fluid. The induction and eduction pipes, for instance, must be larger than are required for steam, and should have no abrupt angles. Freer passages also are necessary; the eduction valve should open very promptly at the end of the stroke, and the induction valve should not close until the stroke is quite completed—that is to say, the influx should cease and the efflux should begin exactly at the same moment. Any material error in making the adjustments designed to accomplish this end, or any imperfect working of the machinery which prevents its attainment, will produce concussions (*coups de bélier*, water-ram blows, as they are called by the French), which will certainly be injurious, and which may be destructive. In the hydraulic engines which have been most extensively introduced, and most successful in practice, provision is made by relief valves or other expedients to mitigate or obviate the evil resulting from this cause; but in so far as it is possible by the adjustments of the machine itself to permit the column by which it is operated to maintain a uniform velocity, both economy of power and durability of parts will be best consulted. In the case of steam, attention to the particulars here pointed out is not so rigidly necessary; the difference arising from the fact that steam is eminently compressible, while water is practically incompressible.

It is only in some special industries that hydraulic engines have been extensively introduced. In large foundries they have been found very convenient in the working of cranes and other heavy machinery. They have also been employed occasionally for the drainage of mines. A remarkably ingenious illustration of their possible usefulness for this latter purpose may be seen in operation at Huelgoat, in Brittany. The great water-engine of Huelgoat, the invention of Mr. Juncker, engineer of the mines it is employed to drain, has been often described. A very full description is given by Mr. Delaunay in his *Mechanics*. This engine is single-acting, and it acts directly to lift the piston of the pump by which the water is drawn from the mines. It makes five and a half strokes per minute, the stroke being $2\frac{1}{2}$ meters, or more than 8 feet in length. The piston-rod is 250 meters (767 feet) long, and weighs 16,000 kilog.—say 16 tons. The power of the engine is derived from a source at a height 110 meters (370 feet) above its own level. In this case, though the direct application of the power reduces the engine to its simplest form, yet the great inertia of the moving columns of water requires that their movements should be very carefully regulated. In a reciprocating engine there are moments of rest, and successive periods in which the piston moves in opposite directions. When the driving force is communicated to a machine through a crank, it is a favorable circumstance that crank-motion necessarily retards the movement of the piston toward the end of the stroke, and brings it insensibly to zero, while at the beginning of the stroke it in like manner favors gradual acceleration. But in the engine at Huelgoat, without some mechanical contrivance to reduce very gradually the volume of inflowing water toward the end of the stroke, the piston would reach the limit of its course with its maximum velocity, and the sudden arrest of its motion would produce a concussion which no strength of materials could resist. The ingenuity and the simplicity of the contrivances by which this powerful machine is made to regulate automatically its own motions, so as to prevent the occurrence of the slightest perceptible shock, have excited the highest admiration of every engineer who has examined it.

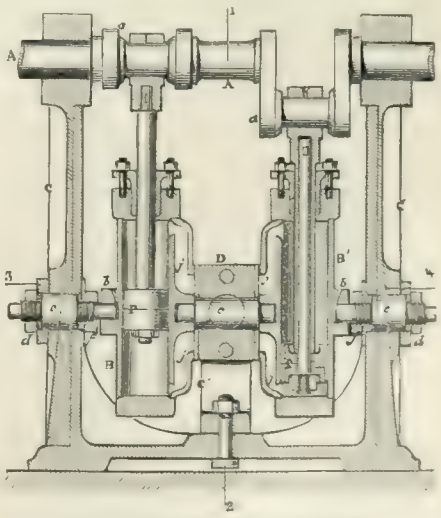


FIG. 1.—Ramsbottom's water-engine

Hydraulic engines upon a smaller scale, and designed for use in the operations of ordinary industry, have been con-

structed in a variety of forms. Several of these—as, for instance, the hydraulic motors of Perret and Coque, of France, and of Carret, Marshall & Co., and Ramsbottom, of Great Britain—are described in full in the *Report on the Industrial Arts* at the Paris Exposition, by Dr. Barnard, U. S. Commissioner. The last, a high-pressure engine which has rendered more important services to industry than any other of its class, is represented in elevation and partial section in Figs. 1 and 2. This engine is oscillating, and employs two cylinders operating the same working shaft by means of two cranks at right angles to each other. The cylinders are supported in a stout framework of cast iron. Fig. 1 is a section through the cylinders, which are vertical, and shows the mode of suspension of the cylinders, and the channels of induction and eduction, which are marked *j*, and which are cast with the cylinder. The dotted circles *c* and *c'* show the position of the supply and discharge pipes. Fig. 3 shows a cross-section of the cylinders and their pivots, and in this will be seen the places of attachment of the pipes just mentioned at K and K'. The pivots are of steel. Those intermediate between the cylinders are firmly fixed in the support. The external pivots admit of adjustment by means of the screws and screw-nuts *d* and *f*, Fig. 2, which is a section through the line 1 and 2. Fig. 1 shows the system of water-distribution. The apertures of induction and eduction are represented at *h* and *i*, and have the form of truncated circular sectors, whose center is the center of motion. The spaces marked *h* are divided from those marked *i* by a sectoral partition, which is of precisely the same area in cross-section as they. The apertures of admission and discharge on the side of the cylinders are also of the same form and dimensions. The surfaces of contact between the cylinders and the support D are perfectly plane and polished, and are made water-tight by means of the adjusting screws *d* and *f* of the pivots. When the piston is at the end of its course in either direction the cylinder will be truly vertical. In this position the piston is momentarily at rest, and both induction and eduction valves should be closed. Accordingly, the disposition of the parts is such that, when the cylinder is vertical, the openings by which the channels *j j* communicate with the supply and discharge pipes present themselves exactly opposite to the solid sector dividing *h* from *i*. In the next moment the flow of water will begin again, the cylinder discharging itself from the full side of the piston, and filling anew on the opposite side.

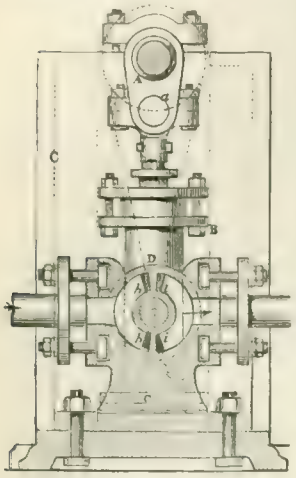


FIG. 2.—Ramsbottom's water-engine.

From this statement it is apparent that the influx and efflux of the water proceed with more and more freedom from the beginning to the middle of the stroke, when the passages are at their maximum opening, and that from this point to the end the reverse takes place. But it is to be also observed that, from the nature of crank-motion, the velocity of the piston varies correspondingly, and that the relation of the supply of water to the demand is very nearly constant. Very nice adjustment is evidently necessary in these engines, in order that the moment of the absolute closing of the valves may correspond to that of the completion of the stroke; and as it is possible that this perfect coincidence may not be exactly secured or permanently maintained, some provision against counterpressure and the effects of hydraulic shocks is necessary. Air-chambers and relief-valves are employed for this purpose. The relief-valves open a backward communication between the cylinder and the driving column, so that if there occurs an obstruction to the discharge, the pressure on the two sides of the piston will be equilibrated by the opening of the valve. The engines of this model heretofore in use have been used for a variety of industrial purposes, as for operating printing-presses, circular saws, lathes, etc., as well as for cranes and other machinery in foundries. Their simplicity and neatness render them preferable to almost any other form of small motor wherever the hydraulic head can be easily secured for working them. But in general it is not a natural hydraulic head that is depended on; and indeed no natural head could furnish, in machines of so small model as those employed in foundries, anything like the large power which they exert. The head is established in an *accumulator* of power, which is a body of water driven into a reservoir under heavy pressure by forcing-pumps worked by steam. For lighter industries such expedients are unnecessary. In cities in which the water-distribution is from elevated reservoirs, and in which the water-supply is sufficiently abundant to justify the application of a portion of it to industrial uses, the water-engine is recommended by the combined advantages of simplicity, neatness, compactness, constant readiness for work, perfect safety, economy while working, and the absolute cessation of expenditure during interruptions.

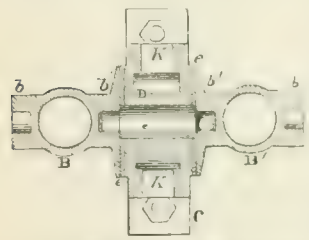


FIG. 3 Cross section of cylinders and their pivots.

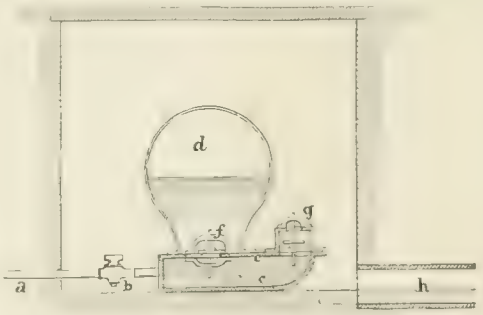
Revised by R. H. THURSTON.

Hydraulic Forging: See FORGING.

Hydraulic Press: See HYDROSTATIC PRESS.

Hydraulic Ram: a well-known machine invented by Montgolfier for elevating a part of the water furnished by a stream to a height greater than that of the source from which it is drawn. Its action depends upon the property of inertia which water, in common with all heavy bodies, possesses. A heavy body, moving with a given velocity, performs, while being brought to rest, an amount of mechanical work sufficient to raise the body to the height due to the momentum. A car, for instance, moving upon a track with a velocity of 48 feet per second, and reaching a steep incline, would mount it to a height of 35·82 feet (friction and resistance of the air not considered), that being the height which a heavy body must fall to acquire a velocity of 48 feet per second. The mechanical work performed by a moving body in coming to rest is represented by the resistance opposed to its motion, multiplied by the distance which the body moves against this resistance; so that the resistance necessary to stop a moving body, or the pressure which it can exert while stopping, is great or small according as its motion is arrested suddenly or slowly.

In the hydraulic ram the moving body is the mass of water contained in a long pipe, the exit of which is alternately opened and closed. The resistance opposed to the water's motion when its exit is closed is the elastic force of air confined in a closed vessel, and the work performed by it consists in compressing this air, which, by its tendency to expand, forces the water to a higher level. The accompanying figure is a section of a hydraulic ram, showing also the chamber or pit in which it is placed: *a* is the supply-pipe leading from the pond or other source of supply. The longer this pipe is, the better, provided there is fall enough to give the necessary velocity; *b* is a cock for closing the supply-pipe; *e* is a plate to which the air-vessel *d* is bolted. Below this plate are two compartments—one, *c*, forming a channel



Hydraulic ram.

through which the water passes freely when the valve *g* is open, and communicating with the air-vessel by the valve *f*,

which allows the water to enter the air-vessel, but not to return. The other compartment communicates freely with the air-vessel, and with a rising pipe, not shown in the figure, for conveying the water to the higher level. The valve g being in the position shown, the water commences to move through the supply-pipe, escaping at g and passing off through the waste-pipe h. The velocity soon becomes so great as to lift the valve g, which closes the outlet. While coming to rest the water in the pipe exerts a pressure sufficient to lift the valve f, and compress air in the air-vessel by flowing into it. As soon as the water comes to rest, the pressure ceases, the valve f closes, the valve g opens, and the same thing occurs again. The expansion of the air in the air-vessel causes a uniform flow through the rising pipe.

J. P. Frizell.

Hydraulics: the science which treats of the laws of flow of water. These laws are partly theoretical and partly derived by the study of experiments. By the help of the rules and experimental results of hydraulics the quantity of water flowing through orifices and conduits may be measured, and reliable computations can be made for the design of canals, water-powers, and systems of public water-supply. The following is a brief synopsis only of the most important and best-established hydraulic principles, laws, and experimental results:

Theoretical Hydraulics.—The theoretical laws are established upon the supposition that water in flowing over surfaces meets with no resistance. Although this is not strictly the case, the formulas thus derived are of great value in forming the basis of practical rules. The oldest of these laws is that announced by Torricelli in 1644 regarding the velocity of flow of water from an orifice—namely, that the velocity with which water issues from an orifice in a vessel is the same as that acquired by a body in falling freely through a height equal to the depth of the orifice below the surface of the water. This law is concisely expressed by the formula $v = \sqrt{2gh}$ in which v is the theoretic velocity at the orifice, h the depth of the water above the orifice, or the *head* as it is generally called, and g is the acceleration of gravity whose mean value is at the rate of 32·16 feet per second. This applies not only to an orifice whose plane is horizontal, as at A in Fig. 1, but to a vertical orifice, as at B, provided its area is very small. If the size of the vertical orifice be large, then both h and v vary for different distances from the top and are the greatest near its base.

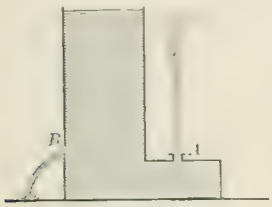


Fig. 1.

The theoretic discharge through an orifice is equal to its area multiplied by the mean velocity. For a horizontal orifice, or for a small vertical orifice, of which the area is a, the theoretic discharge is

$$q = av = a\sqrt{2gh}.$$

which shows that the discharge, like the velocity, varies as the square root of the head.

For a vertical rectangular orifice where h is materially different for the upper and lower edges, let h_1 be the head on the upper and h_2 that on the lower edge, b being the breadth. Let y be the depth of any point below the surface of the water, then $v = \sqrt{2gy}$ is the velocity at that point, and the discharge through an elementary strip of area bdy is

$$dq = bdy\sqrt{2gy}.$$

from which the total theoretic discharge, determined by integrating between the limits h_1 and h_2, is

$$q = \tfrac{2}{3}b\sqrt{2g}\,(h_2^{\frac{3}{2}} - h_1^{\frac{3}{2}}).$$

which is the fundamental formula for use in weir measurements.

In the expression $v = \sqrt{2gh}$ the velocity v is said to be due to the head h, while h is called the velocity-head corresponding to v. Thus if h be 1 foot the velocity 8·02 feet per second results, and conversely a velocity of 1 foot per second requires a head of 0·016 foot to produce it.

When water is at rest in a tube, pipe, or vessel the pressure at any point depends on the head. (See Hydrostatics). But when motion occurs this pressure decreases as the velocity of the water near the point increases. The law which governs this circumstance is that the actual pressure-head always equals the total head diminished by the velocity-head. Thus let h be the total head, and h_0 the part of h which produces pressure, then

$$h_0 = h - \frac{v^2}{2g}$$

is the formula expressing the law. If there be no motion, h_0 equals h, as in hydrostatics; as the velocity v increases, h_0 decreases, and it is possible, as will be seen in instances given below, that h_0 may become zero or even be negative. The possibility of a negative pressure, however, depends upon the presence of the air, and on the surface of the earth a negative head h_0 greater than 34 feet can not be produced.

By the help of the laws of mechanics the theoretic path of a jet issuing from an orifice in the side of a vessel is shown to be a parabolic curve, and its range and other circumstances of motion may be fully investigated. The time required for a vessel to empty itself through an orifice, the phenomena of flow from a revolving vessel, and many other interesting questions have been also theoretically discussed, and conclusions have been derived which are strictly true if the motion of the water could occur without resistances of any kind.

The Standard Orifice.—This is an orifice so arranged that the water in flowing from it touches the edges only on the inner corner, as seen in Fig. 2. An orifice in a thin plate is a standard one, but usually it is cut in a board or plank, care being taken that the inner edge is a definite corner. It is usual to bevel the outer edges so that the escaping jet may by no possibility touch them. The contraction of the jet which is always observed when water issues from a standard orifice is an interesting and important phenomenon. It is due to the fact that the particles of water approaching the orifice move in converging directions, and that these directions continue to converge for a short distance beyond the plane of the orifice. The place of greatest contraction is at a distance from the orifice of about one-half its diameter, and beyond this the jet gradually enlarges in size. Owing to this contraction the discharge from a standard orifice is always less than the theoretic discharge.

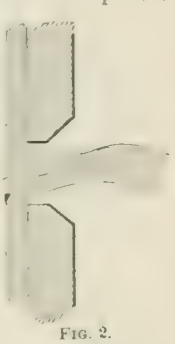


Fig. 2.

The coefficient of contraction is the ratio of the area of the least cross-section of the jet to that of the orifice. The coefficient of velocity is the ratio of the actual velocity in the contracted section to the theoretic velocity. The coefficient of discharge is the ratio of the actual to the theoretic discharge. These coefficients have been determined by many experimenters, and their mean values are,

Coefficient of contraction = 0·62.
Coefficient of velocity = 0·98.
Coefficient of discharge = 0·61.

The last of these is an important constant in practical hydraulics, but it is found to vary somewhat under different circumstances, being greater for low heads than for high heads, greater for rectangles than for squares, and greater for squares than for circles. Tables giving its values are needed in hydraulic work, and the following for circular orifices, perhaps the most important, is abridged from the experiments and discussions of Hamilton Smith, Jr., published in 1886. The table gives the coefficient c by which the

COEFFICIENTS OF DISCHARGE FOR CIRCULAR ORIFICES.

HEAD h IN FEET.	DIAMETER OF ORIFICE IN FEET.					
	0·02	0·04	0·07	0·1	0·6	1·0
0·4	.....	0·637	0·624	0·618	.....	.....
0·6	0·655	0·630	0·618	0·613	0·593	.....
0·8	0·648	0·626	0·615	0·610	0·594	0·590
1·0	0·644	0·623	0·612	0·608	0·595	0·591
1·5	0·637	0·618	0·608	0·605	0·596	0·593
2·0	0·632	0·614	0·607	0·604	0·597	0·595
2·5	0·629	0·612	0·605	0·603	0·598	0·596
3	0·627	0·611	0·604	0·603	0·598	0·597
4	0·623	0·609	0·603	0·602	0·597	0·597
6	0·618	0·607	0·602	0·600	0·596	0·596
8	0·614	0·605	0·601	0·600	0·596	0·596
10	0·611	0·603	0·599	0·598	0·596	0·595
20	0·601	0·599	0·597	0·596	0·595	0·594
50	0·596	0·595	0·594	0·594	0·594	0·593
100	0·593	0·592	0·592	0·592	0·592	0·592

theoretic discharge is to be multiplied in order to obtain the probable actual discharge. The coefficients above the horizontal lines in the last two columns are to be used for the second theoretic formula for q given above, and all the others for the first formula.

In order that water may be accurately measured by the help of a standard orifice, its area must be small compared with the size of the reservoir, and it must not be nearer than three times its least dimension to a corner of the reservoir. Its dimensions are to be accurately determined and the head of water be observed at regular intervals with precision. Small orifices and low heads should be avoided. The probable error of measurement with standard circular orifices is about 1 per cent., and with rectangular orifices about 2 per cent.

When an orifice is placed near a corner of the reservoir the contraction is not fully formed on the side near the corner, or the contraction is said to be suppressed. The same result occurs in orifices with rounded edges, so that they are of no value as an aid to the measurement of water, the coefficient of the discharge in fact ranging from 0·61 to 1·00, according to the degree of rounding.

Flow over Weirs.—A weir is a notch in the top of a vertical side of a vessel through which water flows. The notch is rectangular and its inner edges are to be made with a sharp definite corner, so that the water in flowing out may touch them only in a line, thus insuring complete contraction. The lower edge of the weir is called the crest, and it is often formed with a thin metal plate. Fig. 3 shows the weir with end contractions where the edges of the notch are placed away from the sides of the feeding canal a distance greater than three times the head of water on the crest. When the notch is the full width of the feeding canal the sides of the overflowing stream do not suffer contraction, and it is called a weir without end contractions, or simply a suppressed weir. The latter form of weir is less often used than the former.

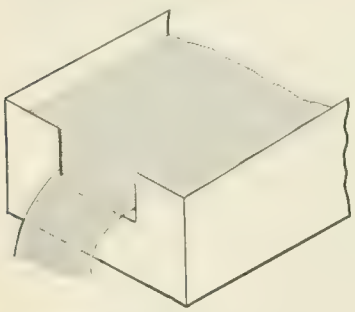


Fig. 3.

The breadth of the weir and the head of water on the crest furnish the means of computing the discharge per second. To measure the head a hook-gauge is used. This consists of a rod sliding vertically in fixed supports, the amount of vertical motion being determined by readings of a vernier. The lower end of the rod is in the form of a hook, as seen in Fig. 4, having a sharp point which can be set very accurately at the surface of the water. The reading of the vernier is first determined when the point of the hook is at the level of the crest of the weir, and then subsequent readings determine the head of water on that crest. Let H designate the head, b the breadth of the weir-notch, and q the discharge per second. Then

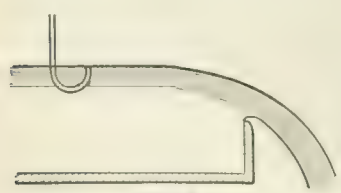


Fig. 4.

$$q = c.\tfrac{2}{3}\sqrt{2g}.bH^{\frac{3}{2}}$$

is the best weir-formula when there is no velocity of the water at the point where the hook-gauge is placed. If there be such velocity of approach, let h be the head corresponding to it, and then

$$q = c.\tfrac{2}{3}\sqrt{2g}.b(H + 1{\cdot}4h)^{\frac{3}{2}}$$

is the weir-formula to be used. The values of the coefficient c, as determined from the discussions of Hamilton Smith, Jr., are given in the following table for heads and weir-lengths most common in practice. The velocity-head h is to be found by the formula

$$h = \frac{v^2}{2g},$$

in which v is known by observation, or computed from the dimensions of the feeding canal and the approximate discharge.

COEFFICIENTS OF DISCHARGE FOR CONTRACTED WEIRS.

EFFECTIVE HEAD IN FEET.	BREADTH OF WEIR IN FEET.					
	0·66	1	2	3	5	10
0·1	0·632	0·639	0·646	0·652	0·653	0·655
0·15	0·619	0·625	0·634	0·638	0·640	0·641
0·2	0·611	0·618	0·626	0·630	0·631	0·633
0·25	0·605	0·612	0·621	0·624	0·626	0·628
0·3	0·601	0·608	0·616	0·619	0·621	0·624
0·4	0·595	0·601	0·609	0·613	0·615	0·618
0·5	0·590	0·596	0·605	0·608	0·611	0·615
0·6	0·587	0·596	0·601	0·605	0·608	0·613
0·7	.	0·593	0·598	0·603	0·606	0·612
0·8	.....	0·590	0·595	0·600	0·604	0·611
0·9	....	.	0·592	0·598	0·603	0·609
1·0	.	....	0·590	0·595	0·601	0·608
1·2	....	.	0·585	0·591	0·597	0·605
1·4	....	....	0·580	0·587	0·594	0·602
1·6	.	.	..	0·582	0·591	0·600

As an example of the use of the formulas and table, let it be required to find the discharge per second over a weir of 4 feet breadth when $H = 0{\cdot}457$ foot. From the table the coefficient c is 0·612. Then

$$q = 0{\cdot}612 \times \tfrac{2}{3} \times 8{\cdot}02 \times 4 \times 0{\cdot}457^{\frac{3}{2}} = 4{\cdot}04,$$

which is the discharge in cubic feet per second when no velocity of approach exists. But if the feeding canal is 7 feet wide and the depth below the crest be 1·5 feet, the velocity of approach is

$$v = \frac{4{\cdot}04}{7 \times 1{\cdot}957} = 0{\cdot}29 \text{ feet per second,}$$

and the head h corresponding to this is 0·0013 foot. The effective head $H + 1{\cdot}4h$ now becomes 0.459 foot, and a second computation gives 4·07 cubic feet per second as the discharge.

The formula established by Francis in 1854 is also extensively used for weir-measurements, but, as it is stated without tabular coefficients, it is to be regarded as giving only mean approximate results. It is

$$q = 3{\cdot}33b\left[(H + h)^{\frac{3}{2}} - h^{\frac{3}{2}}\right]$$

for weirs without end contractions, and for weirs with end contractions b is to be replaced by $(b - 0{\cdot}2H)$. Weirs are extensively used for measuring the discharge of small streams, and for determining the quantity of water supplied to hydraulic motors. Weirs with rounded and wide crests, and weirs where the level of the tail water rises above the crests, can not be advantageously used for the measurement of water, as their coefficients are not well known. Triangular weirs have been used to a slight extent, but only a small quantity of water can be delivered by one of them.

Flow through Tubes.—A standard tube is a very short pipe whose length is about three times its diameter, so that the escaping jet just fills its outer end and issues without contraction. The inner end of the tube is placed flush with the inner side of the reservoir, and is to be a sharp, definite corner, as in the standard orifice. The discharge from such a tube is about 82 per cent. of the theoretic discharge, so that a mean value of the coefficient of contraction is 0·82. By observations with glass-tubes it is found that the contraction of the jet occurs as in the standard orifice, although agitation of the water or a shock upon the tube is apt to destroy it. If, however, a hole be bored in the tube near the inner end, water does not flow out, but air enters, showing that a negative pressure exists. If a small pipe be inserted, as seen in Fig. 5, water will be drawn up in it to a height, h_0, which measures the amount of negative pressure. This was discovered experimentally by Venturi in 1791, and it has been theoretically shown that, when h does not exceed about 40 feet, the value of h_0 will be nearly three-fourths of h_1, provided the contraction of the stream is perfectly formed within the tube. This is an instance of the occurrence of negative pressure-head, above mentioned, and it is due to the formation of a partial vacuum near the contracted vein, which causes the velocity at that

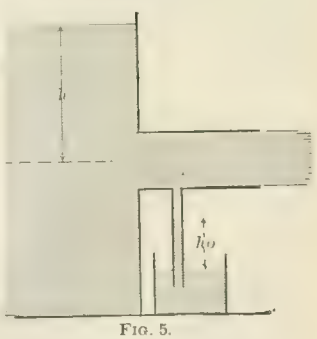


Fig. 5.

point to be due to $h + h_o$, the part h_o being derived from the atmospheric pressure on the surface of the water in the reservoir. It has been experimentally shown that this phenomenon can not occur in a vacuum, and the discharge is then no greater than that from the standard orifice.

Conical tubes, or nozzles, are rarely attached to reservoirs, but are used on hose for throwing streams to a distance. The smooth nozzle is a conical tube with a cylindrical tip, and the ring nozzle has a diaphragm at its outer end, so as to form an orifice smaller in diameter than the end of the tube. The experiments made by Freeman in 1889 show that the former kind have a mean coefficient of discharge of about 0·97, while the latter have about 0·74. They also indicate that the simple cone has a higher discharge than any other form of nozzle.

A diverging tube, sometimes called a Venturi tube, is shown in Fig. 6. It is found for such cases that the velocity and the discharge through the contracted section A B is materially greater than the theoretic velocity and discharge. The explanation of this seeming paradox is the same as that given above for the standard tube, the hydrostatic head being increased by the pressure of the atmosphere on the surface of the water in the reservoir. Experiments made by Francis in 1854 on a tube formed of pieces A B C, etc., which were made to screw together, showed that the maximum discharge occurred for the length and proportions represented in Fig. 6, the coefficient being 2·43 for the contracted section. Although the flow is increased by such tubes, there is no increase in energy or power, and their practical application is very limited, the only important one being the Venturi water-meter, an apparatus devised by Clemens Herschel in 1889 for gauging the discharge by observing the diminished pressure-head at the contracted section.

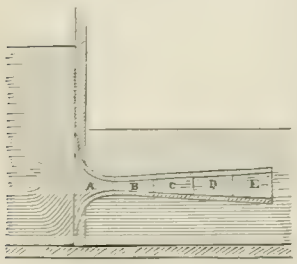


FIG. 6.

Resistances to Flow.—The coefficient of discharge represents in a general way the effect of the resistance to the motion of water due to friction, contraction, and agitation. But a more satisfactory method is to take account of these resistances by the losses of head which result. The total head being h, a certain part, h_o exists as pressure, another part, h_1 as velocity-head, and the remainder, h', is expended in overcoming the various resistances. Then the loss of head is

$$h' = h - h_o - h_1,$$

which is an extension of the theorem of theoretical hydraulics concerning the relation between pressure-head and velocity-head. To apply this to the standard orifice h_o vanishes, because there is no pressure in the contracted section, and $v = 0{\cdot}98\sqrt{2gh}$, from which

$$h_1 = \frac{v^2}{2g} = 0{\cdot}96h,$$

and therefore the loss of head in the standard orifice is

$$h' = h - 0{\cdot}96h = 0{\cdot}04h,$$

or 4 per cent. of the total head. In the same way the loss of head in the standard tube is found to be 33 per cent. of the total head. The stream of water from the tube, therefore, has lost in energy much more than that from the standard orifice.

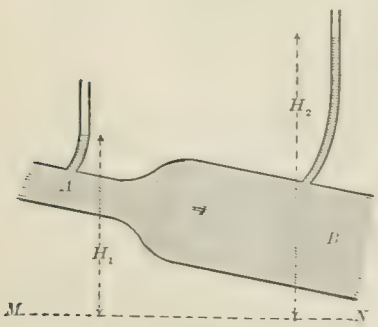


FIG. 7.

When water flows through a pipe whose area suddenly increases from a_1 to a_2 the original velocity v_1 suddenly decreases from v_1 to v_2, and the formula

$$h = \frac{(v_1 - v_2)^2}{2g}$$

represents the loss of head due to the impact or shock caused by the sudden change in velocity. If, however, the increase in size be made gradually this loss of head may be mostly avoided, and in connecting water-pipes of different sizes it is hence usual to employ a long tapering piece called a reducer.

The *piezometer* is a pressure-gauge or other instrument by which the pressure in a pipe may be measured and the head corresponding to that pressure be determined. By the use of piezometers the loss of head between any two sections of a tube or pipe may be ascertained in the following manner: Let A be the first section, where the velocity is v_1 and where the piezometer indicates a pressure-head of H_1 above some assumed plane, MN. Let B be the second section, where the velocity is v_2 and the pressure-head is H_2 above the same plane. Then from the formula

$$h = \frac{v_1^2}{2g} - \frac{v_2^2}{2g} + (H_1 - H_2)$$

the loss of head between A and B can be computed. This formula includes all losses of head, whether they be due to friction, impact, or other causes. For example, if the section at B have a diameter three times that of A, the velocity in A being 6 feet per second, the velocity in B will be two-thirds of a foot per second. Now let the water in the piezometer at B be 0·111 feet higher than in that at A. Then the loss of head is found to be

$$h' = 0{\cdot}560 - 0{\cdot}007 - 0{\cdot}111 = 0{\cdot}442 \text{ feet.}$$

Losses of head occur wherever a pipe makes a sharp bend, or whenever a valve or other obstruction exists in it. But the effect of these is not well ascertained, except for a few special cases investigated by Weisbach. It is desirable to arrange pipes so that losses of head may be made as small as possible, as their effect is to diminish both pressure and discharge. To this end small sections, sharp curves, rough surfaces, sudden enlargements, and all interior obstructions should be carefully avoided.

Flow in Pipes.—The simplest case of flow through a pipe is that where the entire discharge occurs at the end. Other cases are those where the discharge is drawn from the pipe at several points along its length, as in the water-mains for the supply of towns. The first case only will be discussed here, but most of the principles apply, with slight modifications, to water-mains. In a pipe under full flow the water in entering it from the reservoir suffers a loss of head similar to that in passing through a standard tube. The resistance of friction along the interior surface of the pipe then causes a further loss, so that the velocity of flow is much less than in a tube. These losses of head are expressed in terms of the effective velocity-head. Let v be the mean velocity, d the diameter of the pipe, l its length, h the head from the reservoir surface to the end where the flow occurs. Then the two losses of head are

$$h = 0{\cdot}5\frac{v^2}{2g}, \qquad h' = f\frac{l}{d}\frac{v^2}{2g},$$

in which f is a friction factor whose value is to be taken from the table given below, which has been compiled from the discussions of Fanning and Smith, and which is applicable to clean iron pipes, laid with close joints, and either smooth or coated with coal-tar varnish:

FRICTION FACTORS FOR PIPES.

DIAMETER IN FEET.	VELOCITY IN FEET PER SECOND					
	1	2	3	4	6	10
0·05	0·047	0·041	0·037	0·034	0·031	0·029
0·1	0·038	0·032	0·030	0·028	0·026	0·024
0·25	0·032	0·028	0·026	0·025	0·024	0·022
0·5	0·028	0·026	0·025	0·023	0·023	0·021
0·75	0·026	0·025	0·024	0·022	0·021	0·019
1	0·025	0·024	0·023	0·022	0·020	0·018
1·25	0·024	0·023	0·022	0·021	0·019	0·017
1·5	0·023	0·022	0·021	0·020	0·018	0·016
1·75	0·022	0·021	0·020	0·018	0·017	0·015
2	0·021	0·020	0·019	0·017	0·016	0·014
2·5	0·020	0·019	0·018	0·016	[illegible]	[illegible]
3	0·019	0·018	0·016	0·015	0·014	0·013
3·5	0·018	0·017	0·016	0·014	0·013	0·012
4	0·017	0·016	0·015	0·013	0·012	0·011
5	0·016	0·015	0·014	[illegible]	[illegible]	
6	0·015	0·014	0·013	0·012	0·011	

In a long pipe nearly all the head is expended in overcoming the resistances, leaving but a small part to be exerted in velocity. Thus if $l = 10{,}000$ feet, $d = 1$ foot, $h = 100$ feet, and $v = 5{\cdot}41$ feet per second, it is found that the loss of head at entrance is 0·23 foot, and that the loss in friction is

$$h = 0{\cdot}021 \times 10{,}000 \times 0{\cdot}455 = 96 \text{ feet.}$$

which is to be regarded as an approximate value liable to an uncertainty of about 5 per cent.

Disregarding the losses of head due to curves and to valves, the mean velocity in a pipe may be computed from

$$v = \sqrt{\frac{2gh}{1{\cdot}5 + f\frac{l}{d}}},$$

in which f may be taken as 0·02 for approximate computations, and when v is found a closer computation may be made by the help of the table of factors. For a long pipe the frictional resistances are very large, so that 1·5 may be neglected in the formula, which then becomes

$$v = \sqrt{\frac{2gdh}{fl}} = 8{\cdot}02\sqrt{\frac{dh}{fl}},$$

and this may be used with a theoretic error less than 1 per cent. whenever l is greater than $4000d$. The discharge through a long pipe then is

$$q = 6{\cdot}30\sqrt{\frac{d^5h}{fl}},$$

and the diameter required to deliver a given quantity is

$$d = 0{\cdot}479\left(\frac{fq^2l}{h}\right)^{\frac{1}{5}}.$$

In all these formulas d, h, and l are to be taken in feet, and q in cubic feet-second. For instance, if it be required to find the size of a pipe to deliver 7,500 cubic feet per hour through a pipe 26,500 feet long under a head of 324·7 feet, we have $q = 2\frac{1}{2}$ cubic feet per second, $l = 26{,}500$ feet, $h = 324{\cdot}7$ feet, and taking $f = 0{\cdot}02$, the last formula gives $d = 0{\cdot}715$ feet. The velocity corresponding to this diameter is 5·1 feet per second, and the table of friction factors shows that the value of f should be 0·022. Repeating the computation the diameter is found to be 0·722 feet.

The *hydraulic gradient* is the line to which the water-levels would rise if piezometer tubes were inserted along the pipe. For a pipe of uniform size the hydraulic gradient is approximately a straight line. For a pipe discharging freely into the air, as in Fig. 8, this line joins the outlet end, C, with a point, B, near the top of the reservoir. Let D_1 be any point in the pipe whose distance is l_1 from the reservoir, measured along the pipe-line. The piezometer column at D_1 rises to C_1, which is a point in the hydraulic gradient B C. The distance A_1 B_1 below the surface of water in the reservoir is the head lost at entrance, and the distance B_1 C_1 is the head lost in friction. The latter varies with the distance of the point from the reservoir, while the former is constant. The piezometer height C_1 D_1 measures the pressure in the pipe at the point D_1, and it will be seen that if D_1 coincides with C_1 there will be no pressure in the pipe. If the pipe is so laid that a portion of it rises above the hydraulic gradient, the pressure in that portion becomes negative, which causes a partial vacuum in that portion of the pipe. This is liable to break the continuity of the flow, so that as a consequence the pipe from D_1 to the end C is only partly filled with water. This causes a diminution of the discharge, and it has often been necessary to dig up and relay portions of a pipe-line which have been inadvertently run above the hydraulic gradient. When a large part of a pipe lies above the gradient it is called a siphon; for the successful action of a siphon a pump must be attached near the highest elevation, which may be occasionally operated to remove the air that has accumulated there.

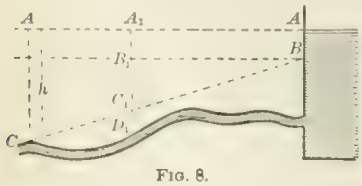


FIG. 8.

Flow in Conduits.—The word conduit means an artificial channel lined with timber, mortar, or masonry, and also includes troughs, large pipes, and sewers. The wetted perimeter of a conduit is that part of the boundary of its cross-section which is in contact with the water: thus if a circular sewer of diameter d be half full of water, the wetted perimeter is $\frac{1}{2}\pi d$. The hydraulic radius of the cross-section of a conduit is its area a divided by its wetted perimeter p; thus let r be the hydraulic radius, then

$$r = \frac{a}{p}.$$

This is also frequently called the hydraulic mean depth, because for a shallow section its value is but little less than the depth of the water. The slope of the water surface in a conduit, represented by the letter s, is the ratio of the fall h to the length in which it occurs, or

$$s = \frac{h}{l}.$$

Both r and s are frequently used in hydraulic formulas; the former is a linear quantity and the latter an abstract number. Their values for any given case are determined by measurements in the field.

The mean velocity of the water in a conduit under the condition of uniform flow is expressed by the formula

$$v = c\sqrt{rs},$$

in which r is the hydraulic radius, s the slope, and c is a number whose value ranges from 30 to 160 for English measures. Numerous experiments have been made to determine the laws of variation of the quantity c, and many volumes indeed have been written on this single formula. For circular conduits, having smooth interior surfaces, and running either full or half full, the values of c, as determined by the extended discussions of Hamilton Smith, Jr., are as follows:

COEFFICIENTS FOR CIRCULAR CONDUITS.

DIAMETER IN FEET.	VELOCITY IN FEET PER SECOND.					
	1	2	3	4	6	10
1	96	104	109	112	116	121
1·5	103	111	116	119	123	129
2	109	116	121	124	129	134
2·5	113	120	125	128	133	139
3	117	124	128	132	136	143
3·5	120	127	131	135	139	146
4	123	130	134	137	142	150
5	128	134	139	142	147	155
6	132	138	142	145	150	...
7	135	141	145	149	153	...
8	137	143	148	151	...	...

As an example of the use of the table let it be required to find the discharge of a semicircular conduit of 6 feet diameter when laid on a grade of 1 foot in 1,000 feet. Assuming c as 125, the formula gives, since r is 1·5 and s is 0.001, the value $v = 4{\cdot}8$ feet per second. For this velocity the table gives c as 147, whence from the formula $v = 5{\cdot}7$ feet per second. Again, the table gives c as 150, whence $v = 5{\cdot}8$ feet per second. As a final result, c may be taken as 149·5, from which $v = 5{\cdot}79$ feet per second, and then the discharge is 81·9 cubic feet per second.

Numerous efforts have been made to derive a formula for c, so that it can be computed for given conditions. The researches of Ganguillet and Kutter have been the most successful in this direction, having resulted in a valuable formula from which c can be derived for any given case when the nature of the interior surface of the conduit is known. Kutter's formula, in English measures, is

$$c = \frac{\frac{1{\cdot}811}{n} + 41{\cdot}65 + \frac{0{\cdot}00281}{s}}{1 + \frac{n}{\sqrt{r}}\left(41{\cdot}65 + \frac{0{\cdot}00281}{s}\right)},$$

in which r and s are the hydraulic radius and the slope respectively, and n is an abstract number whose value depends only upon the roughness of the surface, and

$n = 0{\cdot}009$ for well-planed timber,
$n = 0{\cdot}010$ for neat cement,
$n = 0{\cdot}011$ for cement with one-third sand,
$n = 0{\cdot}012$ for unplaned timber,
$n = 0{\cdot}013$ for ashlar and brickwork,
$n = 0{\cdot}015$ for unclean surfaces in sewers and conduits,
$n = 0{\cdot}017$ for rubble masonry,
$n = 0{\cdot}020$ for canals in very firm gravel,
$n = 0{\cdot}030$ for canals and rivers free from stones and weeds,
$n = 0{\cdot}035$ for canals and rivers in bad order.

This formula has received a wide acceptance on account of its application to all kinds of surfaces. Notwithstanding that it is purely empirical, it is to be regarded as an expression of our best knowledge regarding the laws of flow in conduits and canals, and extensive tables have been published by Jackson, Flynn, and others, for abridging numerical computations which are based upon it.

Troughs are rectangular in section, and the most advan-

tageous proportion is that when the depth is one-half of the width, the frictional resistances then being less than for other proportions. For trapezoidal channels the best dimensions are such as render the hydraulic radius one-half the depth of the water. In canals and ditches the velocity of the water should not, as a general rule, exceed 2 or 3 feet per second, in order to avoid the scouring action which would result from greater velocities. It is found that a velocity of 2 feet per second moves gravel, that 3 feet per second moves pebbles 1 inch in size, and that 4 feet per second moves spalls and stones. It is a theoretic deduction that the diameters of bodies which are moved by a current vary as the square of its velocity. Thus if a stone weighing 0·5 lb. is moved by a current of 3 feet per second, one of 360 lb. will be moved by a current of 9 feet per second.

Flow in Canals and Rivers.—This very important branch of the subject is discussed in the article River Hydraulics.

Measurement of Water.—For a small discharge the water may be allowed to fall into a vessel which stands upon scales where it can be weighed, or into a tank of known capacity, where it can be measured. For larger quantities the principles and coefficients above given may be used, and the measurement be made by orifices, weirs, tubes, or less accurately by the computations for pipes and conduits.

When water runs through a small pipe a water-meter may often be advantageously used to determine the discharge. This consists essentially of a box with two chambers, the water entering into one and passing out of the other. In going from the first to the second chamber the water moves a vane, a piston, or a disk, which communicates motion to a train of clockwork and thereby causes pointers to move on dials, which are read as in a gas-meter. No water-meter, however, can be regarded as accurate until it has been tested by comparing its recorded discharges with those as determined by measurement in a tank of known capacity. These tests should be repeated at intervals, as the moving piston or disk wears under use. A water-meter for very large pipes has been mentioned above in connection with Venturi tubes.

The probable error in the discharge, as computed from the formulas for orifices and weirs, will rarely be less than 1 per cent., and they may be as high as 10 per cent. when computed from the formulas for pipes and conduits. These errors are due to lack of knowledge regarding the effect of rough surfaces in retarding the flow, and it is the constant aim of hydraulicians to render the science more exact in this respect.

Impulse of Streams.—The dynamic pressures exerted by moving water against surfaces which check its velocity or change its direction follow laws very different from those of static pressure. A static pressure is exerted with equal intensity in all directions, but a dynamic pressure is exerted in different directions with varying intensities. The impulse of a stream or jet is the dynamic pressure which it is capable of producing in the direction of its motion when its velocity is entirely destroyed in that direction. Let W be the weight of water delivered by the stream per second with the velocity v; let a be the cross-section of the stream, and w the weight of a cubic unit of water. Then

$$P = W\frac{v}{g} = 2wa\frac{v^2}{2g}$$

is the dynamic pressure in the direction of the motion. This is seen to be equal to the static pressure due to twice the head which produces the velocity v. It would then be expected if two equal orifices, or tubes, be placed exactly opposite, as in Fig. 9, that the dynamic pressure of the jet issuing from B would exactly balance the static pressure at D when the head C D is double the head A B.

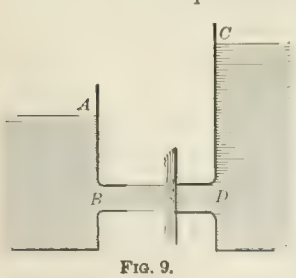


Fig. 9.

When a stream of water strikes upon a surface at rest it is deflected to one side, and the dynamic pressure in the original direction depends upon the direction in which it leaves the surface. Let θ be the angle between the initial and final directions, as shown in Fig. 10. Then neglecting the resistances of friction, the dynamic pressure in the direction of the impinging jet is

$$P = (1 - \cos\theta)\frac{Wv}{g}.$$

If in this $\theta = 0°$, the stream glides along the surface without producing pressure; if θ is 90° the dynamic pressure is $W\frac{v}{g}$, as illustrated in Fig. 9; if θ becomes 180°, as at B in

Fig. 10.

Fig. 10, a complete reversal of direction is obtained, and P becomes $2W\frac{v}{g}$, or the pressure is twice as great as when θ is 90°. These theoretical conclusions have been verified by experiments.

These principles have a direct application to the moving vanes of water-wheels. If the water impinges tangentially with the absolute velocity v, and if the vane move with the velocity u, the work imparted per second is

$$k = (1 - \cos\theta)W\frac{(v-u)u}{g}.$$

This becomes zero when $u = 0$, or where $u = v$, and it is a maximum when $u = \frac{1}{2}v$, or when the vane moves with one-half the velocity of the jet. Then if θ be a right angle, 50 per cent. only of the theoretic power of the jet is obtained, but if θ be 180°, as at B in Fig. 10, the entire theoretic power is utilized except that lost in frictional resistances. This is due to the fact that the water leaves the vane without velocity, for relative velocity on the vane being $\frac{1}{2}v$, as it leaves the vane its absolute velocity is $u - \frac{1}{2}v = 0$. It is a fundamental principle in the construction of all hydraulic motors that the water should enter the vanes tangentially, or without shock, and should leave them without velocity; then the efficiency of the motor is the highest as well as the power which it furnishes.

The theoretic horse-power which can be derived from W pounds of water falling each second through a height of h feet is $0{\cdot}001818\,Wh$, but owing to friction, impact, leakage, and other losses, only about 70 or 80 per cent. of this can usually be obtained. See Turbine and Water-power.

Literature.—Hydraulics is a modern science, the first fundamental principle of which was enunciated in 1644 by Torricelli. Soon after Newton made experiments on the flow of water from orifices, which are given in his *Principia*. In the eighteenth century the labors, both theoretical and experimental, of Daniel Bernoulli, Prony, Chazy, Venturi, and Dubuat resulted in the discovery of many of the laws relating to flow in tubes, pipes, and conduits. The great work of Dubuat, *Principes d'hydraulique et de pyrodynamique*, published in three volumes at Paris in 1816, first placed the science on the solid foundation of careful observation. In the nineteenth century the numerous experiments made by Darcy and Bazin in France, by Weisbach and Hagen in Germany, and by Francis and others in the U. S., have given to hydraulics a more exact character, although much remains to be done in all its branches. Weisbach's *Mechanics of Engineering* (1846) and the American translations of 1870 and 1877 contain important matter. Francis's *Lowell Hydraulic Experiments* (1855), Hamilton Smith's *Hydraulics* (1886), and Kutter's *Flow of Water*, translated by Hering and Trautwine in 1889, contain experimental results of great value. Other books are Fanning's *Water-supply Engineering* (New York, 1877); Box's *Practical Hydraulics* (London, 1879); Merriman's *Treatise on Hydraulics* (New York, 1889); Graeff's *Traité d'hydraulique* (Paris, 1889); and Flynn's *Irrigation Canals* (San Francisco, 1892). Valuable papers by Freeman, Fteley, Herschel, Stearns, Weston, and others, will be found in recent volumes of the *Transactions of the American Society of Civil Engineers*.

Mansfield Merriman.

Hydriodic Acid: See Iodine.

Hydrobromic Acid: See Bromine.

Hydrocarbons [from *hydro-*, compounding form of *hydrogen* + *carbon*]: compounds consisting of the elements carbon and hydrogen. They occur widely distributed and in immense quantities in nature, as in Petroleum (*q. v.*), in the gases that issue from the earth in coal mines and in the neighborhood of petroleum wells, in many essential oils, as oil of turpentine, caoutchouc, etc. The principal method of obtaining the hydrocarbons on the large scale is by the destructive distillation of organic substances. Coal-tar,

which is a by-product in the manufacture of illuminating gas (see GAS-LIGHTING), contains a number of very valuable hydrocarbons, which are separated and purified, and find extensive application in chemical industries. (See ANILINE COLORS, ALIZARIN, ANTHRACENE, NAPHTHALENE.) About 200 hydrocarbons are known, belonging to about a dozen classes or series.

1. *Marsh-gas Series, Methane Series, Paraffins.*—The simplest hydrocarbon known, as far as composition is concerned, is marsh-gas, or methane, which has the formula CH_4. There are many other hydrocarbons that resemble this, and, on arranging them in a series in accordance with the number of carbon atoms contained in them, a very simple relation is observed between their formulas. The first six members are given in the following table:

Methane	CH_4	Butane	C_4H_{10}
Ethane	C_2H_6	Pentane	C_5H_{12}
Propane	C_3H_8	Hexane	C_6H_{14}

Each member is seen to differ in composition by CH_2 from the one immediately preceding or succeeding it in the series. Such a series is called an *homologous series*, or the relation is called *homology*. MARSH-GAS (*q. v.*) is formed under a variety of conditions in nature, and several of the higher members of the series are the principal constituents of petroleum. The first three members of the series are gases at ordinary temperatures, the next fifteen or twenty members are liquids. The more complicated the composition, the higher the boiling-point in general terms. The highest members of the series are solid, and ordinary paraffin appears to be a mixture of these. Although the members of the paraffin series occur in such large quantities in nature, it is practically impossible to isolate them in pure condition from natural products, and our knowledge regarding them has been gained through the aid of artificial methods of preparation. Thus starting with marsh-gas, chlorine may be introduced into it in place of hydrogen, and the compound CH_3Cl thus obtained. When this compound is treated with sodium, the chlorine is extracted and forms sodium chloride with the sodium. This leaves the residue CH_3, which, uniting with another of the same kind, forms the second member of the series C_2H_6. From this in turn by successive treatment with chlorine and sodium a new hydrocarbon can be made. There are several other methods available for the artificial preparation of hydrocarbons, and most of these have been extensively applied.

2. *Ethylene Series, Olefines.*—When alcohol is heated with sulphuric acid a gas is given off. This has the composition C_2H_4, and is known as ethylene or olefiant gas. Its formation from alcohol is represented by the equation

$$C_2H_6O = C_2H_4 + H_2O;$$

or, as will be seen, the alcohol breaks down into ethylene and water. Ethylene differs from ethane, C_2H_6, by two atoms of hydrogen. It is an unsaturated hydrocarbon. Hydrogen, or chlorine, or hydrochloric acid can be added to it, and then it becomes saturated. Ethylene is the first member of a series of hydrocarbons running parallel to the series of paraffins, but differing from these as ethylene differs from ethane. Thus, taking the first four members, the relation is shown by these tables:

CH_4	——		C_4H_{10}	C_4H_8	Butylene
C_2H_6	C_2H_4	Ethylene	C_5H_{12}	C_5H_{10}	Amylene
C_3H_8	C_3H_6	Propylene			

3. *Acetylene Series.*—The first member of this series is acetylene, C_2H_2, which differs from ethylene as this differs from ethane. Acetylene is formed at the carbon poles of a powerful electric battery when these are surrounded by hydrogen. It is made in the laboratory by passing aldehyde through a red-hot tube, the change taking place according to the equation

$$C_2H_4O = C_2H_2 + H_2O.$$

Other members of the series are allylene, C_3H_4, crotonylene, C_4H_6, valerylene, C_5H_8, etc.

4. One hydrocarbon has been made that differs from valerylene, C_5H_8, as this differs from amylene, C_5H_{10}. This is valylene, C_5H_8. It is plainly a member of a possible series of the general formula, C_nH_{2n-4}.

5. Two hydrocarbons resembling those of the two preceding series have been made, but which differ from them by containing a smaller proportion of hydrogen. Both have the formula C_6H_6. They resemble the unsaturated hydrocarbons in their chemical conduct.

6. *Benzene Series, Aromatic Hydrocarbons.*—The principal member of this series is benzene. Its composition is C_6H_6. The other best-known members are given in the table below:

Benzene	C_6H_6	Mesitylene	C_9H_{12}
Toluene	C_7H_8	Cymene	$C_{10}H_{14}$
Xylene	C_8H_{10}		

The principal source of these hydrocarbons is coal-tar (see GAS-LIGHTING), from which benzene, toluene, and xylene are obtained in immense quantities. Many compounds made from them are manufactured on the large scale, especially dye-stuffs. Aniline is made from benzene. Carbolic acid is a derivative of benzene. Picric acid is a derivative of carbolic acid. From a scientific point of view as well as an industrial, this series has also proved of great interest, so much so that for about twenty years the majority of the working chemists were occupied with the study of its derivatives. The question as to the relation existing between marsh-gas and benzene is still under investigation, though much has been learned regarding it.

Now follow other hydrocarbons which differ in composition from the members of the benzene series as ethylene, and acetylene, etc., differ from ethane. The benzene hydrocarbons have the general formula C_nH_{2n-6}. Next in order comes *styrene*, or *phenylethylene*, C_8H_8. This plainly corresponds to the general formula C_nH_{2n-8}. *Phenylacetylene*, C_8H_6, the hydrocarbon from which INDIGO (*q. v.*) is derived, corresponds to the general formula C_nH_{2n-10}. NAPHTHALENE (*q. v.*), $C_{10}H_8$, is the next step. It corresponds to the general formula C_nH_{2n-12}. The other hydrocarbons of importance are included in the table below:

C_nH_{2n-14}.		C_nH_{2n-20}.	
Diphenyl	$C_{12}H_{10}$	Fluoranthene	$C_{15}H_{10}$
Ditloyl	$C_{14}H_{14}$	C_nH_{2n-22}.	
C_nH_{2n-16}.		Pyrene	$C_{16}H_{10}$
Stilbene	$C_{14}H_{12}$	C_nH_{2n-24}.	
C_nH_{2n-18}.		Chrysene	$C_{18}H_{12}$
Anthracene	$C_{14}H_{10}$		
Phenanthrene	$C_{14}H_{10}$		

Of these, ANTHRACENE (*q. v.*) is the best known and most important. A knowledge of the hydrocarbons is of fundamental importance for organic chemistry. They are the simplest compounds of carbon, and all others are regarded as derived from them by the substitution of other elements, or groups of elements, for a part or all of the hydrogen of the hydrocarbon. Thus, by way of illustration, let us take marsh-gas, CH_4. By treatment with chlorine, the hydrogen atoms can be replaced one after the other, and the following products formed: CH_3Cl, CH_2Cl_2, $CHCl_3$, CCl_4. Of these, the third, $CHCl_3$, is ordinary chloroform. Methyl alcohol is marsh-gas, the hydrogen atom of which has been replaced by the water residue, OH. (See ALCOHOLS.) In studying any compound of carbon, one of the principal objects in view is to determine from what hydrocarbon it is derived.

IRA REMSEN.

Hy'drocele [from Lat. *hydrocele* = Gr. *ὑδροκήλη*: *ὕδωρ*, water + *κήλη*, tumor]: a form of dropsy, consisting of an accumulation of water between the two serous coverings of the testicles or of the spermatic cord, known as the tunica vaginalis. It may follow an inflammation of the testes, but generally follows strains. It may affect both sides at the same time, but usually the effusion is found on one side only. It is a curious fact that musicians who play on wind instruments are more subject to this disease than any other class of individuals; it seems to be due to the constant strain produced by blowing. It forms a pear-shaped, painless tumor, which causes uneasiness to the patient only on account of its size; it sometimes grows so large as to reach nearly down to the knees. Unless the sac in which the fluid is inclosed be abnormally thick and distended to its utmost by the contained fluid, fluctuation can be felt. There is no impulse felt upon coughing. By stretching the integuments over the tumor, and placing a candle behind it in a dark room, the light will be transmitted; this would not occur if the swelling were solid. Another test to determine the consistence of it is to plunge a needle into the mass, and see whether it falls over to one side and floats about, or retains the position in which it was placed. The treatment of hydrocele may be divided into the palliative and the radical. The former consists in drawing off the effused fluid by the trocar and canula; this relieves the patient for a longer or shorter time, but the sac is apt to fill again, when the operation has

to be repeated. The radical treatment consists in injecting some irritating substance, as tincture of iodine, into the sac, which thus becomes inflamed on both its reflections, which unite and obliterate the sac.

Revised by WILLIAM PEPPER.

Hydroceph'alus [Mod. Lat., from Gr. *ὑδροκέφαλον*, water in the head, *hydrocephalus*: *ὕδωρ*, water + *κεφαλή*, head]: a dropsical effusion of fluids into the interior of the skull, occupying one or more of the ventricles of the brain or the sub-meningeal space, or both. The symptoms of acute meningitis are such that the older authors called this disease acute hydrocephalus, but there may be very little fluid exudation in meningitis, and when present it is not often clear and watery. The causes of chronic hydrocephalus are various. A low-grade inflammation may give rise to chronic hydrocephalus, just as chronic peritonitis is accompanied by fluid in the belly, but the usual cause of chronic hydrocephalus is some obstruction to the venous circulation. It is regarded as certain that arrest of development of the brain-substance, pressure upon the veins of Galen by masses of tubercle or cancer, and in fact any condition which obstructs the venous circulation in the brain, may lead to hydrocephalic effusion, just as pressure on the veins of the leg may produce dropsy of the feet. It is probable also that in arrest of brain-development the increase of the normal sub-arachnoid fluid is a conservative process, serving to keep full the space between the brain and the cranium. The large majority of cases are congenital, and hydrocephalus must be set down as a disease (or symptom) belonging to infantile life; but cases occasionally occur in mature life or in old age. Dean Swift, after three years of illness, died with hydrocephalus, the result, doubtless, of organic brain disease. The prognosis of chronic hydrocephalus is very grave. The child may live for many years, but (with rare exceptions) becomes idiotic, and in some cases is epileptic. The head becomes distended, the fontanels remain open, supernumerary bones form in the courses of the cranial sutures, and in some cases quarts of fluid are effused, consisting of water, with earthy salts and a little albumin; while in acute hydrocephalus there is sometimes much albumin present, with some pus-corpuscles or a little blood. When the disease is detected early, mercurial inunctions, with the administration of the iodides, may possibly afford benefit. Treatment by systematic compression or by tapping the skull (the latter operation to be followed by firm compression) has been tried in many cases, but the most common result has been the speedy death of the patient, although in a few instances it would appear that more or less advantage has been obtained by these means. The term *spurious hydrocephalus* is sometimes applied to cholera infantum, infantile typhoid, or other enteric disease, the general symptoms of which may simulate those of acute meningitis.

Revised by WILLIAM PEPPER.

Hydrochlo'ric Acid, called also **Chlorhy'dric Acid** and **Muriat'ic Acid** (ancient names, *marine acid*, *spirit of salt*; Fr. *acide muriatique*, *acide chlorhydrique*; Germ. *salzsäure*, *chlorwasserstoffsäure*) [*hydrochloric* is from *hydro-*, compounding form of *hydrogen* + *chloric*, deriv. of *chlorine*; *muriatic* is from Lat. *muria'ticus*, pickled, deriv. of *mu'ria*, brine]: This substance was first made in large quantity by Glauber in the seventeenth century by treating ordinary salt or sodium chloride, NaCl, with sulphuric acid, or oil of vitriol. It is still made in the same way. Priestley (1772) first obtained it in pure condition. The name "spirit of salt" is, like "spirit of wine," "spirit of wood," an indication of the crude theory of spirits so long in vogue. That which escaped from anything easily in intangible form was called its spirit. As hydrochloric acid is a gas which escapes from salt when it is treated with sulphuric acid, it was naturally regarded as the spirit of salt. In the manufacture of sodium carbonate (see SODA) by the process in most common use, salt is first treated with sulphuric acid, by which it is converted into sodium sulphate. In this stage of the process hydrochloric acid is necessarily formed in large quantity. Formerly this was allowed to escape into the air, but its effects upon vegetation were injurious, and the manufacturers were compelled by law to prevent the escape of the gas. This is now accomplished perfectly by causing the waste gases to pass through towers filled with bricks so arranged as to present a maximum of surface, over which water is kept constantly passing. The gas dissolves in the water with great ease, and the solution thus obtained, which is somewhat colored, is commercial hydrochloric or muriatic acid. The pure acid is made by passing the pure gas into distilled water. Hydrochloric acid gas is colorless and transparent. In contact with air it forms clouds, owing to its great power of combining with water. It has a sharp, penetrating smell and taste, and when inhaled it causes suffocation. At ordinary temperatures one volume of water dissolves 450 times its own volume of the gas. The gas does not burn, nor does it support combustion. Hydrochloric acid finds extensive applications in the laboratory and in the arts. For a long time it was supposed that it must contain oxygen (see CHLORINE), but after elaborate study it was found that it contains only the elements hydrogen and chlorine in the proportions represented by the formula HCl.

IRA REMSEN.

Hydrochœ'idæ [Mod. Lat.; *hydrochœ'rus* (Gr. *ὕδωρ*, water + *χοῖρος*, pig) + patronymic suffix *-ίδαι*, descended from]: a family of rodents distinguished by their large size, the great oval anteorbital foramen, and the structure of the four molar teeth, and especially by the union of the alveolar portion of the maxillary bone with the squamosal about the level of the condyle; the clavicles are obsolete; the fibula and tibia separate from each other; and the nails are blunt and somewhat hoof-like; the hair is scant and harsh. This family is established for the reception of the capybara of South America, which is by far the largest of living rodents. As indicated by the name, it frequents the water, and its aspect somewhat (but very slightly) resembles that of a hog. Unlike other rodents, it has not a "squat" body, with limbs much flexed, but it walks with its limbs extended from the body at about the same angle as do the large quadrupeds.

THEODORE GILL.

Hydrocyan'ic Acid [*hydrocyanic* is from *hydro-*, compounding form of *hydrogen* + *cyanic*, deriv. of *cyanogen*]: an acid (also called *cyanhydric acid*, *prussic acid*) which is a most deadly poison to both animals and plants. In the anhydrous state it is one of the most active destroyers of life known, a single drop put on the tongue killing a large dog in a few seconds, and death being even caused by breathing its fumes. Even the medicinal preparation, a dilute aqueous solution containing 2 per cent. of the anhydrous acid, is a violent poison, and must be used cautiously. In excessive dose the symptoms are merely those of the act of death. The sufferer falls as if struck by lightning, all the vital functions being apparently arrested simultaneously. In less dose death ensues by failure of breathing after a brief interval of from a few minutes to half an hour of convulsion or paralysis and collapse. The nature of the poisonous action is not yet thoroughly made out. There is no chemical antidote, and in cases of poisoning by accident or malice, death is generally so speedy that all remedies are too late. Ammonia, atropine by subcutaneous injection, artificial respiration, and alternate dashings of hot and cold water on the chest, are the means that offer most hope. Medicinally the dilute acid is useful to arrest nausea and vomiting, allay cough, and, locally applied, to relieve irritation and itching of the skin.

EDWARD CURTIS.

Hydrodynamic Engines: See HYDRAULIC ENGINES.

Hydrodynam'ics [from Gr. *ὕδωρ*, water + *δυναμικός*, pertaining to power, deriv. of *δύναμις*, power, deriv. of *δύνασθαι*, be able]: the science which treats of the laws of flow, impulse, and power of fluids. By some writers the term is applied to air and water only, and by a few to water only. The word, like its synonyms, hydromechanics and hydrokinetics, is but little used. The flow of water is treated in the article HYDRAULICS, and the expansion and flow of gases under THERMODYNAMICS.

Hydrofluoric Acid: See FLUOHYDRIC ACID and FLUORINE.

Hydrogen [from Mod. Lat. *hydroge'nium*, liter., water-generator; Gr. *ὕδωρ*, water + *-γεν-*, root of *γεννᾶν*, to beget, produce, and *γένος*, birth]: an elementary gaseous substance having neither color, taste, nor odor.

History.—The ancients believed water to be an elementary substance. In the sixteenth century Paracelsus discovered that iron and sulphuric acid engender together an aëriform body or gas. In 1672 this was observed, by both Mayenne and Boyle, to be combustible. It was henceforward known as inflammable air, until Lavoisier, after the discovery of its chemical nature and origin, called it *hydrogen*, or water-generator. In 1700 Lemery discovered that it explodes in admixture with air. Henceforth it was regarded as being or conveying the principle of fire, and under the famous theory of Stahl was believed to be wholly or chiefly composed of

the so-called *phlogiston*. In 1766 the English chemist Cavendish first took up its investigation, and quickly discovered that when burned it produces water. Two other chemists, Macquer and de la Metherie, recorded the same observation at the same date. Not until 1781, however, did Cavendish complete the discovery by burning together *oxygen*—previously discovered, in 1774, by Priestley—and hydrogen, and finding that the sole product was water. James Watt is also believed to have made the same discovery, independently, in this same year (1781).

Occurrence in Nature.—Many authorities assert that hydrogen is never found free in nature upon the earth. It certainly exists, however, in volcanic gases. H. Rose and others have asserted that the gas found compressed in the decrepitating salt of Wieliczka contains free hydrogen. Graham found it, in the condition he called "occlusion," in the iron of aërolites. De Candolle made the remarkable statement that certain fungi evolve free hydrogen night and day. The spectroscope detects hydrogen in the chromosphere of the sun and in many other stars; also in certain nebulæ. Water contains one-ninth of its weight, or 11·11 per cent., of hydrogen. Steam and water in other vaporous forms contain an amount of hydrogen which, when set free in gaseous form, is found to assume, at the same temperature, exactly the volume of the vapor itself; gaseous water being made up of two measures, or volumes, of hydrogen, and one of oxygen; the three measures condensing, in combining, to two measures. Steam therefore contains its own volume of hydrogen. Liquid water, however, contains 1,238 times its volume of free gaseous hydrogen. Hydrogen occurs also in nature in combination with nitrogen, as ammonia; with carbon, as marsh-gas, the chief constituent of the gas of gas-wells and of the fire-damp of coal mines, which, of all known compounds, is the richest in hydrogen, containing one-fourth of its weight, or more than twice as much as water. It also contains twice its own volume of hydrogen. Hydrogen occurs with carbon also, as petroleum and paraffin; and as an essential constituent of most of the solid tissue of organic beings, both animal and vegetable; and therefore of all mineral substances of organic origin, such as coal, asphalts, bitumens, mineral resins and resinoids, etc. In volcanic gases it occurs as muriatic acid gas; also as sulphuretted hydrogen under many circumstances; and, some believe, also in combination with phosphorus, as native phosphuretted hydrodgen.

Preparation.—Hydrogen gas may be obtained from water by many methods, of which there are *seven* principal ones: 1. The method of Paracelsus, with iron (or zinc, which is oftener now used) and a dilute acid, generally either sulphuric or muriatic acid. This is the most common method, but yields generally an impure and very malodorous hydrogen, contaminated by combination with the impurities of the metal and acid used. In the case of iron, important quantities of volatile and gaseous hydrocarbon compounds are formed with the carbon of the iron, and it is doubtful whether pure hydrogen can be obtained by any modification of this method, unless possibly by the use of zinc of chemical purity, which must then be mixed with platinum to produce voltaic currents, or else it will decompose the acidulated water but very slowly. 2. Metals whose oxides are soluble in caustic alkaline solutions, such as zinc and aluminium, will decompose water and evolve hydrogen when warmed with such alkaline solutions. With aluminium free from carbon, hydrogen thus prepared should be pure. 3. The alkali metals, such as potassium and sodium, decompose pure water directly by appropriating its oxygen and setting the hydrogen free—a method useful only as a lecture experiment. 4. Metallic iron, when incandescent, will decompose steam, with formation of magnetic oxide of iron and free hydrogen. This method is not to be recommended in practice. The action is very quickly retarded, and becomes sluggish, from the coating of oxide formed over the iron. 5. A far more rapid and practicable method is arrived at by substituting for the iron some form of mineral or artificial carbon. Hydrogen is thus obtained in admixture with carbonic oxide. Unless the temperature be very high, more or less carbonic acid is also formed. At very high heats, a mixture of about two volumes of hydrogen with one volume of carbonic oxide, and but a small percentage of carbonic acid, may in this way be prepared on a large scale from steam. This is known technically as "water-gas," and is used extensively for heating and illuminating instead of coal-gas. 6. By "dissociation," or the method discovered by Grove in 1846—that is, by the direct decomposition of steam by a high heat, which will furnish a mixture of oxygen and hydrogen. 7. By electrolysis of water containing in solution some substance which increases its conducting power for the voltaic current. Hydrogen is then evolved from the cathode or negative electrode, and may be collected in a state of purity.

Hydrogen is also a product of the destructive distillation, at incandescent heats, of all organic substances. Thus common coal-gas contains 40 per cent. or more of this gas as a proximate constituent.

Hydrogen is the lightest known gas, and of course, therefore, the least dense of all known substances. Air being 1, its density is 0·0693, but water being 1, its density is only 0·00008974. One cubic foot weighs 39·1545 grains, an equal volume of air weighing 565 grains; hence its use sometimes for filling balloons. Air is 14·43 times as heavy as hydrogen, and water is 11·143 times as heavy. The metallic mineral platiniridium, the heaviest known substance (sp. gr. = 23), is over 256,000 times as heavy as hydrogen, the lightest. Pure hydrogen is colorless, inodorous, and tasteless. It is not directly poisonous when inhaled pure, death ensuing from mere absence of oxygen; but it should never be inhaled unless certainly pure, the contaminations that are incident to it being often highly poisonous. A person breathing it speaks with a peculiar squeak. If hydrogen, cooled by a bath of boiling air, is allowed to expand at a pressure of 200 atmospheres, a liquid jet of the substance can be seen. The critical temperature of hydrogen is — 233° C.; its boiling-point — 243°. The great tenuity of hydrogen gas gives it a great penetrative or rapid *diffusive* power; many solid metals are readily penetrated or permeated through their pores, iron being one of these. When there is an adhesive attraction —or, it may be, a feeble chemical affinity—between hydrogen and the metal, the former may become largely condensed in the pores of the latter. This condensation, called by Graham "occlusion," occurs with iron (as in meteoric iron), but much more notably with palladium, which Graham caused to condense and retain 600 or 700 times its volume of hydrogen, forming what he imagined to be of the nature of a metallic alloy; whence he believed hydrogen passed here into a *metallic* form, called by him "hydrogenium."

Hydrogen, in its tendency to combine directly under normal pressures and temperatures with other elements, is almost as passive and inert as nitrogen; the only element toward which it manifests much activity being chlorine. With this it does not combine spontaneously in the dark, but light causes an immediate combination to form hydrochloric acid gas; and direct sunshine will even set up rapid and explosive combustion. When mixed with oxygen or air no combination takes place spontaneously, but contact with certain metals causes a condensation and combination, to form water, on the surfaces of such metals, developing heat; which may easily be so managed as to raise the metal to incandescence, and thus cause the gaseous mixture to kindle throughout, with explosion if confined. This phenomenon, discovered by Döbereiner, furnishes the principle of what is known as Döbereiner's "hydrogen lamp," in which a jet of hydrogen, generated in a self-regulating reservoir of that gas, may be emitted into the air, and the gaseous combustible mixture thus formed caused to impinge on a small mass of platinum in spongy form, which latter instantly becomes red hot and kindles the hydrogen jet. Thus fire may be at any moment obtained. At temperatures higher than normal, hydrogen will combine with some other elements, as with sulphur at the boiling-point of the latter, to form sulphuretted hydrogen, and with bromine and iodine, at a red heat, to form the corresponding hydracids. Even with carbon, at the intense temperature of the voltaic arc, it was found by Berthelot that a tendency to direct combination was developed, one product being acetylene gas. There are other cases in which hydrogen enters directly into combination—namely, when in the act of being evolved from water by the agency of a metal or of electrolysis, or in what has been called the "nascent state." Under these conditions it will even manifest sufficient activity to decompose other existing combinations present in the liquid, and appropriate their elements. It will thus take up, for example, *arsenic* and *antimony*, and carry them along with itself in gaseous combinations. This is the principle on which is founded the well-known "Marsh's test" for arsenic and antimony, which is of great toxicological importance.

Revised by Ira Remsen.

Hydrogen Peroxide, called also **Bioxide, Binoxide, Dioxide, Deutoxide of Hydrogen**, and **Oxygenated Water** [respectively from *per-*, highest (from Lat. *per-*, very), *bi-* (= Lat. *bi-*, two, double), *bini-* (= Lat. *bini*, two by two), *di-* (= Gr. δι-, δις-, double), *deuto-* (from Gr. δεύτερος, second) + *oxide*]: an oxide of hydrogen discovered in 1818 by the French chemist Thenard. He found, when peroxide of barium, BaO_2, was added in the cold to dilute hydrochloric acid, HCl, instead of a decomposition, such as might have been anticipated, $BaO_2 + 2HCl = BaCl_2 + H_2O + O$—that is, the formation of neutral chloride of barium and water, with a setting free of the second equivalent of oxygen of the peroxide—that no oxygen appeared to be set free at all; and he was finally led to the discovery that the reaction is as follows: $BaO_2 + 2HCl = BaCl_2 + H_2O_2$, a new compound being formed, containing twice as much oxygen as water. By a long, complex, and laborious process of alternate purifications and concentrations, Thenard finally obtained the hydrogen peroxide almost free from excess of water, and almost of the composition stated, containing 475 times its volume of oxygen over and above that of the water itself. Pelouze afterward devised a simpler method, founded on the use of hydrofluoric or hydrofluosilicic acid (instead of hydrochloric), which acids precipitate the baryta at once in an insoluble form. The final concentration, for separation of intermixed water, is effected *in vacuo* over oil of vitriol, by reason of the fact that the new compound, though volatile without decomposition, is nevertheless less so than water itself. The resulting product is transparent and colorless, with a density = 1·452, nearly half as high again as water; not freezing at 22° F. below zero; tastes like tartar-emetic; and makes itching sores on the skin. It breaks up spontaneously at ordinary temperatures into water and free oxygen when pure, but the presence of acids makes it more stable, and that of alkalies less so. Cold preserves it. By suddenly heating it to the temperature of boiling water oxygen is evolved with explosive rapidity. Mere contact with certain substances, as charcoal, some metals, and some oxides, sets up more or less violent decomposition, often with strong evolution of heat. On many substances it acts as a most powerful oxidizer, converting them into their highest oxides. Among these are arsenious and sulphurous acids. Sulphide of lead becomes sulphate. Arsenic, molybdenum, chromium, and selenium are at once converted into their highest oxides. On the other hand, on another class of substances this peculiar compound actually operates as a powerful reducer, as on argentic and mercurous oxides, manganic and plumbic peroxides, chromic and permanganic acids; oxygen being evolved simultaneously from the oxide operated on and from the peroxide of hydrogen itself. Brodie first (in 1850), and Schönbein afterward, proposed the view that in the cases in which peroxide of hydrogen and another oxide decompose each other, the two compounds contain oxygen in two different "allotropic" modifications, represented as positive and negative (+ and — oxygen), and that the ordinary molecule of oxygen set free was produced by the combination of these positive and negative molecules. This view is, however, no longer held. The molecule of oxygen is believed to consist of two atoms of the same kind that are combined with each other just as two atoms of different kinds are in such a compound as hydrochloric acid. Hydrogen peroxide has been found also to be formed in many cases of slow oxidation of moistened substances, such as metals. It bleaches indigo and decomposes iodide of potassium, with liberation of iodine, easily detectable by starch. It also decolorizes a solution of permanganate of potash by reduction. With chromic acid it forms perchromic acid; and one method of detecting it in a liquid is to add chromic acid and ether, whereupon the latter is colored bright blue by perchromic acid, in its presence.

The discoverer of peroxide of hydrogen, Thenard, proposed its use—after testing it personally—for restoring paintings which had become dim through the conversion of the white lead carbonate used in the pigments to black sulphide of lead. The latter is at once converted by it into white lead sulphate. It is stated that it has been largely sold, in France at least, for bleaching living human hair, in accordance with certain dictates of fashion. It is used for bleaching ostrich-feathers, bones, ivory, silk, wood, cotton, etc. It is, further, valuable in medicine, as in syphilitic and scrofulous sores, in diphtheria, and, in general, in the treatment of purulent discharges. It has been recommended for the purpose of bleaching teeth that have become discolored. The chief objection to the use of hydrogen peroxide in medicine is that it is difficult to keep solutions of constant strength. Recently, however, the difficulty appears to have been largely overcome.

Revised by Ira Remsen.

Hydrographic Office: an office both of the Navy Department of the U. S. and of the Board of Admiralty of Great Britain, having for its object the improvement of the means of navigating safely the vessels of the navy and of the mercantile marine. See Hydrography.

Hydrog'raphy [as if from Gr. **ὑδρογραφία*, water-writing; *ὕδωρ*, water + *γράφειν*, write]: that part of the science of physical geography which pertains to the waters of the earth's surface. It describes the river systems, the annual regimen of streams, their function as agents for the sculpture of the land, and the conditions under which their courses are modified. It describes the lakes, the oscillations and motions to which they are subject, and the processes by which they are created and destroyed. It describes the oceans, with their dependent gulfs, seas and straits, the tides by which they are swayed, and the great currents, by means of which they diversify climates and regulate the distribution of marine life and marine sediments. See Deep-sea Exploration, Gulf Stream, Lakes, Ocean, Rivers, and the names of the several oceans.

G. K. G.

Hydrography, or the art of marine surveying, includes the investigation and charting of the depths, shoals, and shore-lines of oceans, lakes, rivers, harbors, and other bodies of water. The resulting charts are intended, primarily, for practical use by navigators, and especial pains are therefore taken to represent correctly and as graphically as possible the configuration and character of the bottom (especially where the water is shoal), the best channels for entering and leaving port, and the position and character of all aids to navigation, such as lighthouses, light-ships, and buoys, as well as the life-saving stations along the coast. In connection with the charts there are published certain manuals or guide-books also, such as the sailing directions, coast pilots, and light lists, which contain much additional information, more or less essential to the navigator. Moreover, the continued revision of such charts and books is a never-ending work, owing not only to the additions made by more thorough surveys but to actual changes that take place in the configuration of regions charted, such as the gradual deepening or shoaling of the bar at the entrance of a harbor, the sudden formation of a dangerous shoal or island by volcanic action, or the extinction of a lighthouse or light-ship by a storm. In order to give prompt notice of such changes, pamphlets or leaflets are published, either periodically or at irregular intervals, with brief but exact detailed information regarding them. These pamphlets are called *Notices to Mariners*, and efforts are made to give them immediate and wide circulation among those especially interested.

By far the greater part of the hydrographic work that is going on is under the direction of the naval authorities of the various maritime nations. The hydrographic office of the Navy Department of the U. S. includes within its jurisdiction the cartographic, hydrographic, and marine meteorologic publications of the U. S. relating to the oceans and to foreign coasts; the execution of the marine surveys which the Navy Department is authorized by Congress to undertake; the receiving and taking charge of the results of surveys and of all remark-books and hydrographic information from all nautical sources, home or foreign; and the compilation and publication of such information in the form of charts and notices to mariners. An officer of the line of the navy presides over the office, which is organized in five divisions: chart construction, chart supply (with two sections —the British admiralty and the hydrographic office), sailing directions, marine meteorology, and branch offices, the last having charge of the printing, binding, and mailing of the blank forms and supplies and of the correspondence relating to the branch hydrographic offices at Boston, New York, Philadelphia, Baltimore, Norfolk, Savannah, New Orleans, Chicago, Portland (Ore.), and San Francisco. The chart-construction division is in charge of a civil assistant; the operations of the other divisions are directed by naval officers. Each of the branch offices is under the directorship of an officer of the navy, detailed from the main office with the approval of the Navy Department. They are supplied with charts covering the navigable waters of the globe, nautical works, light lists, and sailing directions, all corrected to date, sources of information which are thus made accessible to masters of all vessels reaching these ports.

Hydrographic work forms an appropriate part of the duties of naval vessels in time of peace. Each of the principal maritime nations has one or more naval vessels expressly fitted up and detailed for this sort of work, and every vessel in commission has orders to take advantage of every possible opportunity to verify and correct its charts and sailing directions. In addition to such naval vessels, work is done by the steamers and sailing vessels of the U. S. Coast and Geodetic Survey, such as the Patterson, Hassler, Blake, Bache, and Eagre, as well as of the well-known steamer Albatross, belonging to the U. S. Commission of Fish and Fisheries, which are officered and manned by the navy, although not under the naval administration.

Next in importance, perhaps, must be considered the data collected by the various exploring expeditions that are fitted out from time to time, of which the most notable is the celebrated Challenger expedition, whose published results are monumental both in quality and quantity, and whose organization and conduct have furnished models well worthy of imitation in planning future expeditions. In this category come also such expeditions as are occasionally sent out at private expense, with hydrography as one of the subjects to be investigated, notable examples of which are furnished by the enlightened liberality of Prince Albert of Monaco. The aggregate of the results of all such expeditions, both public and private, is so large as to give them the second place in the list of sources of original data.

In addition to the above, however, there are certain other important sources of information, notably the work of the many cable steamers belonging to the various telegraphic cable companies of the world. These vessels, of which there are thirty-seven in commission (of which seven belong to governments and thirty to private companies), do a great deal of reliable hydrographic work in the ordinary course of their duties in picking up and repairing cables, and still more when it is proposed to lay a new cable. The general route is first carefully projected, by reference to all available data, and then a very careful detailed survey is made by one or more of these steamers; the information thus obtained is ordinarily forwarded to some hydrographic office for publication, thus receiving wide circulation and adding largely to the general fund of information regarding the depths of the sea.

Among other sources of hydrographic data must be mentioned those government bureaus whose work, though not exclusively hydrographic, necessitates the collection and publication of considerable information relating to this subject. The most notable example of this is the Coast and Geodetic Survey (*q. v.*) of the U. S., of whose work the hydrography of the coasts of the U. S. and adjacent waters is an essential part; also, though to a less extent, the Corps of Engineers, U. S. army, charged with the improvements of rivers and harbors; the U. S. Commission of Fish and Fisheries, whose studies of the lives and migrations of fishes often necessitate the collection of special hydrographic data; and the U. S. lighthouse establishment, in connection with the placing and maintenance of lighthouses, light-ships, and buoys.

Finally, in addition to all of these, every sea-going vessel may at any time note some fact relating to hydrography which, if brought to the attention of the proper authorities and published, may make an important addition or correction to existing charts.

A hydrographic chart is so different in appearance, symbols, and purpose from ordinary maps that any one particularly interested in the subject should refer to one; this can be done at almost any library. The number published is very great, inasmuch as not only the various oceans but every little harbor must have its own chart. Thus every vessel must have general sailing charts and detailed harbor charts, so that for a naval vessel bound for a foreign station, with the possibility of visiting various coasts, the number of charts required may reach almost a thousand. To give an idea of the usefulness of the many soundings and symbols representing the character of the bottom, plotted in their proper positions all over the water-area on a chart, the following quotation from *The Atlantic Coast Pilot*, published by the U. S. Coast and Geodetic Survey, will be of interest:

"Among the irregularities of bottom which serve as indications of a vessel's position when approaching New York Entrance may be mentioned the soundings off the coasts of Long Island and New Jersey. The water shoals very gradually, going to the westward toward the latter coast, and very rapidly if standing to the northward, toward Long Island. From the peculiar position, also, of the two shores, relatively to each other and to the waters of New York Bay, it follows that the course which will deepen the water, if the vessel is on the Long Island side of the approach, will shoal it if she is on the New Jersey coast. This is very important in thick weather. The following rule, based upon the above fact, is safe and reliable: Striking 15 fathoms and in doubt as to position, steer SW. by S. If the water deepens, the vessel is on the Long Island shore; if it shoals gradually, she is on the Jersey coast. In the former case you may stand off and on, taking care *not* to go inside of 12 fathoms, and so work up toward the light-vessel. In the latter case the ship's head should at once be put off-shore (as nearly E. by S. as possible), and you should stand off in that direction until the soundings give 20 fathoms, which is at a safe distance from land. A stranger finding himself on the Jersey coast in thick weather should not attempt to run in toward the light-vessel, but should keep off-shore until the weather clears up."

It may be added also that some further clue to the vessel's position is given by the specimens of bottom brought up by the lead, as it is stated all over the chart whether the bottom is clay, gravel, mud, ooze, pebbles, rocks, sand, etc., with the color and nature of the material.

The *Notices to Mariners* are issued periodically, generally weekly, by the principal nations, and irregularly and less frequently by other nations. They are mailed at once to local maritime exchanges, newspapers, steamship and shipping companies, etc., and to all foreign hydrographic offices, where, in many cases, they are republished. Similarly with new charts and new editions of old charts, which thus become useful to navigators of every nationality. In all this work nations take part about in the order in the importance of their shipping, Great Britain leading, followed by France, the U. S., Germany, Russia, Spain, Italy, Holland, Denmark, Sweden and Norway, etc. Distant provinces generally publish their own *Notices*, sometimes regularly, as in India, Canada, Australia, New Zealand, and Batavia, and sometimes only occasional notices are published, as in Hong Kong, Ceylon, Jamaica, etc.

The outfit of a steamer engaged in hydrographic work consists of astronomic sextants (with standards and artificial horizons), chronometers, and a portable transit instrument for astronomic work; theodolites, heliotropes, base-line battens, steel tapes and chains, and plane tables used for triangulation, together with scantling, sheeting, and whitewash, for use in building signal-stations; a surf-boat specially fitted with air-tanks and water-tight compartments, enabling the triangulator to land in safety upon most forbidding shores and with dry instruments; steam-launches, and air-tanks of sufficient buoyancy to keep the launches afloat with a full crew, even when full of water, fitted with stages for the leadsmen and a wire reel for sounding work; also an instrumental outfit, consisting of a compass, two sextants, a three-arm protractor, a clock, a record-book, lead-lines, a patent log, and a boat-sheet. For soundings less than 40 fathoms the deep-sea lead is used by the ship. The lead-line is rove through a single block aft, and thence by snatch-blocks to the reeling-engine on deck. The lead itself is hung in a trigger-block, that can be hauled forward to the forecastle along a traveling jackstay rigged out beyond the ship's side, and there let go at an order from aft. Up to 40 fathoms soundings can thus be taken without stopping the ship, merely allowing a little for an up-and-down cast, according to speed and sea.

For greater depths than 40 fathoms the wire sounding-gear is used. This consists in the main of a steel drum upon which is wound about 2,000 fathoms of piano-wire, and to the free end of this, with some stray line, is attached the lead. To this drum there is attached a hand-brake, and it is also connected up by a clutch-coupling to a little steam-engine for reeling in.

"For sounding with wire (says Lieut. J. M. Ellicott, in describing the work done by the Ranger on the coast of Lower California) the ship has to be stopped dead in the water at each cast, but can start ahead again as soon as the lead strikes bottom, the lead and wire trailing astern as it is reeled in. The time lost is thus mainly due to losing and regaining headway. The depth is registered by turns of the drum, each turn throwing off a fathom of wire at its circumference, a table of corrections being used when the amount of wire on the drum makes an appreciable difference in its diameter. Into the face of the big leads is screwed a brass

cup of peculiar design, intended to bring up specimens of the bottom.

"Then comes the preparation of the working sheets. The main triangulator plots his stations, and all prominent objects he has been able to fix, upon a convenient scale, say half an inch to the mile. The sheet is then taken in hand by the secondary triangulator, who plots upon it the more numerous shore-signals. The sheet is then ready for use by the ship in running her lines of soundings, while two copies of it are made by the draughtsman for the use of the launches. The system of lines intended to be run are sketched in on these boat-sheets for the guidance of the officers conducting the soundings. The system usually adopted is that of lines normal to the general trend of the coast. The steam-launches run these lines half a mile apart from the shore to a distance of 3 miles, or farther if a depth of 10 fathoms is not then reached. The little boats take alternate lines in order to be near one another in case of accident. The ship takes up the work 3 miles off-shore and carries the soundings to seaward until a depth of at least 100 fathoms is obtained. The ship's lines are a mile apart. Soundings in the launches are taken every tenth of a mile (about 200 yards) from the shore outward until 10 fathoms are reached, then every quarter of a mile to 20 fathoms, and above that the interval is half a mile, up to 50 fathoms. These intervals are also observed on board ship and increased as the water deepens beyond 50 fathoms, the distance between lines being also increased."

The report of the hydrographer to the British admiralty made in 1893 shows that during 1892 there were six naval vessels, two hired steamers, and one colonial gunboat engaged in hydrographic work; three of these were working along the coasts of the British isles, one in the Gulf of St. Lawrence, one along the east coast of Africa and west coast of Greece, two in China and the East Indies, one in Australia, and one in the New Hebrides. Their crews aggregated 66 officers and 627 men. The expenses of the surveys in Australia and the Gulf of St. Lawrence are shared by the imperial and colonial governments, and naval surveying officers are also employed, with the sanction of the admiralty, under the Indian Government and that of the Dominion of Canada.

In addition to the soundings taken by men-of-war and government surveying vessels, an enormous number of soundings are taken by vessels engaged in laying submarine cables, as mentioned above. There are about 120,000 miles of submarine cable, of which governments own about 12,000 miles and private companies 108,000. The cable fleet of the world consists, according to Mr. H. L. Webb, of thirty-seven vessels, of which ten belong to construction companies and twenty-seven are repair steamers, the property of various government and private telegraph companies. The Silvertown and Faraday are the largest, being of 4,935 and 4,916 gross tonnage respectively, while the Scotia is a close third (4,667). The best known of the repairing steamers is the Minia, which patrols the North Atlantic, with headquarters generally at Halifax.

The incidental but often important hydrographic work done by government bureaus other than hydrographic offices may be illustrated by a brief reference to some recent work of the U. S. Commission of Fish and Fisheries. The special object of the work, which was in charge of Prof. William Libbey, Jr., was to determine the relation between the cold and warm currents off the New England coast, in order to ascertain whether changes in these relations affect the movements of schools of fish. In the season of 1890 the Fish Commission schooner Grampus, the Coast Survey steamer Blake, and a party on the Nantucket New South Shoal light-ship, co-operated in carrying on this work, the general plan followed being to run north and south lines, at intervals of ten minutes of longitude and 120 miles long, upon which, at intervals of ten minutes of latitude, stations were established where temperature observations were made at surface and at various depths. Certain important conclusions were reached, and these were confirmed and supplemented by the following season's work, with results of scientific and economic importance. Finally, navigators may, and many do, send in reports of their own observations, each thus adding a little to the sum of our knowledge and to the completeness and accuracy of our charts.

EVERETT HAYDEN.

Hydroi'da [Mod. Lat.; Gr. ὕδρα, hydra + εἶδος, form, likeness]: an order of cœlenterate animals belonging to the class HYDROZOA (*q. v.*). With half a dozen exceptions the species are marine, and many forms are noticeable, not only from the fact that they form large colonies, but from the differentiation of the different members of the colony, in some cases there being individuals set apart for each of the functions of eating, defense, and reproduction. The frequent occurrence of an alternation of generations adds to the interest. The various relationships involved are best understood by considering first the simpler types and then proceeding to the more complex.

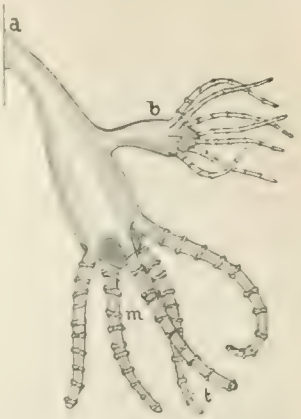


FIG. 1.—Fresh-water *Hydra* slightly contracted: *a*, point of attachment; *b*, a bud; *m*, mouth of parent hydra; *t*, tentacles.

About the simplest form of hydroid is the common fresh-water HYDRA (*q. v.*), in which the cylindrical body consists of a two-layered sac, bearing a circle of tentacles surrounding the terminal mouth. The outer wall of the sac (ectoderm) is protective and sensory; the inner (entoderm) is digestive in function. *Hydra* reproduces itself in two ways, by eggs and spermatozoa (sexual reproduction) and by budding (asexual reproduction). In the latter a small outgrowth appears on one side of the body; gradually it becomes larger, tentacles appear, and finally a mouth breaks through. (See Fig. 1.) For a time the two individuals thus formed remain in connection, there being no separation between the digestive cavities of the two, and we thus have a colony in its simplest expression. The buds, however, separate sooner or later and form distinct individuals. In the regularly colonial hydroids, on the other hand, most of the individuals—here called zooids or polyps—remain connected to each other, either directly or by the intervention of a common stem. When this stem is upright it is a "hydrocaulus"; when it creeps along in a root-like manner upon rock or seaweed it is a "hydrorhiza." In either case it is tubular, and its cavity is the common digestive tract for all the zooids of the colony, so that the food taken by one may be utilized by all the others.

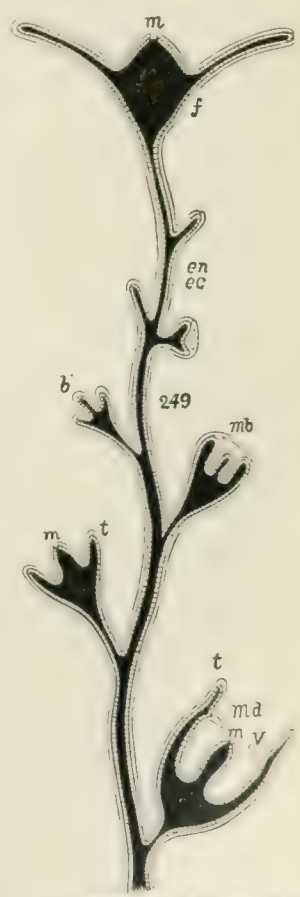


FIG. 2.—Diagram of section of a colony of hydroids. At the top a feeding zooid, *f*, with a terminal mouth and a tentacle on either side. On the left are younger feeding zooids in various stages of development; on the right different stages of reproductive zooids, the latter budding. Ectoderm white; entoderm [illegible]; the tubular digestive cavity black; *m*, mouth; *t*, tentacle; *en*, velum; *md*, medusa bud; *med*, nearly ripe medusa.

In most of the colonial hydroids a second type of zooid is present. Besides the individuals which are for feeding purposes, and which are provided with tentacles and a mouth on the end of a proboscis of varying length, there are others whose business is sexual reproduction. In the typical species these reproductive zooids differ much from the feeding zooids, and usually they separate sooner or later and henceforth lead a free life

as "jellyfish" or medusæ. These medusæ form the eggs and sperm-cells, which in turn develop into fixed colonies.

Fig. 3.

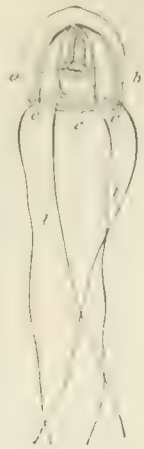


Fig. 4.

Fig. 5.

Fig. 3. One of the zooids *Syncoryne mirabilis*, enlarged: *o*, mouth; *c*, body; *t*, tentacles; *d*, a medusa bud not fully developed (Agassiz).

Fig. 4.—Mature free medusa of *S. mirabilis*: *o*, mouth; *b*, a radiating tube; *c*, circular tube; *e*, velum; *t*, tentacles (Agassiz).

Fig. 5.—*Obelia commissuralis*, a gonotheca and two hydrothecæ, enlarged (Agassiz).

The medusæ buds arise from different portions of the colony in different species. Thus in some (Fig. 3) they may arise from the zooids; again (Fig. 5), they can arise from the hydrocaulus; while in still other instances they may occur on the hydrorhiza.

Wherever found the medusæ consist of a gelatinous "bell" or "umbrella," in the center of which, corresponding to the clapper in position, is a proboscis with the mouth at the end. Inside the proboscis is the principal digestive cavity, while from the point of its attachment canals, typically four in number, radiate to the margin of the bell. These radial canals here empty into a "ring canal," which follows the margin of the bell, connecting them all together. This whole canal system is lined with entoderm, and is connected with the central digestive cavity, so that by means of it partially digested food is conveyed to all parts of the animal. From the margin of the bell depend tentacles, the number of which varies within wide limits. Only exceptionally are there less than four (*Hybocodon*), and except in these cases one tentacle is exactly opposite each of the radial canals, the others when present being interpolated between these. The special sense organs are situated around the margin of the umbrella, and consist of colored eye-spots and so-called ears. These latter are more or less sac-shaped and contain one or more hard strictures (otoliths), which in some medusæ are derived from the ectoderm, in others from the entoderm. The aperture of the bell is partially closed (Fig. 4) by a membrane (velum), with a circular opening in the center. From the presence of this velum the hydroid jellyfishes are often called craspedote, while the scyphozoan jellyfishes, which lack it, are acraspedote. A matter of deeper significance is that in the hydroid medusæ the œsophagus is lined with entoderm, in the others with ectoderm. The sexes are separate in the medusæ. The reproductive bodies (gonads) lie on the under surface, and are always placed between the ectoderm and the entoderm. In some they occur upon the proboscis (Fig. 4), in others they are upon the radial canals (Fig. 11).

From the typical conditions already described, variation can occur in almost every direction. Thus in the fixed condition, the whole colony may be entirely naked, or the ectoderm of the hydrorhiza and hydrocaulus may secrete a horny covering (perisarc) as a protection, and finally this perisarc may be continued into cups (hydrothecæ) for the feeding zooids, and into cases (gonothecæ) for the medusa buds (Fig. 5). Usually the perisarc is ringed near the attachment of branches and thecæ. On the other hand, the connecting stalk can be greatly reduced, and the thecæ correspondingly crowded together as in Sertularia (Fig. 12) and Plumularia. Modification in another direction is found in the Hydrocorallinæ, where the protective layer is composed of carbonate of lime, but so united are the various members of the colony that the perisarc now forms a solid coral.

An even greater range of variation occurs in the relations of the medusæ to the colonial forms. Typically these separate, and while maturing the reproductive products they swim freely through the water. In other cases fully formed medusæ are produced, but they never leave the parent; but usually in these cases the medusæ are more or less reduced, so that careful study is necessary to show that they are

Fig. 6.

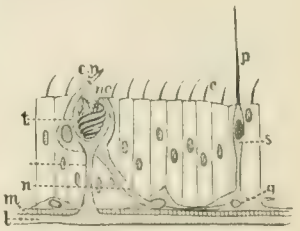


Fig. 7.

Fig. 6.—*Hydractinia polyclina*, part of female colony enlarged: *a*, nutritive zooid; *c*, defensive zooid; *d e f*, medusa buds containing eggs in different stages of development (Agassiz).

Fig. 7. Diagram of the mechanism of a nettle-cell after von Lendenfeld: *nc*, a nettle-cell with its thread coiled inside; *cn*, the trigger, contact with which discharges the thread; *g*, ganglion-cell; *p*, a tactile hair.

really present. This reduction reaches nearly its extreme in genera like *Clava* and *Hydractinia* (Fig. 6), where the sole recognizable feature of the medusæ (aside from the genital products) is the reduced proboscis; an intermediate condition is found in the Tubulariæ, like *Parypha* (Fig. 10), where the reduced but still recognizable medusæ, hanging in long racemes, consist each of a proboscis without a mouth and a greatly modified bell.

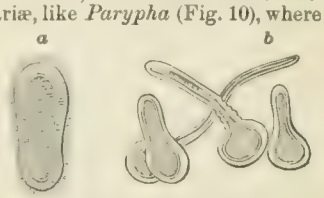


Fig. 8.—Embryos of *Melicertum campanula*: *a*, planula; *b*, embryos just attached, much enlarged (A. Agassiz).

In some forms the complication of the colony extends still further. Thus in *Millepora* and *Hydractinia* (Fig. 6) we have both feeding and reproductive zooids, and, besides, individuals without mouths, but with well-developed batteries of nettle-cells, so that these must be regarded as zooids specialized for offense and defense. Here a word may be said about the nettle-cells. These structures, which are characteristic of all Cœlenterates, consist of specialized cells, usually of the ectoderm, one end being drawn out into a long tube which is inverted and coiled up inside the rest of the cell, much as one might invert the finger into the palm of a glove. Inside the cell is a poisonous fluid. When stimulated by some object touching either the general surface of the body or a peculiar trigger-like structure connected with the nettle-cell itself (Fig. 7, *c n*), the cell is discharged, the long tube being everted and forced into the offending animal, carrying the poison into its tissues. In its physiological effects this poison is much like formic acid.

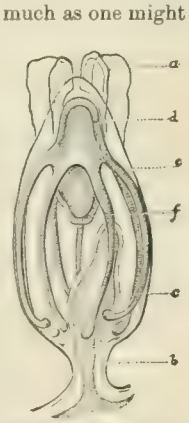


Fig. 9.—A female medusa bud of a Tubularian much enlarged: *a*, tentacles; *b*, pedicel; *c*, proboscis; *d*, body of embryo; *e*, tentacles; *f*, embryo (Agassiz).

In the development of the egg of the hydroids the following stages may usually be traced: The egg divides many times, and on the surface of the resulting embryo there become developed numerous vibratile hairs (cilia), by means of which the whole is propelled through the water. The cells of the embryo now divide parallel to the surface, thus differentiating an outer (ectoderm) from an inner layer (entoderm). The embryo is now in the stage called a "planula" (Fig. 8). After swimming about for a short time it becomes attached to some submerged object by one end, which becomes much enlarged, while the other end rapidly elongates, and later at its tip tentacles appear, and finally a mouth breaks through, and the first zooid of the future colony is formed. This now takes food and forms

new buds, which in turn grow tentacles and mouths. Sooner or later reproductive buds are formed from which numbers of more or less completely formed jellyfish arise, and these latter produce the eggs which are to form the new generation. We thus have an alternation of generations. From an egg arises a feeding zoöid, which produces asexually a number of reproductive zoöids (medusæ), which in turn produce eggs. In some instances this may be still further complicated by budding in the medusæ, etc. In Tubularia and a few allied forms a modifications in development is introduced in that here the egg before leaving the medusa bud, here called a "sporosac," undergoes a large portion of its development, and when it escapes (Fig. 9) the embryo (known as an actinula) may be compared to a free hydra with greatly reduced body. This actinula swims about freely or walks about upon its tentacles, and finally becomes affixed and grows into a colony much as in other forms.

The following classification represents well the present condition of our knowledge:

Order I. Hydridæ. Small, solitary, or forming small colonies, reproducing by budding and by eggs; no medusa stage. *Hydra* (Fig. 1).

Order II. Hydromedusæ. Colonial forms with at least dimorphic individuals; sterile feeding zoöids and reproductive zoöids, the latter either separating and swimming freely as craspedote medusæ or remaining, in a more or less reduced condition, attached to the colony. In some cases the fixed colonial conditions are lacking.

Fig. 10.—*Parypha crocea*, one of the zoöids, with clusters of medusoid buds (sporosacs), about natural size (Agassiz).

Sub-order I. Hydrocorallinæ. Colonial forms with calcareous skeleton, medusæ never separating from the colony. *Millepora.*

Sub-order II. Tubulariæ. Colonies naked or with a chitinous perisarc which covers the hydrocaulus alone. When free-swimming medusæ are formed these have no ear-sacs, and the reproductive bodies are in the outer wall of the proboscis (Fig. 4). Here belong *Tubularia*, *Parypha*, *Syncoryne*, *Hydractinia*, etc.

Sub-order III. Campanulariæ. Colonies covered with a chitinous perisarc, which is expanded to form cups (thecæ) protecting the zooids (Fig. 5). When free-swimming medusæ are formed these have the reproductive bodies on the radial canals (Fig. 11), and the ear-sacs, when present, have ectodermal otoliths. Here belong *Obelia*, *Campanularia*, *Clytia*, *Æqueria*, etc. Possibly near these should be placed the Sertulariæ (Fig. 12) and the Plumulariæ, but, from the fact that in these the medusæ have become extremely reduced, certainty is not possible. Even more uncertain in position are the fossil Graptolites (*q. v.*), which superficially somewhat resemble the Sertularians.

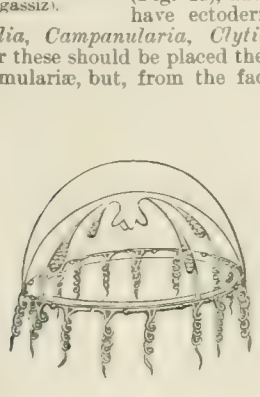


Fig. 11.

Fig. 12

Fig. 11.—*Cytia johnstoni*, the mature medusa, enlarged.
Fig. 12. *Sertularia pumila*, natural size.

Sub-order IV. Trachomedusæ. No fixed condition. Medusæ with ear-sacs containing entodermal otoliths. Gonads on the radial canals. Development directly into medusæ. *Geryonia*, *Rhopalonema*, etc.

Sub-order V. Narcomedusæ. No fixed stage. Medusæ with ear-sacs containing entodermal otoliths. Gonads on the wall of the proboscis. Radial canals often absent. Development direct, or with a metamorphosis. *Cunina*, *Solmaris*, etc.

The present tendency is to regard the medusoid condition the primitive one, and the fixed as a derivative from it. From this point of view the imperfect medusæ buds are to be explained as instances of degeneration, while those forms like Hydra, in which nothing comparable to a medusa is formed, represent the extreme of the process.

Literature.—Macready, *Medusæ of Charleston*, *Proceedings of the Elliot Society* (1856–60); Agassiz, *Illustrated Catalogue of North American Acalephæ* (1865); Hincks, *British Hydroid Zoöphytes* (1868); Allman, *Monograph of Gymnoblastic Hydroids* (1871–72); Haeckel, *System der Medusen* (1879); Brooks, *Life History of the Hydromedusæ* (1886).

J. S. Kingsley.

Hydrom'eter, Areom'eter, or **Gravim'eter** [*hydrometer* is from Gr. ὕδωρ, water + μέτρον, measure; *aræometer* is liter. measurer of porosity; Gr. ἀραιός, porous, rare, thin + μέτρον; *gravimeter* is from Lat. *gravis*, heavy + Gr. μέτρον, measure]: an instrument consisting of three parts: (1) a graduated stem of uniform diameter and cross-section; (2) a bulb; (3) a counterpoise or ballast. On being placed in a liquid it sinks until a certain point on the scale is on a level with the surface of the liquid, and from the reading of the scale at that point the specific gravity of the liquid is either ascertained directly or by a simple calculation. The principle of the hydrometer is simply that of the law of floating bodies—viz., that when a body floats the weight of the bulk of liquid displaced is equivalent to the weight of the body floated. The bulb is put on in order that the instrument may float, and the counterpoise or ballast insures its floating in an upright position. The stem is of small diameter, in order that small differences of specific gravities in liquids may show considerable differences on the scale. Hydrometers are usually of glass, though they are sometimes made of metal. Glass has the advantage of cleanliness, resistance to corrosion, incapability of fraudulent alteration except by an experienced worker in glass, and its facility of manufacture. Its fragility, however, is a point against it. Some of the first hydrometers constructed were made so that weights might be added to them, either in a pan at the top of the stem, or attached between the bulb and counterpoise, and therefore below the surface of the liquid. Fahrenheit's hydrometer is a sample of one having the pan at the top of the stem, to which weights may be added in order to sink the hydrometer to a certain mark. Such instruments are termed hydrometers of *constant immersion*, in contradistinction to those carrying a scale upon the neck, which are called hydrometers of *variable immersion*. The former class may be used for the determination both of solids and liquids (see article Gravity, Specific), the latter for liquids only. The hydrometers of Sikes and Dycas are hydrometers where the weights are added to the portion immersed in the liquid. The addition of weights in this way, by increasing the volume of the immersed portion, as well as the weight of the entire hydrometer, however, introduces considerable complication into the instrument, and renders it difficult of accurate adjustment. The Sikes and Dycas instruments have, however, been used as standards in the British custom-house for a considerable period. The Dycas hydrometer was ordered by the U. S. Congress as the official instrument in 1790, and was in use as late as 1844. This instrument possessed the advantage that by the addition of weights a considerable range might be given to the instrument. Nicholson's hydrometer is, like the preceding ones, of metal, and has not only a pan at the top of the stem for the reception of weights, but has also a pan just above the counterpoise for the reception of solids of which it may be desirable to determine the specific gravity. The majority of the hydrometers at present in use are invariable in size and weight, and are usually constructed of glass. Some of these are graduated, so as to read off directly in specific gravities. The hydrometers of Schmidt, of Berlin, constructed carefully on mathematical principles, have given his name to some instruments made on this plan; but usually hydrometers made on this plan have not the name of any individual attached to them. Wilson's or Lovi's beads are a peculiar form of hydrometer (if a number of bodies can be spoken of in the singular number). They consist of

Hydrometer.

a number of bead-like bulbs of glass, slightly differing from each other in weight or volume, each engraved with a number. The figures on the one which neither floats nor sinks, or barely floats or sinks, show the specific gravity of the liquid under examination. The Twaddell hydrometer is so graduated that the number of degrees indicated, multiplied by 5 and added to 1,000, give the specific gravity of a liquid referred to water as 1,000. The marine hydrometer for seawater has a range of 40°, the number of degrees indicating the third place of decimals in expressing specific gravities; thus 5° indicate a specific gravity of 1·005; 22°, of 1·022, etc. Hydrometers with an arbitrary scale are extensively used in certain manufactures or for testing the products of such manufactures, and are graduated with this object. Thus that of Brix (sometimes called a saccharometer) is graduated so as to indicate at once the percentage of sugar in an aqueous solution This is used by sugar-refiners on the European continent. Southworth's hydrometer, adopted some time since in the State of New York by act of the Legislature, has the zero-point at the point to which the instrument sinks in proof spirits (50 vols. of alcohol to 50 of water), and the graduations above and below indicate the percentages above or below proof. The hydrometer of Gay-Lussac (also called alcoholmeter) is graduated so that the readings give the percentage of alcohol by volume in an alcoholic solution, in which alone it is intended to be used. The temperature, which is an important factor in considering the indications of a hydrometer, is for Gay-Lussac's instrument, 15° C. or 59° F. A table of corrections for temperature has been published. The alcoholmeter of Tralles is essentially the same as that of Gay-Lussac, but is intended for a temperature of 60° F. This is now the official instrument for testing alcoholic liquors in the U. S. Numerous other hydrometers for testing alcoholic liquors have been devised, among which may be mentioned Richter's, which reads in percentages by weight of alcohol; Meissner's, which has two scales, one giving percentages by weight and the other by volume, etc. Dinacourt's galactometer is intended for use in testing samples of milk for watering. The 0 of the scale is at the point to which the instrument sinks in pure water; the 100, the point to which it sinks in pure milk, which ordinarily has a specific gravity of 1·029. The space between is divided into 100 equal parts, and the readings of the instruments show, with a close approximation to the truth, the amount of pure milk which the sample contains. The hydrometer of Balling is arbitrarily graduated, its indications being converted into specific gravities by the formula specific gravity $= \frac{200}{200 \pm n}$, in which n represents the reading of the hydrometer, the + sign being used when the liquid is lighter than water, the − sign when it is heavier. This instrument is widely used in Great Britain.

The instrument, however, which is most generally used, both here and abroad, is that of Baumé. Properly speaking, there are two instruments bearing the name of Baumé, the one for liquids lighter than water, the other for those heavier, and the scales do not correspond. For liquids lighter than water the zero-point is the point to which the instrument sinks in a solution containing 10 parts of common salt, by weight, in 90 of water, while the 10-mark is at the point to which the instrument sinks in pure water. The space between is divided into 10 parts, and the gradations are continued indefinitely. For liquids heavier than water the zero-point is the point to which the instrument sinks in pure water, and 15° is at the point to which it sinks in a solution containing 15 parts by weight of common salt in 85 of water. The space is divided into 15 parts, and the gradations are continued indefinitely downward. The first-mentioned instrument is called the *pèse esprit*, the latter the *pèse acide*. The formulas for converting the readings into specific gravities are—

For the pèse esprit, sp. gr. $= \frac{146}{136 + x}$	McCulloh, *Report on Hydrometers*, Pub. Doc. 50, 1848.	Sp. gr. $= \frac{144}{134 + x}$ Gilpin, and *U. S. Disp.*
For the pèse acide, sp. gr. $= \frac{152}{152 - x}$		Sp. gr. $= \frac{144}{144 - x}$

Numerous tables have been constructed by different scientific men, showing the specific gravities corresponding to the indications of the Baumé hydrometers. They differ somewhat among themselves, owing to the fact that the common salt used to standardize the instruments often contains impurities, which cause a slight difference in the indications. Moreover, the liquids used, in consequence of the attraction of the glass stem of the hydrometer, rise in a curve against it, so that it is difficult to determine the exact point which coincides with the level of the liquid, and errors of manufacture are thus introduced. The specific gravities corresponding to the indications of the Baumé and Beck hydrometers are given as follows (*Watt's Dict.*, vol. iii., pp. 209, 210):

COMPARISON OF THE DEGREES OF BAUMÉ'S HYDROMETER WITH THE REAL SPECIFIC GRAVITIES OF LIQUIDS HEAVIER THAN WATER, CALCULATED BY GILPIN'S FORMULA.

Degrees.	Specific gravity.	Degrees.	Specific gravity.	Degrees.	Specific gravity.	Degrees.	Specific gravity.
0	1·000	20	1·152	39	1·345	58	1·617
1	1·007	21	1·160	40	1·357	59	1·634
2	1·013	22	1·169	41	1·369	60	1·652
3	1·020	23	1·178	42	1·382	61	1·670
4	1·027	24	1·188	43	1·395	62	1·689
5	1·034	25	1·197	44	1·407	63	1·708
6	1·041	26	1·206	45	1·421	64	1·727
7	1·048	27	1·216	46	1·434	65	1·747
8	1·056	28	1·226	47	1·448	66	1·767
9	1·063	29	1·236	48	1·462	67	1·788
10	1·070	30	1·246	49	1·476	68	1·809
11	1·078	31	1·256	50	1·490	69	1·831
12	1·086	32	1·267	51	1·505	70	1·854
13	1·094	33	1·277	52	1·520	71	1·877
14	1·101	34	1·288	53	1·535	72	1·900
15	1·109	35	1·299	54	1·551	73	1·924
16	1·118	36	1·310	55	1·567	74	1·949
17	1·126	37	1·322	56	1·583	75	1·974
18	1·134	38	1·333	57	1·600	76	2·000
19	1·143						

BAUMÉ'S HYDROMETER FOR LIQUIDS LIGHTER THAN WATER, CALCULATED BY GILPIN'S FORMULA.

Degrees.	Specific gravity.	Degrees.	Specific gravity.	Degrees.	Specific gravity.	Degrees.	Specific gravity.
10	1·000	23	0·918	36	0·849	49	0·789
11	0·993	24	0·913	37	0·844	50	0·785
12	0·986	25	0·907	38	0·839	51	0·781
13	0·980	26	0·901	39	0·834	52	0·777
14	0·973	27	0·896	40	0·830	53	0·773
15	0·967	28	0·890	41	0·825	54	0·768
16	0·960	29	0·885	42	0·820	55	0·764
17	0·954	30	0·880	43	0·816	56	0·760
18	0·948	31	0·874	44	0·811	57	0·757
19	0·942	32	0·869	45	0·807	58	0·753
20	0·936	33	0·864	46	0·802	59	0·749
21	0·930	34	0·859	47	0·798	60	0·745
22	0·924	35	0·854	48	0·794		

TABLE FOR CONVERTING DEGREES OF BECK'S HYDROMETER INTO REAL SPECIFIC GRAVITIES.

Degrees.	Specific gravity.		Degrees.	Specific gravity.		Degrees.	Specific gravity.	
	Greater than 1'000.	Less than 1'000.		Greater than 1'000.	Less than 1'000.		Greater than 1'000.	Less than 1'000.
1	1·006	0·994	25	1·172	0·872	48	1·393	0·780
2	1·012	0·988	26	1·181	0·867	49	1·405	0·776
3	1·018	0·983	27	1·189	0·863	50	1·417	0·773
4	1·024	0·977	28	1·197	0·859	51	1·429	0·769
5	1·030	0·971	29	1·206	0·854	52	1·441	0·766
6	1·037	0·966	30	1·214	0·850	53	1·453	0·762
7	1·043	0·960	31	1·223	0·846	54	1·466	0·759
8	1·049	0·955	32	1·232	0·842	55	1·478	0·756
9	1·056	0·950	33	1·241	0·837	56	1·491	0·752
10	1·063	0·944	34	1·250	0·833	57	1·504	0·749
11	1·069	0·939	35	1·259	0·829	58	1·518	0·746
12	1·076	0·934	36	1·268	0·825	59	1·532	0·742
13	1·083	0·929	37	1·278	0·821	60	1·546	0·739
14	1·090	0·924	38	1·288	0·817	61	1·560	0·736
15	1·097	0·919	39	1·298	0·813	62	1·574	0·733
16	1·104	0·914	40	1·308	0·810	63	1·589	0·730
17	1·111	0·909	41	1·318	0·806	64	1·604	0·727
18	1·118	0·904	42	1·328	0·802	65	1·619	0·723
19	1·126	0·899	43	1·339	0·798	66	1·635	0·720
20	1·133	0·895	44	1·349	0·794	67	1·651	0·717
21	1·141	0·890	45	1·360	0·791	68	1·667	0·714
22	1·149	0·885	46	1·371	0·787	69	1·683	0·711
23	1·157	0·881	47	1·382	0·783	70	1·700	0·708
24	1·164	0·876						

The Holland hydrometer is essentially the same as Baumé's, used, as its name implies, in Holland, where it is the official standard. The instrument of Cartier, adopted at one time by the French Government, is essentially the same as that of Baumé. The 22°-mark of each is the same: for other points, either above or below, 15° of the Cartier scale correspond with 16° of the Baumé scale. The construction of this instrument was really an infringement upon Baumé, who was thereby deprived of the emoluments which he would other-

wise have received had his instruments, instead of Cartier's, been adopted by the Government.

Beck's hydrometer is one having the zero-point corresponding to a specific gravity of 1, and 30 to specific gravity 0·850, and the scale is extended by equal divisions both above and below 0. Several other hydrometers with arbitrary scales have been constructed, but as a general rule their use is so limited that a further enumeration of the instruments is unimportant.

Indeed, at the present time, although various special hydrometers with such scales find an important place in commercial and technical practice, such as salinometers, lactometers, minometers, etc., the tendency is to discard all arbitrary scales and to make hydrometers which read in terms of the specific gravity directly.

Temperature naturally has a considerable effect on the indications of the hydrometer. All the above-mentioned instruments are intended to be used at the ordinary temperature, or about 60° F.

A hydrometer resembling a flute—in fact a graduated brass tube closed and loaded at one end—is described, under the name of *hydroscopium*, in a letter of Synesius to Hypatia, but Archimedes is claimed to be the real inventor. It was not introduced into general use, however, until the close of the seventeenth century. Revised by E. L. Nichols.

Hydrop'athy [Gr. ὕδωρ, water, and πάθος, disease]: the use of water in the treatment of disease. The terms *hydrotherapeutics* and *hydrotherapy* are becoming more familiar, and are preferable. Hydropathy has sometimes been used in the sense of a distinct school of medicine, and there have been practitioners narrow enough to limit their practice to hydrotherapeutics.

Though methods of water-cure are as old as the history of medicine, and though Hippocrates himself laid down certain principles regarding the use of water, no systematic attempt was made to introduce bathing or other forms of hydrotherapy into general practice until the close of the eighteenth century, when Wright and Currie and Jackson advocated bathing in fevers; but, notwithstanding their clear exposition and actual proofs, the treatment fell into disuse, and, as has been so common in the history of medicine and of medical treatment, was not revived and set on a lasting basis until it was advocated by an ignorant person claiming specific virtues for it in many diseases. Vincent Priessnitz, a small farmer of Graefenberg, in Silesia, had experienced the benefit of cold affusions in the case of a sprain, and was led to engage in the practice of water-curing in all kinds of acute and chronic diseases, and established the noted institution at Graefenberg in 1839. Priessnitz introduced a number of modifications of the simple bath, such as the pack, in which the patient is wrapped in a sheet saturated with water; the partial baths, as foot-bath and hip or sitz bath; the rubbing with a wet sheet, and others. He also directed the abundant internal use of water, believing that disease depends upon an acrid humor which might in this manner be eliminated. Naturally, with this treatment and the active exercise and restricted diet entailed, many persons were cured, but others were as distinctly injured. Numerous hydropathic establishments sprang up on the continent of Europe, in Great Britain, and in the U. S., and the treatment was in some cases carried to the ridiculous limits of the grossest quackery. Finally, a few institutions were placed under the care of educated physicians, and the effects of water upon the human system were studied somewhat scientifically. Hydrotherapy is now regarded as a well-grounded branch of treatment, though it is doubtful if it receives at this day the recognition it merits. The triumphs in the treatment of typhoid fever by Brand's method of cold bathing (see Bath) have forced upon the medical profession the acceptance of this method, and it is earnestly hoped that the objections on the part of the general public which physicians encounter in private practice may be likewise removed.

The Internal Use of Water.—Water is a necessity to the animal economy for purposes of solution of food and effete matter, to facilitate the absorption of the one and the removal of the other. A certain quantity of water is therefore required to maintain health. If the quantity of effete matters is increased, the amount of water drunk must be increased. It is on this account that the use of considerable water benefits those of gouty tendencies. A purely mechanical result of the drinking of much water is the increase in the liquid excretions—urine and sweat; and when either of these is inefficient the internal use of water becomes useful. In acute Bright's disease, in which the quantity of urine becomes sadly deficient and the patient tends to die of poisoning by retention of urinary excreta, the use of abundant water increases the urine, makes it less condensed and irritating, and thus relieves the blood of its poisonous excretory matter and the kidneys of the irritation of concentrated urine. One thing, however, must always be remembered, viz., that the drinking of much water is apt to derange the digestion, and this may prove an insurmountable obstacle. Regulation of the temperature and intervals of drinking will often obviate gastric disturbances, and should be carefully defined.

The external use of water is of more varied importance, and more profoundly influences the general system. In surgical and medical practice cold or hot water applications to local diseases, such as diseases of the eye, erysipelas, wounds, sprains, etc., have been used probably since the beginning of human medicine, but the constitutional effects of hydrotherapy have not been studied with care until modern times. In a general way we may say that two effects are obtainable—stimulation and depression—and also that the cold bath produces the one, while the warm bath induces the second. To these general statements limitations must be assigned, for though a cold bath of brief duration is a powerful stimulant to a healthy person, one of immoderate length is highly depressing, and to an unhealthy person cold bathing of any duration is debilitating; and, on the other hand, there are persons who may be stimulated by hot baths judiciously applied, and probably in all persons the briefest application of very hot water acts as a general stimulant. It is evident, therefore, that to be exact in our application of the influence of bathing we must study the constitution of the patient as well as consider the conditions of the bath.

The stimulant influence of cold bathing is often increased by the manner of application, e. g. cold douching, and by the subsidiary aids given to subsequent reaction, as in friction, massage, etc.

Hot bathing, on the other hand, may be modified and rendered more powerful as a depressing and depleting agent by the use of steam, as in Russian baths, or of hot air, as in Turkish baths. In these cases the action of the skin is stimulated powerfully, and effete matter doubtless removed through the perspiration.

The number of diseases in which bathing has been used with advantage is naturally very great, and the results achieved sometimes seemingly contradictory, but when the principle before stated, that the effects of bathing depend upon the nature of the bath and the reactive power of the patient, is remembered, these contradictions largely disappear. William Pepper.

Hydropho'bia [Mod. Lat. = Gr. ὑδροφοβία, hydrophobia, liter., fear of water, deriv. of ὑδρόφοβος, fearing water; ὕδωρ, water + φοβεῖν, fear]: a remarkable disease to which both the human species and many of the brute creation are subject. In examining its very interesting history we find that the Hebrew writers are altogether silent in regard to it. The earliest distinct mention of the disease occurs in a Hindu medical work of great antiquity—dating probably as far back as nine or ten centuries before Christ—written by a renowned physician named Susruta. It is observed therein that when dogs, jackals, foxes, wolves, bears, or tigers become rabid, they foam at the mouth, which remains open and from which saliva flows; their tails hang down; they do not hear or see well; they snap at and bite one another, and thus communicate the same malady. The symptoms of hydrophobia in human beings who have been bitten are likewise detailed briefly, and are said to terminate in convulsions and death. Scarification of the wound and burning it with boiling *ghee*—a sort of oil made from butter—are recommended, as well as various antidotes to be subsequently administered. This concise and remarkably accurate description of the affection, with suggestions for treatment, may be regarded as an epitome of all ancient and modern research upon the subject. Homer is supposed to allude to hydrophobia in the expression κύνα λυσσητῆρα of the *Iliad*, where Hector is compared to a raging dog. There are two passages in Hippocrates which appear to indicate that the physician of Cos had observed its characteristic symptoms in man, but failed to regard it otherwise than as a variety of idiopathic phrenitis. His contemporary, Democritus, however, who was a famous traveler, had probably encountered the disease in foreign regions, as he was evi-

dently well acquainted with its most striking peculiarities. We are informed by the distinguished physician Cœlius Aurelianus that Democritus, in a treatise upon opisthotonos, had described the affection in the human subject, admitting its origin from the bite of rabid animals, but considering it simply as a form of tetanus. Theocritus and Plato refer to madness among wolves. Aristotle, in his *History of Animals*, remarks that dogs are afflicted with madness, quinsy, and gout; that the first renders them furious and inclined to bite other animals, which thereupon also become rabid; and that all animals except man are liable to be seized with and destroyed by the malady so engendered. Artemidorus and Gaius, who flourished some two centuries B. C., allude to the disease, the former locating it in the stomach, and the latter in the pneumogastric. Asclepiades, less than 100 years B. C., refers the chief cause of hydrophobia to irritation of the brain membranes.

In the early portion of the Christian era the allusions to this affection become more frequent. M. Artorius, the friend and medical attendant of Augustus, speaks of it in a treatise on the subject as being situated in the stomach. Gratius Faliscus, a poet of the same period, describes rabies in a work entitled the *Cynegeticon*. Vergil, in his *Georgics*, classes rabies among the distempers of cattle and sheep induced by a pestilential condition of the atmosphere. Ovid speaks of a rabid she-wolf and rabid centaurs (*rabidi bimembres*), and Pliny of the bite of a mad dog. Ovid states, moreover, that hydrophobia and gout are incurable maladies, while Pliny advises a number of specifics for the prevention of the former. Horace employs the expression *rabies canis* in a figurative sense, applying it to the fierce heat of the dog-star, instead of using the ordinary phrase, *æstus caniculæ*. The disease is mentioned by Columella, a writer on husbandry in the first century, who alludes to an opinion common among shepherds that a dog may be ensured against rabies by biting off the last bone of its tail on the fortieth day after birth. This is still a popular superstition. Suetonius refers to wild animals affected with madness (*fera rabida*). Eumedes, a physician in the reign of Tiberius, makes some interesting observations upon the disease, remarking that even the shedding of tears will excite pharyngeal spasms in an affected person. Dioscorides, in the time of Nero, appears to be the first who claims to have actually observed and treated the disease. Both he and Galen describe it as attacking animals and men, and agree in the opinion of its communicability from the former to the latter by contact of morbid saliva with the second skin. But Galen and Celsus concern themselves rather with the prevention and treatment of hydrophobia than with its history and progress. Their contemporary, Magnus of Ephesus, locates the affection in the stomach and diaphragm. According to Plutarch, it was not until the time of Pompey the Great that the rabific poison first began to manifest itself among human beings. Andreas of Caryste, a physician of the Alexandrian school, has left a work upon the disease, which he terms κυνόλυσσος. Cœlius Aurelianus, who has already been mentioned, a distinguished physician of the reign of Trajan or Hadrian, or perhaps as late as the fifth century, is the first to furnish an accurate detailed description of the affection in man, and of the various controversies regarding it. He mentions it as being endemic in Caria and Crete. He called it *passio hydrophobica*, and relates one instance of its occurrence in a seamstress who used her teeth to rip the cloak of a hydrophobic patient. About the same period the affection is treated of with more or less minuteness by Pedanius Dioscorides the Cilician, Claudius Ælianus, Claudius Galenus, Oribasius, and Vegetius Renatus. Ætius, a Mesopotamian doctor of the sixth century, is the first to furnish anything like an accurate description of rabies in dogs. A century later the physician Paulus Ægineta gives an excellent account of hydrophobia, dividing it into two varieties—viz., that arising from inoculation, always fatal, and that due to nervous irritability, capable of cure. A similar distinction is now sometimes made, particularly by French authors. Among the Arabian physicians, Yahia-ebn-Serapion, Rhazes, Africanus, and Avicenna mention the disease. Yahia-ebn-Serapion, who lived in the ninth century, expresses the opinion that the affection produced by the bite of a mad dog is incurable. Rhazes affirms that a certain hydrophobic man barked by night like a dog and died, and that another when he beheld water was seized with trembling, extreme terror, and rigors. Avicenna, at the beginning of the eleventh century, describes hydrophobia with considerable fullness, noticing several of its phenomena ignored by the Greek and Roman authors. He terms it simply *canis rabidi morsus*. Since the time of Paulus Ægineta the disease has been described by numerous European writers, the study of its symptomatology especially keeping pace with the general progress of medical science. In 1026 an outbreak of rabies among dogs is mentioned in the laws of Howel the Good. From that time it appears to have been well known in England, numerous specific remedies, charms, and incantations against it being recommended in old Anglo-Saxon manuscripts still extant. On the continent of Europe the modern history of rabies is obscure until the thirteenth century. One of the earliest reports of scientific interest refers to wolves afflicted with the disease in Franconia, Germany, in 1271, where more than thirty shepherds and peasants fell victims to their attacks. Since that period there are frequent mention of the affection as prevailing in an epizoötic form in almost every country of Europe, but more particularly in the wooded districts of Germany, Switzerland, and France, appearing to attack principally wolves, dogs, and foxes. Vulpine madness, however, was not noticed in Europe until the beginning of the nineteenth century, although it had appeared in the neighborhood of Boston, U. S., in 1768. In 1776 rabies made its first appearance in the French West Indies, and in 1785 it became extremely prevalent throughout the U. S., and since that time the disease in both animals and men has occupied a prominent place in medical literature. It was unknown in South America until 1803, when it broke out in Peru. It has been recognized for centuries in Northern Africa, but its presence in Western and Southern Africa is denied upon the authority of distinguished travelers. In Asia its history, as we have seen, is very ancient. It has never appeared in Australia or New Zealand.

The popular belief upon which the name is founded, that hydrophobia is in all animals characterized by an *abhorrence of water*, was long since proved to be erroneous. The mad dog laps it eagerly, and will not hesitate to swim in it when it obstructs his course. In the case of man, however, the attempt to drink, or whatever is suggestive in any manner of that act, induces such dreadful spasms of the muscles of deglutition and respiration, with sense of suffocation, that a horror of fluids, even though associated with intolerable thirst, may be truly regarded as one of the most prominent and characteristic features of the disease. For these reasons a distinct term, *rabies*, has been employed by some writers to designate this affection as it prevails among the brute creation, the word *hydrophobia* being restricted to the disorder as manifested in man. Others have spoken of *rabies* in a universal sense, while endeavoring to abolish entirely the term *hydrophobia*. Numerous other more or less comprehensive terms have been proposed to distinguish the affection, but *hydrophobia* has continued to be its most popular and general name among English-speaking nations.

Although the manifestions of hydrophobia are clearly modified by character, habit, and temperament in various species and varieties of animals, and even in individuals, it is undoubtedly the same disease in all, whatever its peculiar form or mode of origin and propagation. It is almost universally conceded that *the introduction of a specific virus, from a rabid animal, into the system, through either an actual wound, an abraded surface, or a delicate mucous membrane, is an essential preliminary to the development of this affection in man.* But its origin among brutes has always been, and still is, a subject of much discussion, and one worthy of most serious consideration. Hydrophobia certainly infests, and by many is regarded as originating *de novo* among certain Carnivora—viz., the dog, wolf, jackal, cat, skunk, and raccoon—while herbivorous and other creatures, including man, contract it by inoculation alone. Of the various conditions asserted as favoring its spontaneous development in the canine race, few have even a probable foundation. They are principally repressed sexual desire, extremes of atmospheric temperature, excitement of anger, want of water, and putrid or insufficient food. Ziegler fixes the origin of the disease in lack of the instinctive degree of nourishment from blood and flesh, and hence designates it *Blutdurst* and *Fleischgier*. Still another presumed influence is the presence under the dog's tongue of a worm-like appendage, whose extirpation in puppyhood is considered an infallible preventive of the disease. This idea may doubtless be referred to a very ancient myth. Pliny speaks of it, terming the peculiar appendage *lyssa*. The Germans term it *Tollwurm*, or worm of madness, and among them it

has long been a popular superstition. The practice of removing the so-called worm still exists in Thrace, Turkey, Greece, Roumania, Moldo-Wallachia, Spain, and even in the Southern U. S. Its efficacy has been entirely disproved by scientific investigation, and the operation may be best characterized, in the expressive language of Dr. Johnson, as "a substance—nobody knows what, extracted—nobody knows why." The other presumed causes of spontaneous hydrophobia would appear to be equally equivocal. Unsatisfied salacity, putrid food, hunger, thirst, anger, and extremes of temperature are manifestly circumstances which obtain among dogs quite generally throughout the world. But in some regions abounding in dogs hydrophobia has always, so far as can be learned, been either totally unknown or extremely rare, while in others exempt from it for ages it has only recently appeared, and in most instances can be traced positively to importation. Such exemption has been particularly noticed in various islands throughout the world and in isolated localities. It is related that Mr. Meynell, the most eminent English sportsman of the eighteenth century, preserved his kennel of hounds from hydrophobia during many years by forcing every new dog to undergo a rigid quarantine of several months preparatory to his admission into the pack. There is little doubt that were the universal adoption of such a system of sequestration practicable rabies would become extinguished.

Rabies canina prevails indifferently in all seasons, as the following figures prove most conclusively. They embody the large number of 2,520 distinct and authentic cases observed in France, Italy, Austria, Great Britain, and the U. S. The foreign statistics refer almost exclusively to cases investigated by distinguished veterinary surgeons; those of the U. S. (101) are derived from a report on the subject by Dr. Blatchford to the American Medical Association in 1856. Of the 2,520 cases, there occurred 704 in the spring, 621 in the summer, 608 in the autumn, and 587 in the winter. These figures demonstrate the absurdity of repressive laws designed to be in operation only in the dog-days, when the canine race is popularly supposed, as Mr. Mayo observes, to be afflicted with a sort of dog-lunacy, having the same relation to Sirius that human insanity has to the moon.

The mode of its transmission in the vast majority of instances is solely by inoculation from one animal to another; and although it be urged that the disease must have sprung from a beginning, such argument when used with regard to any communicable affection can only remove us from the sphere of susceptible proof back to the confines of the mysterious and impenetrable domain of original causes. It seems quite well established that all creatures liable to contract the disease are also in a greater or less degree competent to transmit it, and no animals are exempt from it. It is true that herbivorous and ruminating beasts, owing to the formation of their jaws and teeth, as well as to their seldom attempting to bite when rabid (sheep only excepted), rarely communicate the disease; and hence the belief, entertained for some time by some eminent men, that the power to propagate the affection was confined to such animals as naturally employ their teeth for weapons of offense. The fallacy of this opinion has been provoked by numerous unquestionable experiments, and it is now likewise conceded by the best authorities that the saliva of a hydrophobic human being is capable of inoculating the disease.

Among the various creatures subject to hydrophobia, the dog, on account of its intimate association with man, is not only our greatest source of danger, but it affords us the most frequent opportunities for observing the phenomena of this redoubtable affection. A knowledge of the disease, therefore, as manifested in the canine race, is of vital importance in enabling us to recognize it promptly, and thus to escape the dreadful consequences of its communication to ourselves. Hydrophobia in the dog has been by some writers divided into two varieties, *dumb* and *furious* rabies, according as the animal is silent and undemonstrative or noisy and fierce. Other authors recognize still a third variety, which they term *tranquil* rabies, where the animal is quiet, indifferent, and unaggressive. These distinctions, however, are by no means clear, and are altogether denied by Virchow, who considers the different forms merely as prolonged conditions or stages which, according to him, are (1) the stage of *melancholy*; (2) the *irritable* and *furious*; (3) the *paralytic* stage. It is often very difficult to detect the existence of rabies in its nascent state. This accounts for most cases of hydrophobia in persons inoculated by dogs supposed not to have been mad which died or were injudiciously destroyed before the full development of the disease. Fortunately, however, the disposition to bite is not apt to be exhibited until the affection is well established. The disease is first manifested by constant restlessness, uneasiness, and irritability of temper, the dog of fondling and sociable disposition becoming snarly, morose, and shy, retiring under pieces of furniture, into dark corners, or the interior of its kennel, but not remaining long in any one spot, and being continually engaged in licking, scratching, or rubbing some portion of its body. Costiveness and vomiting are often present. The appetite becomes depraved, such indigestible substances as bits of thread, hair, wood, glass, straw, and dung being swallowed by the animal, which also shows a propensity to lap its own urine and eat its own excrement. It grows quarrelsome toward its canine companions, and chases and worries the cat. The countenance undergoes a marked change; that of a docile and affectionate dog assumes an earnest, inquiring, appealing expression; that of a savage brute becomes the very picture of ferocity. In the early stages the animal's attachment for its master appears greatly exaggerated, and as long as it retains its consciousness it will refrain from injuring him. Two early and characteristic signs of rabies are a peculiar delirium, causing the animal to snap at imaginary objects in the air, and a remarkable alteration in its voice, the bark ending very abruptly and singularly in a howl a fifth, sixth, or eighth higher than at the commencement. Sometimes it will utter a hoarse inward bark, rising slightly in tone at the close. Common symptoms are strabismus and twitchings of the face. In a day or two the animal begins to lose control of its voluntary muscles and experiences difficulty in eating and drinking. In the early stages frothy spume or saliva is generally seen dripping from its jaws, but this soon lessens in quantity and becomes thick and glutinous, adhering to the corner of the mouth and fauces, and causing intense desire to drink. In its eagerness to lap water the dog often overturns the vessel containing it. It is now insensible to pain—will munch burning coals or even mutilate itself without apparent suffering. It exhibits an inclination to escape from home, to which it will sometimes return after many hours of absence. It is restless and savage, wandering about, attacking imaginary objects or venting its fury upon real ones. If confined, it gives utterance to the peculiar bark and howl described. When at large, however, it gives forth no warning noise, but seems only determined upon a straightforward trot. If interfered with, and more especially if struck, it will wreak its vengeance upon the offender, but will seldom, as a rule, go out of its way to do a mischief, and if pursued will generally endeavor to escape. This is not invariably the case, as a naturally ferocious dog is apt to hunt out its prey diligently, often attacking many animals and persons in its fearful course. It does not continue its progress long, but becomes exhausted, and moves with unsteady, tottering gait, drooping tail, head toward the ground, mouth open, and protruded tongue of a lead-blue color; finally paralysis ensues, first of the hind quarters and then of the whole body, which is promptly followed by death. The progress of canine rabies is rapid, and its termination almost always fatal. Its duration rarely exceeds ten days; the ordinary time is from four to six days. Nothing has been positively determined with regard to the interval elapsing between the receipt of the injury and the appearance of rabies in the dog and other animals. It seldom, however, exceeds six months.

The phenomena of rabies in the cat are gloominess of disposition, restlessness, tendency to bite and keep aloof, thirst, refusal of food, and sometimes depraved appetite. When the disease reaches the furious stage, the original tiger-like ferocity of the animal becomes predominant; it froths at the mouth; its eyes glare; its back is arched; its tail beats its flanks; its claws are rigidly protruded. If disturbed, it usually flies at the face. It soon gets haggard and emaciated, its voice sounds hoarse and sinister, and paralysis and death finally supervene. The wolf and fox, and in fact most wild Carnivora, when rabid become extremely audacious, taking to the fields and roads, entering towns, and without hesitation furiously attacking men, dogs, horses, herds, and flocks. They usually fly at the hands or face, and hence their wounds are much more frequently followed by inoculation than those of dogs, who are apt to snap at the legs, and from whose teeth the rabid saliva is

often absorbed by the clothing. Renault, in a report to the Paris Academy of Medicine in 1852, presented statistics of 254 persons bitten by mad wolves, of whom 164 perished from hydrophobia; while, according to Niemeyer, of 145 persons bitten by rabid dogs in Würtemberg, only 28 contracted the disease. In the pig, horse, sheep, goat, and bovine species, the general symptoms of rabies are very similar. They are manifestations of disagreeable sensations at the seat of injury, restlessness, irascibility, hallucinations, alteration in voice, salivation, exaltation of sexual desire, great susceptibility to external influences, loss of appetite, difficulty in swallowing, dilatation of pupil, congested eye, emaciation, and finally paralysis, coma, and death. The desire to bite is often exhibited in the pig, horse, and particularly in the sheep. All have paroxysms of rage, during which they attack everything within reach with their natural weapons. Fowls manifest the disease by restlessness, excitability, mental delusions, and frenzied movements—finally staggering, convulsions, and paralysis. They are often aggressive, and sometimes endeavor to bite.

Hydrophobia in our own species possesses a deep and melancholy interest on account of the peculiarity of its mysterious and often prolonged latency, the horrible intensity of its paroxysms, and its natural fatality. The most venomous reptile or insect may inflict a wound for whose effects an antidote may be successfully administered, but the virus of the rabid animal, when once its insidious operation has begun, has defied the most consummate therapeutical skill. When the rabific poison has been deposited within the body no extraordinary appearances succeed about the point of reception, which seems to heal and cicatrize entirely in a natural manner. At that spot, however, the virus remains *perdu*, until at some uncertain period it comes forth stealthily upon its deadly errand. Watson infers that it is shut up in a nodule of lymph, or detained in temporary and precarious union with some of the tissues, until liberated by an injury to the cicatrix or some constitutional disturbance. The duration of this union is no less variable in man than in the lower animals. According to Thamhayn's statistics of 220 cases of hydrophobia in the human subject (in *Schmidts Jahrbücher*, 1859), the period of incubation in 202 instances ranged from three days to six months. But it is extremely doubtful if the three-day incubation here mentioned is authentic. In 145, or the large majority, it extended to from four to thirteen weeks. One occurred after four years, and another after five and a half years. Many other unquestionable cases of prolonged incubation have been recorded, and it is by no means improbable that the poison may, if undisturbed by causes such as those mentioned, remain latent until the occurrence of natural death.

About the year 1818 Dr. Marochetti, a Russian physician, announced that he had discovered, in a number of cases which he had attended in the Ukraine, characteristic phenomena never previously noticed. These consisted of pustules beneath the tongue, appearing ordinarily between three and nine days after the bite, and containing the virus transmitted from the point of injury, their immediate destruction by cauterization being necessary in order to arrest the disease. Similar appearances, termed *lyssæ*, were said to exist in rabid dogs. This announcement created a great sensation in the medical world, but Marochetti's opinions were soon proven to be entirely erroneous, the so-called pustules being simply enlarged mucous follicles caused by the disease.

One of the earliest symptoms is usually a tingling sensation at the cicatrix, which sometimes opens and discharges a thin ichorous fluid. In a short time the person grows dejected, morose, taciturn, restless, and irritable; he seeks solitude and shuns bright and sudden light. Within a period varying from a few hours to several days the more serious and characteristic symptoms are developed. The patient is sensible of a stiffness or tightness about the throat, and is troubled with some difficulty of swallowing, especially liquids. Deglutition soon becomes impossible unless attempted with the utmost resolution. The real paroxysms of the disease then supervene; they are either spontaneous or produced by anything suggestive in the slightest degree of the idea of drinking, or of almost any other trifling act or effort; they are preceded by chills and tremors. During these attacks sensations of stricture about the throat and chest are experienced; the respiration is painful and embarrassed, and interrupted with sighs and sobs; in fact, there occur terribly violent spasms of the muscles of the throat, almost intercepting the entrance of air into the trachea. In the intervals between the paroxysms the patient is sometimes calm and collected, retaining full consciousness and knowledge of his condition, but generally he exhibits more or less excitement and irregularity, and occasionally has fits like those of mania. Frequently he is seized with a species of delirium; he seems to see about him swarms of flies; he converses with imaginary persons or fancies himself in the midst of perils. When suddenly addressed, however, his hallucinations are for a time dispelled. Occasionally, in some of his fits of violence, he will attempt to bite his attendants, will roar, howl, curse, and endeavor to destroy anything in his reach. He often seems conscious of the approach of such attacks, and will beg to be restrained. Hyperæsthesia of the skin and acute sensibility of the nerves distributed to the other organs of the senses are usual. In some instances there is developed unwonted loquacity, and in others a singular increase of intelligence. The latter phenomenon is recorded in the *Gazette des Hôpitaux*, Aug. 27, 1854, as having been noticed in the case of a confirmed cretin, seventeen years old, suffering from hydrophobia. The paroxysms are sometimes attended with involuntary micturition, priapism, and seminal emissions. A very characteristic symptom is the copious secretion of a viscid, tenacious mucus in the fauces, which the patient constantly hawks up and spits out with vehemence in every direction, producing a sound sometimes imagined to resemble a dog's bark. The tongue is at first coated and red, afterward dry and brown. Occasionally there is vomiting of a "coffee-ground" fluid. The pulse is quick and excited, becoming very frequent and feeble before death. The urine is high-colored and scanty. It generally contains albumen, sometimes sugar. The temperature of the body is always elevated, which is coincident with rapid waste of tissue. Often within a few hours a plump and well-nourished patient grows shrunken and emaciated, and the face of youth is transformed into the shriveled visage of old age. As the disease advances cerebral disorder becomes more and more marked. The eyes are staring, bloodshot, and always open, with frequently dilated pupil; the speech is abrupt, rapid, and incoherent, and at length there is confirmed delirium. Sometimes remissions occur, and the patient eats and even drinks—with great difficulty, however. Toward the end such a remission, with complete subsidence of agony and agitation, is not uncommon. But this relaxation is only a delusive calm, the prelude to dissolution, which is usually unattended with violent symptoms. Death ordinarily ensues from asphyxia. The duration of the disease is generally from two to five days. It has been known to terminate within twenty-four hours, four of such cases being recorded by Thamhayn, while in a case mentioned by Tardieu life was prolonged for nine days.

It is now quite generally admitted that although hydrophobia may be originally due to a blood-contamination, its action when developed is manifested exclusively through the nervous system, and principally that portion whose functions are governed by the medulla oblongata. In former times there was much diversity of opinion upon the character of this disease. Some eminent men believed it to be a continued fever, while others even went so far as to consider it a putrid fever. Some maintained its analogy to yellow fever, principally on account of the "coffee-ground" or black vomit occasionally observed. Boerhaave regarded it as an inflammatory affection, and this idea was generally accepted until the time of Cullen, who placed it in the class *Neurosis*, order *Spasmi*.

The autopsical appearances in both hydrophobic dogs and human beings are variable and non-distinctive. Bruckmüller, after the most careful autopsies of 375 rabid dogs during a period of twenty years, arrived at the conclusion that the evidence furnished by dissection is of no value in defining or distinguishing the disease, and is worthless as a foundation for any theory. In man the most careful examinations of those who have perished from hydrophobia have proved similarly inconclusive as to the pathogeny of the disease. In some instances the cerebrum, cerebellum, medulla oblongata, spinal cord, and eighth pair of nerves, in both origin and distribution, have been found apparently normal after the closest scrutiny with the naked eye as well as skillful microscopical investigation. It is true that congestion, effusion of lymph, and even softening, have occasionally been observed in portions of the brain, medulla, or cord, but these and all other lesions thus far discovered in the body can only be regarded as *results* of the dreadful disturbance in the nervous centers and respiratory and cir-

culatory systems. The other morbid alterations noticed may be briefly mentioned as follows: great vascularity of the mucous membrane of the fauces and air-passages; intense pulmonary congestion; injection of the gastric vessels; sometimes ecchymoses and effusion of dark blood in the stomach. The whole blood is usually dark and grumous. There is apt to be more or less hyperæmia of all the parenchymatous organs. Autenrieth, Brandreth, and Sallin have seen the nerves communicating with the cicatrix inflamed. Various investigators have thought they had discovered organisms specific for this disease, but while there is unquestionably a *contagium vivum*, the distinctive character of the disease-germ remains to be established. The diseases with which hydrophobia in man may be confounded are tetanus and delirium tremens, and in dogs anthrax, epilepsy, and distemper. An enumeration of the distinctions between hydrophobia and these various affections would occupy more space than the limits of this article will permit. Suffice it to say that to those who are acquainted with such disorders there can be little difficulty in the differential diagnosis. There is, furthermore, a special hysterical or *mental hydrophobia*, as Trousseau named it, or *lyssophobia*, as it has been recently called, induced by emotion on seeing hydrophobic patients, through fear of the disease after having been bitten, or even in very nervous people from simply hearing the description of a case. In this spurious hydrophobia there is only difficulty in swallowing, and there are no convulsions, scantiness of urine, nor elevation of temperature. This condition occasionally proves fatal only from pure fright, as when the conventional newspaper victim dies in "horrible agony twenty-four hours after reception of the bite."

Like all contagious diseases, it is liable to lulls and outbreaks; in a given locality, after being prevalent for some time, it may be unheard of for years.

When once the rabific virus has declared its presence in the human system, all measures hitherto adopted would appear unavailing to arrest its course. With our present knowledge the most satisfactory treatment after the disease has appeared consists in simply fulfilling rational indications—viz., by palliating the symptoms as far as possible, excluding all controllable causes of mental and physical disturbance, and supporting the powers of the system with stimulants and appropriate alimentation. There is no doubt, however, that we have at our command effectual prophylactic means for destroying the poison, provided they be employed within a reasonable time after the infliction of the injury. These precautions consist in the application of a ligature, if possible, to impede the circulation from the wound, in sucking the wound, and in its thorough cauterization, nitrate of silver being the most valuable agent; but if this be not available, the hot iron, a burning coal, potassa fusa, or almost any acid may be used. Mr. Youatt, the very best authority upon this subject, testified in 1830, before a committee of the British House of Commons, that he had been successful in arresting the inoculation of the virus by means of cauterization with nitrate of silver in some 400 human cases and in innumerable dogs—in his own person, moreover, as he had been very frequently wounded by rabid dogs, and once severely by a mad cat. There is a prevalent and most foolish superstition among many people that if a dog which is supposed to be mad, and has bitten another dog or a man, be at once killed the victim of the bite is thereby protected from harm. This is mentioned only to condemn, of course, the notion. Much better would it be to isolate and watch the animal to see whether it may develop rabies.

It is one of the greatest of the many services which Pasteur has rendered to humanity that he has devised and perfected a plan of preventive inoculation by which victims of bites of rabid animals can be, with great assurance, protected against the subsequent development of rabies, provided this be practiced previous to its appearance. This is based upon the known fact that the medulla and spinal cord of a rabid animal hung in a dry sterilized atmosphere (as in a protected jar) for ten days loses its virulence, while those exposed for shorter lengths of time lose it in proportion to such time. Emulsions or extracts are accordingly made from cords exposed for one, two, three, and more days, up to ten. If now an animal is inoculated with an emulsion from a harmless cord he can next day receive an injection from a cord nine days old, on the next day from one eight days old, etc., until on the tenth day an injection prepared from the fresh cord of an animal just dead from rabies produces no effect. In other words, an artificial immunity has been conferred.

This principle is applied to human beings with an astonishing measure of success. Failure has been for the most part due to delay in submitting to the treatment promptly enough, or at least eight or nine days before the first sign of the disease. Rabbits are the experimental animals most commonly used for keeping up a supply of virus, and the disease is inoculated by trephining and inserting the virus under the dura mater.

This treatment can at present only be administered in institutions especially fitted for the purpose. In New York city there is a Pasteur institute similar to that in Paris. Of the first 300 patients treated there only three died of rabies, one a child who had received nineteen bites; the other two were men who had been bitten several times. It will thus be seen what a revolution Pasteur has worked in treating a previously almost invariably fatal disease.

Revised by Roswell Park.

Hydropter'ideæ: See Fernworts.

Hydrora'chis: See Dropsy.

Hydrostat'ic Press, also called **Hydraulic Press** and **Bramah's Press** [*hydrostatic* is from Mod. Lat. *hydrostaticus*, from Gr. ὑδροστάτης, hydrostatic balance; ὕδωρ, water + στατός, standing]: a machine much employed in the mechanic arts for producing great pressures. The pressure applied to a small piston or plunger is transmitted, through the medium of water, to a larger one, and increased in the same proportion in which the sectional area of the latter exceeds that of the former. Fig. 1 shows the main features of this machine. A is a very thick and strong cylinder, generally of cast iron. A broad flange surrounds its mouth, resting upon masonry. B is the plunger, with a watertight packing at *f*. It carries the platform C, on which is placed the body to be submitted to pressure. E, a very strong plate confined by the uprights D D, receives and resists the pressure exerted by B. F is a shaft turned by a belt and pulley, which, by means of an eccentric, works the plunger G of the force-pump I. The force-pump and its accessories are shown on a larger scale at Fig. 2. I is the force-pump with its plunger G, working through a stuffing-box. The valve H opens during the up stroke of the plunger G, and closes during its down stroke, preventing the water from being driven backward through the supply-pipe N. In like manner the valve K is closed during the up stroke and opens during the down stroke of the plunger. The pipe O leads to the cylinder. L is a safety-valve so weighted that when the pressure becomes great enough to endanger the bursting of the cylinder, it allows the water to escape into the waste-pipe. M is a branch communicating with the waste-pipe. A cock in this pipe, upon being opened,

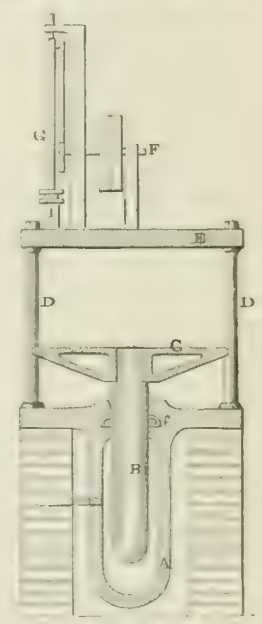
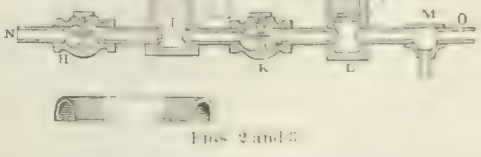


Fig. 1



Figs. 2 and 3

allows the water to escape from the cylinder and the plunger to descend. The packing of the plunger consists of a cupped leather collar (Fig. 3). It is a channel-shaped collar encircling the plunger in a recess formed in the metal of the

cylinder, its open side being turned toward the chamber of the cylinder. The water entering it from the cylinder, and tending to escape on the opposite side, keeps it firmly pressed against the surface of the plunger. If the diameter of the plunger G be an inch, and that of the plunger be a foot, the area of the cross-section of the latter will be 144 times that of the former, and a pressure of a ton applied to G will exert a pressure of 144 tons upon B. About 10 per cent. of the power applied to B is absorbed by the friction of the packing collar. These are the essential parts of the hydraulic press, though they may occupy all conceivable positions. In presses for fixing car and other wheels upon their axles the cylinder is sometimes horizontal. In many machines the force-pump is worked by hand.

J. P. Frizell.

Hydrostat'ics [Gr. ὕδωρ, water + στατική, statics, from ἵστασθαι, stand]: the science which treats of the mechanical properties of fluids in a state of rest. A fluid is a body which offers no resistance to a change of form. Fluids are of two kinds: (1) elastic fluids, which may be compressed to any extent by a sufficient force, recovering their original volume upon the withdrawal of the force; (2) liquids which, though strictly speaking, admitting of slight compression, are for all practical purposes to be regarded as incompressible. In this treatise the term hydrostatics is restricted to liquids, of which water is taken as the representative, it being understood that whatever is affirmed of water is true, with certain modifications depending upon the weight, for any other liquid.

General Properties of Water.—As indicated above, water is slightly compressible. Up to a pressure of 65 atmospheres the compression is proportional to the pressure, and its volume is diminished about $\frac{50}{1000000}$ by a pressure of one atmosphere, or 14·7 lb. per square inch, by which the volume of air would be reduced one-half. Water is expansible by heat. Its exact weight per cubit foot depends upon its temperature. The accompanying table gives the weight of a cubit foot of pure water, corresponding to different temperatures by Fahrenheit's scale. The weight of a cubic foot of water at the temperature of maximum density is taken upon the authority of Rankine. The weights at other temperatures are computed by the aid of a table given in the *Transactions* of the Berlin Academy of Sciences for 1855, by G. Hagen, deduced by him from his own experiments, which were made with all the care and accuracy characterizing that distinguished investigator. It will be noticed that the density of water—i. e. its weight per cubic foot—increases from 32° up to 39° (in strictness, 39·1°), and thence diminishes up to the boiling-point. This temperature, 39·1°, is called the temperature of maximum density. For ordinary temperatures, and for calculations not requiring great exactness, the weight of water may be taken at 62½ lb., or 1,000 oz. per cubic foot. In what follows the weight will be assumed as that corresponding to a temperature of 60°, being 62·37 lb. per cubit foot. Water expands about $\frac{1}{12}$ of its volume in freezing. A cubit foot of ice weighs 57·5 lb.

TABLE OF THE WEIGHT OF A CUBIC FOOT OF PURE WATER AT DIFFERENT TEMPERATURES.

Tem. F.	Weight. lb.	Tem. F.	Weight lb.	Tem. F.	Weight. lb.	Tem. F.	Weight. lb.	Tem. F.	Weight. lb.
32	62·417	57	62·382	82	62·201	114	61·805	164	60·920
33	62·419	58	62·377	83	62·191	116	61·777	166	60·879
34	62·421	59	62·372	84	62·181	118	61·747	168	60·838
35	62·422	60	62·366	85	62·171	120	61·716	170	60·796
36	62·424	61	62·361	86	62·161	122	61·685	172	60·755
37	62·424	62	62·356	87	62·150	124	61·653	174	60·712
38	62·425	63	62·350	88	62·140	126	61·621	176	60·670
39	62·425	64	62·344	89	62·129	128	61·588	178	60·627
40	62·425	65	62·338	90	62·118	130	61·555	180	60·584
41	62·424	66	62·331	91	62·107	132	61·521	182	60·540
42	62·424	67	62·325	92	62·095	134	61·487	184	60·496
43	62·423	68	62·318	93	62·084	136	61·452	186	60·452
44	62·421	69	62·311	94	62·072	138	61·417	188	60·407
45	62·420	70	62·303	95	62·060	140	61·381	190	60·363
46	62·418	71	62·296	96	62·048	142	61·345	192	60·318
47	62·416	72	62·288	97	62·036	144	61·308	194	60·272
48	62·414	73	62·280	98	62·024	146	61·271	196	60·225
49	62·411	74	62·272	99	62·012	148	61·234	198	60·181
50	62·408	75	62·264	100	61·999	150	61·196	200	60·135
51	62·405	76	62·255	102	61·973	152	61·158	202	60·088
52	62·402	77	62·247	104	61·947	154	61·119	204	60·042
54	62·398	78	62·238	106	61·920	156	61·080	206	59·995
54	62·394	79	62·229	108	61·893	158	61·041	208	59·948
55	62·390	80	62·220	110	61·865	160	61·001	210	59·901
56	62·386	81	62·210	112	61·836	162	60·961	212	59·853

Pressure.—The condition of fluidity implies that the fluid particles move, with reference to one another, under the action of the slightest force; one consequence of which is that a pressure applied at any part of a fluid mass acts at all parts of it and in all directions. If a vessel with a horizontal bottom be filled with water to a depth of a foot, every square foot of its bottom will sustain a pressure of 62·37 lb.; every square inch will sustain a pressure of $62{\cdot}37 \div 144 = 0{\cdot}433$ lb. Let Fig. 1 be a prismatic vessel containing water, A B the surface of the liquid, and C D a horizontal plane. The fluid immediately below this plane sustains a pressure in pounds per square inch of 0·433 time the height A C in feet. This is true not only of the vertical pressure, but also of that in every other direction. The fluid particles in the plane C D exert the above pressure against one another and against the sides of the vessel. The pressure now under consideration is that due to the weight of the water. If an additional pressure be applied to the surface, the pressure at any point within the vessel will be increased by the same number of pounds per square inch. Such an additional pressure is always present, consisting in the weight of the atmosphere, which in its ordinary state, at heights not far above the sea-level, exerts a pressure of 14·7 lb. per square inch. Thus the absolute pressure at any point within a vessel is that due to the superincumbent water, increased by 14·7 lb. per square inch. Inasmuch, however, as the atmospheric pressure acts upon the outside of the vessel as well as the inside, it may, for most practical purposes, be neglected, and we may regard the pressure as that due to the weight of the liquid. The pressure at any point in a mass of water does not depend at all upon the form of the vessel containing it. This may be a prismatical vessel, as in Fig. 1, a vessel with a vertical tube (Fig. 2), with an incline tube

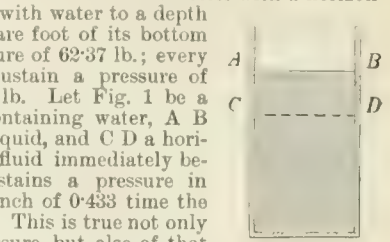


Fig. 1.

Fig. 2

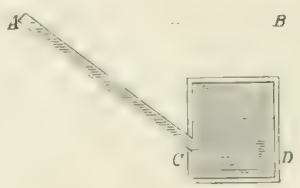


Fig. 3.

(Fig. 3), or an entirely irregular form (Fig. 4). In either case, if we neglect the weight of the atmosphere, the pressure in any horizontal plane C D depends solely upon the vertical height from this plane to the horizontal plane A B of the surface. This vertical height is called the *head*. In most hydraulic calculations the pressure is designated as so many feet of head. Thus we say a head of 10 feet, 20 feet, 100 feet in preference to saying a pressure of 4·33, 8·66, 43·3, etc., lb. per square inch.

The foregoing considerations apply to vessels having free communication with the atmosphere. The pressure in confined vessels depends upon other conditions. In a steam-boiler, for instance, the pressure depends upon the tension of the steam, and this, again, upon the temperature. It is often convenient to reduce such pressures to an equivalent

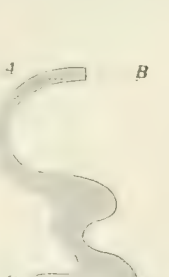


Fig. 4

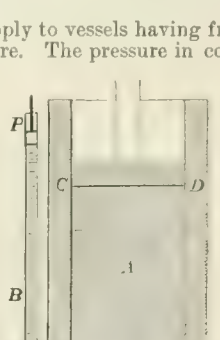


Fig. 5.

head of water by dividing the pressure in pounds per square inch by 2·3. Let B (Fig. 5) be a pipe communicating with the closed vessel A, both filled with water. Let P be a piston fitting closely in the tube B. Any pressure applied to this piston will be transmitted to all parts of the vessel A. If the area of the piston be 1 sq. inch, and the pressure applied to it be 10 lb., the pressure at all points within the vessel A will be increased by 10 lb. per square inch. The aggregate pressure transmitted to the surface C D will be as many times 10 lb. as the surface contains square inches. If we suppose A to be a strong cylinder accurately bored, and C D to be a close-fitting piston capable of moving therein, we have a hydrostatic press, and may readily conceive what enormous pressures these machines are capable of exerting.

Pressures upon the Surfaces of Immersed Solids.—To find the pressure upon a horizontal immersed surface offers no difficulty. We simply multiply the area of the surface by the pressure due the head. Thus the pressure upon a horizontal area 100 sq. inches in extent lying 10 feet below the surface of the water is $100 \times 10 \times 0{\cdot}433 = 433$ lb. When the given surface is vertical or inclined, however, the question is not so simple, the head being different upon different parts of the surface; and when the surface is bounded by curved lines, the operation becomes very complicated, involving the more intricate processes of mathematics. The general principle applicable to all plane surfaces, whether bounded by straight lines or curved lines, and whether vertical or inclined, is this: If we understand by *head* the depth of the center of gravity of the surface below the surface of the water, the pressure may be found in the same way as for horizontal surfaces. For a plane surface partly immersed the center of gravity of the immersed portion is to be used. The pressure so found is the normal pressure, or that perpendicular to the surface. In the case of an inclined surface it is often necessary to find the pressure in a horizontal or vertical direction. Understanding the term *head* as above, the horizontal or vertical pressure upon an inclined plane is found by multiplying its horizontal or vertical projection by the pressure due the head. Thus in Fig. 6 let A C represent the inclined face of a dam, D the center of gravity of the part under water, F A B the horizontal line of the bottom, C B a vertical line. Then if A C represent the normal pressure upon the dam, C B will represent the pressure tending to shove it horizontally, and A B that tending to load it down. It will be noticed that the pressure tending to move an inclined dam is the same as for a vertical dam of equal height. The advantage of the former consists in the pressure tending to load it, which has the same effect as an increase of its weight. It must be observed that the pressure upon a weir or dam does not depend at all upon the extent of the body of water behind it. The pressure upon A C is the same whether the body of water confined by the dam is limited by a wall or surface at F G, or is practically unlimited in extent, as a great pond or lake.

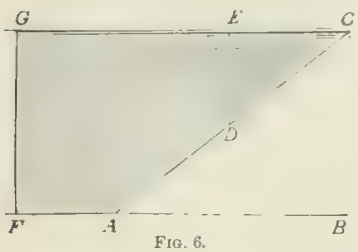
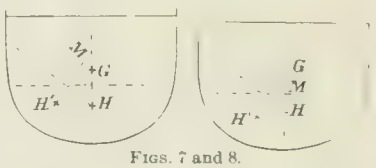


Fig. 6.

Pressures upon Curved Surfaces.—In considering such pressures the object usually is to find the resultant pressure, or that with which the fluid tends to give motion to the surface, or to resist its motion in some particular direction, usually horizontal or vertical. The pressure, for instance, tending to burst a water-pipe is not the entire pressure upon the curved surface of the pipe, but the pressure tending to separate one-half the pipe from the opposite half, and is represented by the pressure which the same head would exert upon a plane whose width is the diameter of the pipe. The pressure acting upon a curved surface in any given horizontal direction is the same as would be exerted upon the projection of the surface on a vertical plane perpendicular to the given direction. The pressure upon a curved surface in a vertical direction is equal to the weight of the mass of water lying vertically above the surface. In finding, according to this principle, the upward pressure upon the lower surface of an immersed solid, we must for a moment regard it as a surface merely, not pertaining to a solid, and suppose the space between it and the surface of the water to be wholly occupied by water.

Weight Lost by Immersed Solids; Specific Gravity.—The upward pressure upon an immersed solid tends to raise it; the downward pressure tends to sink it. This latter is equal to the weight of the mass of water lying vertically above the upper surface. The excess of the upward over the downward pressure is evidently equal to the weight of the mass of water displaced by the solid. If the weight of the solid is less than this, it floats; if greater, it sinks. In either case the weight lost by the body is equal to that of the mass of water displaced by it. This property is employed in determining the relation between the weight and volume of solid bodies. If we weigh a body in air, or, more strictly, in a vacuum, and again while suspended in water, the difference is the weight of a volume of water equal to that of the body. Dividing the entire weight of the body by the loss of weight in water, we have the ratio of the weight of the body to that of an equal volume of water. This ratio is called the *specific gravity* of the substance. A body lighter than water is immersed by attaching to it a body heavier than water whose weight and specific gravity are known. The weight of a volume of water equal to that of the lighter body is the loss of weight of the aggregate, less the loss of weight of the heavy body. A piece of dry pine, e. g., weighs 27 lb. It is attached to a piece of lead, specific gravity 11·33, weighing 45 lb. The aggregate weight in water is 8 lb.; loss of weight, 64 lb.; loss of weight of the lead, $45 \div 11{\cdot}33 = 3{\cdot}97$ lb.; loss of weight of the wood, or weight of equivalent bulk of water, $64 - 3{\cdot}97 = 60{\cdot}03$ lb.; specific gravity $27 \div 60{\cdot}03 = 0{\cdot}4498$; weight per cubic foot, $62{\cdot}37 \times 0{\cdot}4498 = 28{\cdot}05$ lb.

Stability of Floating Bodies.—When a solid floats in water, it takes a position such that its center of gravity is in the same vertical line with the center of gravity of the fluid displaced by it. This position is called a position of rest or equilibrium. Most floating bodies have more than one position of rest. A position of rest is said to be stable when the body tends to return to it on being tilted or inclined; unstable, when it tends to rotate into another position. One body has more or less stability than another according as a greater or less inclination is necessary to overcome its tendency to return to its position of rest, and a greater or less force is necessary to produce that inclination. The theory of the stability of floating bodies is of the greatest importance in ship-building. Let G (Figs. 7 and 8) be the center of gravity of a floating body; H the center of gravity of the fluid displaced by it in its position of rest; H′ the corresponding point in an inclined position. A line H M drawn through H and G is vertical when the body is in its position of rest. In the inclined position H′ M is vertical. Two forces act upon the body: (1) its own weight, acting vertically downward through G; (2) the pressure of the water, acting vertically upward through H′. The direction of this latter force intersects the line H G in M. If M lies above G, as in Fig. 7, it is evident that the two forces will tend to bring the body back to its position of rest; if below G, as in Fig. 8, they will cause it to recede farther from that position. When the body is in its position of rest, these forces act in the same line and have no tendency to cause rotation. The position of M, corresponding to a very slight inclination, is called the metacenter. A section of the body made by a plane coincident with the surface of the water, the body being in its position of rest, is called its plane of flotation. A floating body in rocking or oscillating always tends to revolve around a horizontal line drawn through the center of gravity of its plane of flotation. The height of the metacenter above the center of gravity of the displaced fluid is equal to the moment of inertia of the plane of flotation with reference to a horizontal line drawn through its center of gravity, divided by the volume of the displaced fluid. The height of the metacenter above the center of gravity of the body determines its degree of stability. That is to say, among all the positions of equilibrium which can be assumed by a body of given weight, it will have the greatest relative stability in that in which its metacenter is highest. The absolute stability of a very light body is but slight in any position, since the lighter the body the less the forces tending to restore it to its normal position



Figs. 7 and 8.

when disturbed. Up to a certain point the stability of a floating body is increased by increasing its weight. It is for this reason that a vessel returning without cargo from a distant port is obliged to take on board a quantity of heavy material, usually sand, to give her what seamen call "stiffness." On the other hand, beyond a certain point an increase of weight diminishes the stability of a floating body. A homogeneous body when entirely submerged has no stability; it rests indifferently in any position.

Surface of Liquids.—It is a law of mechanics that the surface of a liquid in equilibrium under any forces whatever is, at any point, perpendicular to the resultant of the forces acting upon it at that point. When, as is commonly the case, the only force acting upon water of limited extent is gravity, its surface, so far as our senses can perceive, assumes the form of an exactly horizontal plane. In strictness, however, since gravity does not act in parallel lines, but in lines tending toward a common point—viz., the center of the earth—no liquid surface is an exact plane, but forms a part of the surface of a vast sphere.

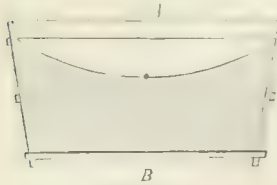


FIG. 9

When water is contained in a vessel revolving around a vertical axis, its surface is acted on at any point by two forces — viz., gravity, acting vertically, and the centrifugal force, acting horizontally. The resultant force is neither horizontal nor vertical, but inclined, and the surface takes such a form that the resultant force is at all points perpendicular to it. A vertical section of the surface of water in a vessel (Fig. 9) revolving around the vertical axis A B is the curve called a parabola. J. P. FRIZELL.

Hydrozoa [Mod. Lat., from Gr. ὕδρα, hydra + ζῷον, animal]: one of the two great divisions or classes of CŒLENTERATA (*q. v.*), the other being the Scyphozoa. In the Hydrozoa there is no distinct œsophagus, the entoderm (digestive layer) extending to the mouth. The animals may exist singly, or they may form colonies, the various members of which are connected with each other by a continuous digestive cavity. All of the members of the colony may be alike, or some may be specialized for feeding, some for reproductive purposes, and others for defense. Some may be fixed to a solid support, while others are free-swimming, and fixed and free forms may alternate in the same species. (See ALTERNATION OF GENERATIONS.) Most of the forms are minute, but some of the colonial species may attain a considerable size. The Hydrozoa are divided into three subclasses: (1) Hydridæ, including the fresh-water hydra and a few similar forms; (2) the HYDROIDA; (3) the SIPHONOPHORÆ (*qq. v.*). J. S. KINGSLEY.

Hygiei'a [= Lat. = Gr. Ὑγίεια, Health, personification of ὑγίεια, health, deriv. of ὑγιής, healthy, sound]: in Greek mythology, the goddess of health, a daughter of Asclepius, in connection with whom she was worshiped. As the personification of an abstract idea she belongs among the younger deities. It is not certain just when her worship began, but the oldest trace of it is found at Titane, on a high mountain in the country of Sicyon. In sculpture the free-standing Hygieia is represented in seven different ways, though in all cases she is feeding a serpent, the symbol of health. The best-known statue is that in Cassel, Germany, in which she is represented as a young woman holding in her left hand a cup from which a serpent, that coils around her naked right arm, feeds. In the Vatican group of Asclepius and Hygieia, she leans with her left hand upon the shoulder of her father, and with her right hand she extends a cup to a serpent which coils around a staff in the left hand of Asclepius. J. R. S. STERRETT.

Hy'giene [from Fr. *hygiène*, from Gr. ὑγιεινός, wholesome, healthful; deriv. of ὑγίεια, health; deriv. of ὑγιής, healthy]: the art of preserving and improving health. Health in this sense is defined as soundness of body, that is, such a condition of all its several parts that they are able to perform their functions without difficulty, and every natural appetite can be satisfied without consequent distress. Paget defines the typical healthy man as being one who lives vigorously, who in every part of his life, wherever it may be, does the largest amount of the best work that he can, and, when he dies, leaves healthy offspring. Parkes states the objects of hygiene to be the rendering growth more perfect, decay less rapid, life more vigorous, death more remote. It is sometimes called preventive medicine, but it includes more than prevention; and is sometimes referred to as sanitary science, or the science of health; but its aim is not merely to know, but to act in view of what is known. It is an ancient art, some of its most important precepts formed a part of the wisdom of the Egyptians at least 1500 B. C., and it is probable that from this source were derived many of the sanitary regulations of the Jews as given in the Levitical code. Thence also, through Pythagoras and the earlier Greek philosophers who studied in Egypt, came the rules of the Asclepiadæ, and a large part of the teachings on this subject embodied in the Hippocratic writings.

In Egypt, Assyria, and India, and among the Jews, hygienic rules were framed by the priests, and were promulgated and enforced as a part of their religious systems, the reason given for many of these rules, such as for ceremonial ablutions, for the avoidance of certain forms of food, for circumcision and other matters connected with sexual hygiene, for the disposal of the dead, and for dealing with certain forms of contagious disease, being simply that they were divine commands. Under the influence of Greek philosophy these rules were modified and placed upon another basis, the effects of various kinds of diet and exercise were discussed, and finally the famous treatise on airs, waters, and places, by Hippocrates, placed the whole subject on a much broader foundation than it had before occupied. In so far as public hygiene is concerned, the ancient legislators had in view what they considered to be the benefit of the community or nation solely, and enforced their regulations to this end with little or no regard to the rights or welfare of individuals. The Jewish laws provide for driving out lepers and destroying their houses, but not for the care of the lepers themselves. The maxim of the Roman law, *Salus populi suprema lex*, was framed and executed in the same spirit. Modern hygiene endeavors to preserve both the community and the individual, recognizing that each has rights which should not be sacrificed for the benefit of the other.

As regards personal hygiene, the teachings of the Greek and Roman writers, and of those of the Middle Ages, consisted mainly of rules for diet and exercise intended for the benefit of kings, nobles, and the wealthier classes. The typical ancient work on personal hygiene is the *Code of Health* of the school of Salernum, which dates from about the twelfth century, and was first printed in 1480. There have been over 200 editions of the code, and it has been translated into many languages. For over 200 years it appears to have been the most popular book in existence, and every physician was expected to know it thoroughly. It treats of what were called "the six non-naturals," namely, air, food, exercise, sleep, excretions, and the passions, and most of its advice on these points is in accordance with modern teachings. The great epidemics of the Middle Ages, from the plague of Justinian to the black death, seem to have had little effect in advancing hygiene; they were supposed to be due to mysterious influences of the stars and planets, or to the anger of Divine Providence—against which it was useless to contend.

At the beginning of the nineteenth century the principal advances in hygiene which had been made since the days of Hippocrates were the discovery of proper methods for the prevention of scurvy; the discovery of the true cause of lead colic, and therefore the means for preventing it; the methods of mitigating or preventing smallpox by inoculation or by vaccination; and some more definite ideas as to the action of foul air in producing disease and death, resulting from the discoveries of Lavoisier.

The next step, made in the nineteenth century, was the recognition of the difference between typhus, typhoid, and relapsing fevers, which was a necessary preliminary to the discovery that they are due to different causes, and therefore require different methods of prevention. The establishment of a general system of registration of deaths in England in 1838 was a most important step in its influence on public hygiene. Fortunately Dr. William Farr, then an almost unknown country physician, was appointed as superintendent of the statistical department at the very beginning, and he proceeded to devise a system of tabulations and of calculating death-rates which have been generally accepted as models, and the results of which, by showing the different liabilities to death in different localities, in different occupations, and at different ages, have led to many important discoveries in practical sanitation.

The cholera epidemic of 1832 differed widely in the mor-

tality caused by it in different places, and, as this became known, public interest on the subject of the causes and possibilities of preventing certain diseases increased, until, in 1840, a select committee on the health of towns, appointed by the House of Commons, made a most important report upon water-supplies, overcrowding, etc. This was followed in 1842 by a report on the sanitary condition of the laboring population of Great Britain, drawn up by Mr. Edwin Chadwick, which report became the basis of practical legislation for the improvement of the public health embodied in what are known as the Public Health Act and the Nuisances Removal and Diseases Preventive Act of 1848. The effects of these acts were the establishment of a general board of health, the conferring upon local authorities special powers for the suppression of health nuisances, and the giving to the privy council the power to increase greatly the scope of the authority of the general board of health in times of unusual danger from epidemics. In 1848 Mr. John Simon became medical officer of health of the city of London, and began a series of reports which had great influence in calling public attention to the dangers of accumulations of filth and of foul water-supplies. To the three men above named, William Farr, Edwin Chadwick, and John Simon, and to their labors during the next thirty years, Great Britain, and in fact the world, is largely indebted for the advances which have been made in systematic efforts to improve the public health. The scientific foundations of public hygiene, including the devising of special methods of determining the existence of conditions unfavorable to health, and the best means of preventing or modifying these conditions, were greatly broadened and strengthened by the labors and teachings of Pettenkofer and Parkes, but the most decided and definite step in this direction has been made by Pasteur and Koch and their pupils, in the discovery that certain diseases are due to specific micro-organisms, and in the study of the nature, characteristics, modes of growth, etc., of these organisms, constituting the modern science of bacteriology.

A very considerable part of the work of public sanitary authorities consists in the prevention of the specific infections and contagious diseases which are liable to become epidemic in a community, and as the majority of these are now believed to be due to micro-organisms, the efforts of health officials are largely directed to measures which will either prevent their introduction or dissemination or will make the surroundings unfavorable for their development, or will destroy their vitality if they are present. The present methods of quarantine or maritime inspection, of isolation of cases of contagious disease, and of disinfection, are based mainly upon the results of bacteriological research, and differ in many respects from those which were relied upon thirty years ago. As regards Asiatic cholera, typhoid fever, various forms of diarrhœal and dysenteric diseases, and diphtheria, our knowledge as to their causes, means of communication, and prevention, is much in advance of the actual practice of most communities, mainly because the methods which are known to be effectual to secure constantly pure water-supplies, and the satisfactory removal and disposal of refuse and excreta, require considerable sums of money to establish and to maintain, and the public has not yet arrived at the conclusion that such expenditure is wise and proper, and that taxation for such purposes is necessary to secure the prosperity of a community.

The greater the number of persons residing within a limited area, the greater is the need for a general system of sanitary regulations which will prevent individuals from causing or spreading disease, and will secure to each one pure water and air. The greater part of public hygiene, therefore, may be said to be municipal hygiene, and the problems which present themselves to city and town authorities in regard to it are numerous and complicated.

Cities are increasing in population much faster than the rural districts, but this is due mainly to migration from the country to the cities, and not to a greater excess of births over deaths, for the death-rates are much higher in the cities than they are in villages and in the rural districts. This tendency to the aggregation of men in limited localities will no doubt continue until it is checked by the cost of transportation of food and fuel due to gradual exhaustion of coal-supplies, because it stimulates and makes possible the doing of many things conducive to comfort and pleasure which would not be done in a scattered population. A very considerable part of the excess of death-rates in a city is due to the poverty of the inhabitants of certain sections of it. In certain parts of all large cities there are to be found a number of people who are insufficiently fed and clothed, and who are huddled together in such a way that cleanliness, decency, and morality are difficult or impossible to obtain. Here congregate the idle and intemperate, the tramps and loafers of the country, the hereditarily indolent and vicious classes. Mingled with them and living under much the same conditions are many honest and industrious people who are living from hand to mouth, the daily wage-earners, to whom sickness means recourse to the public hospitals and loss of means to earn their own subsistence. The death-rates in these quarters are from 50 to 150 per cent. greater than those of the better class of population; the average duration of life is from ten to fifteen years less by reason of such poverty and squalor; a large part of their sickness must be relieved by public charity; and one-third of those who die among them must be buried at public expense. The problem of how to improve the sanitary condition of these quarters, to prevent the increase of foul, damp, dark, overcrowded dwellings, and thus to lessen burdens of the community without still further pauperizing the people, and attracting to the place other vagrants and criminals, is one of the most serious which confronts modern civilization and municipal governments. It is easy to prove to any intelligent business man that high death and sickness rates in a city imply heavy demands upon the public purse in the maintenance of hospitals and other charities, and also to show that an abundant and pure water-supply, clean streets, good sewerage, and good and well-enforced building regulations are among the best means of lowering these death and sickness rates.

Among the most satisfactory evidence as to the value of practical sanitary improvements of this kind, in a business point of view, are the results obtained in modern times in the armies of most civilized countries. Here we can use in our own studies the records, not only of deaths, but of sickness; can ascertain the effects of improved ventilation, drainage, water-supply etc., upon the loss of time due to sickness; and can fairly estimate the money value of healthy adult life for a year or other definite period. Such evidence was obtained in abundance during the Crimean war. The occupation of the Crimea by the British and French troops lasted nearly two years. During the first year of the siege of Sebastopol there were 15,013 deaths from disease alone among the British troops, while during the second half there were only 1,863 deaths, although the number of men had largely increased. The reason for this was that during the first year the troops were improperly housed, badly clothed, and poorly fed, while in the second year all these defects were corrected.

The money value of a properly trained soldier supplied with his outfit of clothing, etc., is about $1,000, that is to say, it will cost that amount to replace him, and thus the pecuniary value of a lowering of the death-rate by five in the thousand, which is a low estimate of the result of modern military hygiene, can easily be calculated.

The effect of an epidemic of smallpox, cholera, or yellow fever upon the commercial interests of a city, and upon the revenues of a railway and other transportation lines connected with it, is well understood by business men, and the fear of loss of money has led in past times, in some cases, to strenuous efforts to conceal the presence of such diseases in a city. It is now, however, generally recognized that this is a short-sighted policy, and that the fullest publicity is the best way to inspire confidence.

Instruction in hygiene has long had a place in the education of medical men, but it is only within a comparatively recent period that it has been made systematic and comprehensive. Most of the German and French universities have a professor of hygiene in their faculties, and many of them have laboratories especially devoted to this subject, the oldest and most celebrated being that of Prof. Pettenkofer, of Munich. In the U. S. laboratories of hygiene have been constructed for the University of Michigan and the University of Pennsylvania, and a systematic course of lectures on the subject is given in many of the medical schools. The larger and best-organized technological schools are also beginning to recognize the fact that engineers, architects, and chemists should receive instruction bearing on the problems of municipal sanitary engineering, the ventilation and heating of buildings, the care of the health of workmen, and the examination of water, air, and foods, from a sanitary point of view, and lectures on these subjects are given in the School of Mines of Columbia College, New York, the Massachusetts Institute of Technology, and to the stu-

dents of architecture and engineering in the University of Pennsylvania. It is also the subject of lectures to young officers in the military schools at Fort Leavenworth and Fort Monroe. It is probable that in the near future systematic instruction in hygiene will find its place in all schemes for professional education, for an outline of scientific knowledge on this subject is almost as important to the clergyman, the lawyer, or the teacher, as it is to the physician or to the engineer.

In the U. S. the special impulses leading to the creation of sanitary authorities have mainly come from the effects of epidemics of yellow fever, beginning with those which affected Boston, New York, Philadelphia, and Baltimore, toward the close of the eighteenth and the beginning of the nineteenth centuries. The civil war (1860–65) had a powerful educational influence through the evidence which it gave as to the possibilities of preventing or controlling certain forms of disease. The first State board of health established was that of Massachusetts in 1868; at present (1894) thirty-five of the States have boards of health or State health officers, although more than half of these have no authority, and no means to do any work. The American Public Health Association, organized in 1872, has exerted a strong educational influence throughout the States.

A national board of health was organized by Act of Congress in 1879, mainly for the purpose of preventing or mitigating outbreaks of yellow fever, the impulse to this legislation being given by the epidemic of yellow fever in the Mississippi valley in 1878. The object of Congress was mainly the establishment of some form of national quarantine which should be consistent with the power of the individual States to regulate their own quarantine systems. The board was opposed by the marine hospital service of the Treasury Department, which desired to retain the control of whatever national quarantine service might be established, and which succeeded in doing so, and in effecting the practical abolition of the board.

The most important sanitary authorities in the U. S. are the municipal boards of health, or health officers of the large cities. Most of them are older than their respective State boards; they usually have charge of the registration of vital statistics, and have considerable powers in the management of infectious diseases, the enforcement of tenement and common lodging-house regulations and of plumbing regulations, and in the mitigation of dangerous nuisances of various kinds.

In a few of the States the law requires the organization of local boards of health throughout the States, but in most of them this is not the case, and there is no uniformity as to their composition, compensation, or powers. Only the New England States, New York, and New Jersey, have such a registration of deaths as is required to give a reliable foundation for useful sanitary work, and elsewhere it is only, as a rule, the outbreak of an epidemic which can arouse the public to the desirability of preventive medicine, and the effects of this rarely last more than two or three years where there is no registration of vital statistics. As the country becomes more thickly settled, it will become more and more necessary to establish definite rules with regard to the rights of individuals and communities in such matters as disposal of sewage, pollution of water-supply, notification and isolation of contagious and infectious diseases, regulation of dangerous or offensive trades, etc., and the enforcement of these rules will require the co-operation of both local and State sanitary authorities.

The preservation and improvement of the health of the individual is the object of what is called personal hygiene, which includes more especially the subjects referred to above, the six non-naturals, or, in other words, the maintenance in good condition of each of the great divisions or organs which make up the complicated mechanism of the human body, namely, the digestive organs, the circulatory organs, the muscular system, the nervous system, the genito-urinary organs, and the skin with its appendages. The needs of a man as regards food, exercise, sleep, clothing, sexual functions, etc., vary greatly with age, occupation, and climate, so that each one must be to a considerable extent a law unto himself in these matters. Moreover, while the preservation of health is a good and desirable thing, it is not the highest good nor the most desirable thing in human life, because it is not an end in itself, but a means. It enables a man to work and thus to obtain the means of enjoyment, but it may be right to run the risk of sacrificing it for the sake of others, for one's family, or for one's country. A man will often choose and persist in an occupation or a place of residence which he knows to be more or less unhealthful for the sake of money or of company, or of accessibility to certain means of amusement. It is well that this is so, for there is a great variety of work to be done in the world, and it is not all equally pleasant and healthful. A thoroughly sound and healthy man does not usually pay much attention to the details of his daily life from the point of view of personal hygiene; he does not, as Paget says, feel bound by exact rules of living in order that he may do his work, nor does he need to take precautions against the effects of every change of weather or of diet, or to regulate his hours of sleep by fixed rules. Most men injure their health more or less unnecessarily and without any corresponding gain in other ways. As regards food, the most common error in the U. S. is the taking too much, and the error which produces the greatest amount of disease is the taking of too much alcohol in the form of spirits, wines, or malt liquors. Improper cooking is also responsible for a considerable amount of diseases of the digestive organs.

The normal and healthy man does not know that he has a stomach after his appetite is satisfied, and "when he becomes curious in his diet, because of impaired digestion, it is well that he be content with the contemplation of his own discernment and do not seek to enforce his dietary upon his neighbors." Habit has great influence in this matter, and in the course of several generations natural selection plays its part in fitting the digestive apparatus to that which it has to work on. Many of the statements made in popular works on physiology and dietetics as to the relative digestibility of various articles of food are based on the observations made by Dr. Beaumont upon a man named St. Martin, who had a fistulous opening through the abdominal wall into the stomach, through which it was possible to observe the time required for the complete dissolution of any particular article of food. For example, boiled venison was found to be completely digested in an hour and a half, while pork required from four to five hours. While the results thus obtained agree fairly well with those of everyday experience, it is very probable that many changes would be made in the scale of digestibility of various articles were they tested in the same way in other people.

There are but few diseases of animals which make their flesh positively dangerous as an article of food, and these are all parasitic or infectious diseases, including anthrax, rabies, glanders, actinomycoses, tuberculosis, trichinæ spiralis, and septicæmia. The danger from meat taken from animals affected with any of these diseases is greatly diminished by thorough cooking; nevertheless, all such meats should be condemned, and the danger is sufficient to warrant the establishment of a system of meat inspection in all cities.

In the U. S. there is very little danger to health from adulterations of food-supply, for although certain articles, such as ground spices, coffee, etc., are extensively adulterated, the materials used for this purpose are, as a rule, not dangerous to health.

To preserve the muscular system and the heart in good working condition, a certain amount of exercise is required, equal, for an adult, to the exertion of walking 5 or 6 miles on level ground daily. This exercise is participated in, and is needed by the nervous system quite as much as by the muscles; it should, as far as possible, be taken for some other object than exercise alone, and should not be hurried or violent. The clothing should not interfere with the shape and movements of the body or limbs. Woolen underclothing is usually the best. Young children and women are those who suffer most from insufficient or badly fitting clothes.

Comparatively few people can select their habitation with reference to the sanitary conditions of the location, which, for most men, is determined by questions of cost, vicinity to place of business or to means of rapid transit, etc. The best locations are on elevated rocky or gravelly sites, where there is free exposure to air, good natural drainage, and where the top of the subsoil water is at least 30 feet from the surface. As regards the dwelling itself, the usual defects are insufficient exposure to sunlight, defective ventilation, and want of proper means for the disposal of sewage. See Bacteriology, Disinfection, Plumbing, Sewerage, Water, Water-works, etc.

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Hygi'nus: a name which occurs in Roman literature prefixed to a variety of treatises, most of which are lost. Suetonius in his lives of distinguished grammarians has given a brief account of C. Julius Hyginus, whom he calls a freedman of Augustus and a Spaniard by birth, although, he adds, some consider him a native of Alexandria, and say that he was brought to Rome when a boy by Julius Cæsar. He studied under Cornelius Alexander, and was placed by Augustus over the library founded by him, B. C. 28, in the temple of Apollo on the Palatine Hill. He was an intimate friend of Ovid. Hyginus wrote special works on the poems of Vergil and of Helvius Cinna; lives of illustrious men, a work similar to that of Cornelius Nepos, in at least six books; on the cities of Italy; on the gods; and on agriculture. These are all lost. To this writer also are assigned by some critics two works still extant—the first entitled *Fabularum liber*, containing 277 fabulæ, considered by some an extract from a work entitled *Genealogiæ* by C. J. Hyginus; and the second an astronomical treatise on the signs and constellations, interspersed with fables, in four books, entitled *Poeticôn Astronomicôn libri IV.* or *de Astrologia*. Most scholars regard these as of much later date than the time of Augustus, and as late as the second century. See Dietze, *Rheinisches Museum* (1894, p. 33). The best edition of the two works is in the *Auctores Mythographi Latini* of Van Staveren (Leyden, 1742). See also edition of *Astronomica* by B. Bunte Leipzig, 1875) and of the *Fabulæ* by M. Schmidt (Jena, 1872). To a different writer, styled Hyginus Gromaticus by way of distinction, of the time of Trajan, are assigned several treatises on surveying and mensuration and a work on castrametation. The remains of the former treatises are collected in Lachmann's and Rudorff's *Gromatici Veteres* (vol. i., Berlin, 1848), and the work *De Munitionibus Castrorum* has been edited by Domaszewski (Leipzig, 1887). The authorship of Hyginus is, however, very uncertain. See, for the former writer, Teuffel's *Hist. Latin Lit.*, § 262, and for the latter, § 344. Revised by M. Warren.

Hygrom'eter [from Gr. *ὑγρός*, wet, moist + *μέτρον*, measure]: an instrument for determining the amount of aqueous vapor present in the atmosphere. We may leave out of question apparatus for the mere indication of changes of humidity by means of the modifications of form, color, etc.,

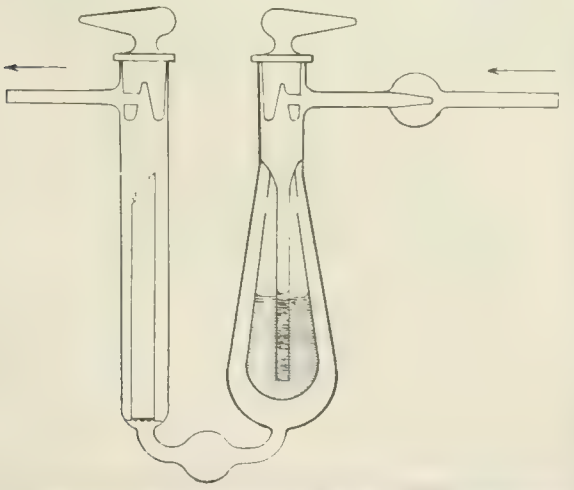

Fig. 1.—Drying-tube with liquid (H_2SO_4) and solid (HPO_3) desiccators.

on the part of certain hygroscopic substances, since they are not strictly quantitative in their performance. Instruments like the "hair hygrometer" of Saussure and the various "weather indicators" which depend for their action upon the twisting and untwisting of a strand of catgut or silk or flax, or upon the change of color of a sensitive salt, such as the chloride of cobalt, should be classed as hygroscopes, the term hygrometer being reserved for instruments for the measure of humidity.

Of hygrometers proper there are three classes. The first class comprises forms of apparatus not commonly spoken of as hygrometers, although affording the highest degree of accuracy attainable in the absolute measurement of the moisture present in the air.

Chemical Hygrometers.—The essential parts are (1) drying-tubes or flasks; (2) a device for driving through the drying-tubes a known quantity of air, the moisture of

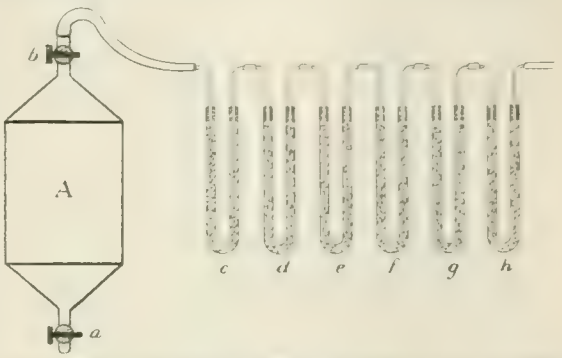

Fig. 2.—Chemical hygrometer, showing aspirator A and drying-tubes *c d e f g h*.

which is to be determined; (3) some means of weighing the tubes before and after the operation. The drying-tubes contain some highly hygroscopic substance, such as the chloride of calcium ($CaCl_2$), the oxide of potassium or sodium (Na_2O or K_2O), the pentoxide of phosphorus (P_2O_5), or strong sulphurous acid. These and other materials of their class possess such avidity for water that gases passed through them on coming into contact with their surface are deprived of every trace of moisture. The essential features of a drying-tube are, therefore, that it shall permit the free passage of air, but that no air shall traverse it without coming into contact with the desiccating substance.

Liquid desiccators through which gas to be dried is forced to bubble fulfill the latter condition most completely, but precautions must be taken to prevent the liquid from being carried away by the current of gas. A great variety of forms have been given to drying-tubes, the simplest being that of a long U filled with bits of pumice-stone soaked with strong acid or containing granules of calcium chloride (Fig. 2). Such tubes are efficient, but unwieldy and difficult to weigh. Another and more convenient form is shown in Fig. 1, in which a liquid dryer, H_2SO_4, is used in connection with a very hygroscopic solid, HPO_3 (metaphosphoric acid).

The usual device for drawing a known quantity of air to be tested at the proper rate through the tubes is the *aspirator*. This is a cylindrical reservoir of from 50 to 100 liters capacity. It is previously filled with water through the stopcock (*a*) at the base (Fig. 2). The valve (*b*) at the top of the reservoir connects it with the set of drying-tubes, *c d e f*, etc. As water flows out the air to be tested traverses the tubes, giving up its moisture, and enters the aspirator. The tubes, weighed before and after, give the amount of moisture. The volume of water displaced indicates the amount of moist air to be tested. The tube *c*, nearest the aspirator, is not weighed, since it is liable to gain moisture by diffusion from the saturated atmosphere of the aspirator. Weighings are performed with the delicate analytical balance of the chemist.

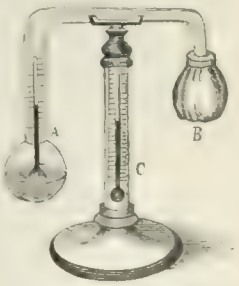

Fig. 3.—Daniell's dew-point hygrometer.

Hygrometers for Meteorological Purposes.—Although the chemical hygrometer is an instrument of precision, it is not altogether adapted to the uses of the meteorologist. In his work the conditions of the atmosphere as regards moisture involve a knowledge of the temperatures, the barometric pressure, the amount of aqueous vapor per unit of volume, the tension of the vapor, the degree of saturation of the air, and the dew-point.

These quantities can all be computed (1) from the temperature pressure and dew-point; (2) from the pressure and the indications of the wet and dry bulb hygrometer (the *psychrometer*).

The hygrometers used in meteorology are accordingly one of these classes.

Dew-point Instruments (hygrometers of condensation).—The forms best known are the *Daniell hygrometer* and the *Regnault hygrometer*. The former instrument (Fig. 3) consists of two bulbs of glass connected by a bent tube. One bulb is of opaque glass and contains a thermometer, the other is inclosed in a snugly fitting bag of muslin. The apparatus is partially filled with ether, and is sealed up while the liquid is in ebullition. In the determination of the dew-point, ether is poured upon the muslin bag, the inclosed bulb is cooled by evaporation, condensation of the ether within results, with evaporation of the liquid surrounding the thermometer in the other globe.

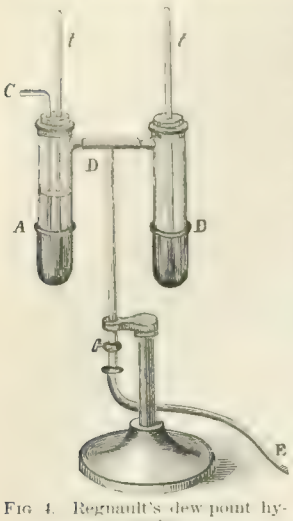

FIG. 4. Regnault's dew point hygrometer.

The temperature of the latter falls rapidly in consequence of this process until dew begins to form upon its surface. The temperature within the bulb and that of the outer air are noted at the moment of condensation. The *Regnault hygrometer* (Fig. 4) consists of a tube containing a thermometer. Ether within the tube is vaporized by passing a current of air through it. The temperature is thus reduced to the dew-point, and the indication of the thermometer is noted at the time condensed vapor appears upon the outer surface of the instrument.

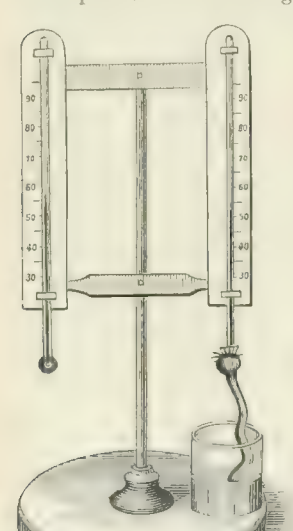
FIG. 5. Mason's wet and dry bulb hygrometer.

The wet and dry bulb hygrometer (known as Mason's hygrometer, also as August's psychrometer) is shown in Fig. 5. It consists of two thermometers, the bulb of one of which is encompassed in wicking. The wet bulb is moistened by capillarity of the wick, the lower end of which is immersed in liquid. Evaporation takes place at a rate which depends upon the humidity of the surrounding air. The resulting fall of temperature of the wet bulb serves to indicate the condition of the atmosphere as regards moisture. To facilitate the computation of relative humidity by means of the dew-point hygrometer and the psychrometer, tables have been constituted covering the usual range of condition met with in meteorological practice. E. L. NICHOLS.

Hygrom'etry: the science of determining the state of the atmosphere as regards moisture. For a treatment of this subject from the point of view of the meteorologist, see HUMIDITY. A description of the instruments used in hygrometry is given under HYGROMETER (*q. v.*). E. L. N.

Hyksos: the name applied by Manetho to the foreign conquerors of Egypt at the period of the fourteenth to seventeenth dynasties. The word does not occur in the hieroglyphic writing, but similar formations are found. The etymology usually accepted is *Hik* or *hak* and *shasu*, "Princes of the Beduin." *Shasu* is the name applied to the nomads of the desert, against whose incursions the eastern frontier was fortified. (See SHUR.) The place of their origin is doubtful. "Hyksos" only hints at the direction from which they came, but states nothing definite as to the nationality of the invaders. It agrees, however, with Manetho's statement when he calls them "ignoble" men, "out of the eastern parts," adding that "some say these people were Arabians." (Cf. Josephus, *Cont. Apion.*, i., 14, 26, 27.) This is in striking contrast with the Egyptian practice of naming exactly the nationality and home of their enemies. The view usually accepted makes the Hyksos to have been Mongoloid in type, a mixed multitude, who took advantage of the divided and weakened condition of the country at the time. They were probably urged on by the reputed wealth of the land. It is also a fact that there was then a large Semitic element in the Eastern Delta. The extent of their rule in Egypt is doubtful. Having gradually taken possession of the Delta, they adopted the manners and customs of the land, their kings even assuming the royal titles of the Pharaohs. There is an evident break in Egyptian art and architecture coincident with this foreign occupation. No monuments of importance have been found which are attributable to them with the exception of the sphinxes of Tanis, which are un-Egyptian in style and execution so far as the heads and features are concerned. They adopted Set or Sutech as their national god, and it was because of religious demands of a repulsive character made on Seqenen-Ra, King of Thebes, that the war with the Hyksos arose which resulted in their expulsion by Aahmes (Amasis I.) at the beginning of the eighteenth dynasty. (*Records of the Past*, vi., 8.) In consequence of their expulsion and the elevation of a Theban king, the Theban Amon, who had been previously only a local god, became, as the special deity of the victor, the national god of Egypt. Manetho names several Hyksos kings, the principal ones being Salatis, Beon, Apachnas, Apophis, Ionias, and Assis. The monuments contain only those of Apepi (Apophis) I. and II., and of Nubti. Naville found at Bubastis another name (*Bubastis*, p. 23 ff.) which he reads Ian-Ra, and which he identifies with Ionias or Ianna. A tablet from the time of Ramses II. is dated in the four hundredth year of Nubti, the only distinct era yet found in Egyptian history. This lends some plausibility to the statement of Bar-Hebræus that Apepi was the Pharaoh of Joseph, when it is compared with the 430 years of sojourn of the Israelites in Egypt. The chief cities of the Hyksos were Tanis and Avaris (probably PELUSIUM, *q. v.*), both, according to Manetho, on the Bubastite branch of the Nile. In 1887–89 Naville found Hyksos remains at Bubastis, so that this must also be reckoned as a Hyksos royal residence. See GOSHEN.

CHARLES R. GILLETT.

Hylæosau'rus [Mod. Lat.; liter., wood-lizard; Gr. ὑλαῖος, pertaining to a forest + σαῦρος, lizard]: a large extinct reptile from the Wealden of England, belonging to the order *Dinosauria*. It was described by Mantell in 1832. The teeth are small in proportion to the size of the animal, close together, and set in sockets. The skin appears to have been defended by subcircular bony scales, and large bony spines indicate the existence of a strong crest along the back. The length of the animal may have been 25 feet.

O. C. MARSH.

Hy'las (in Gr. Ὕλας): in Greek mythology, son of the Dryopian Theiodamas. Because of his beauty he was beloved by Heracles, who murdered the father, kidnaped the boy, and took him along on the Argonautic expedition. Owing to a broken rudder the heroes made a halt on the coast of Mysia in order to make a new rudder. The nymph of the spring Pegæ, to which Hylas went to get water, fell desperately in love with him, and dragged him down into her waters. Polyphemus heard the cries of Hylas, drew his sword, and ran in the direction of the cries, and meeting Heracles could only tell him the story. Glaucus, the sea-god, told the Argonauts that Hylas had become the husband of the nymph, and so they sailed away, leaving Heracles and Polyphemus behind. Polyphemus remained there, and became king of the country. Heracles forced the Mysians to give him hostages that they would search for Hylas, a ceremony which was ever observed throughout the country. Heracles returned to Greece in sadness and alone.

J. R. S. STERRETT.

Hy'lidæ [Mod. Lat.; liter., belonging to the Hyla tribe; *Hyla*, the typical genus (from Gr. ὕλη, wood, woods) + Gr. patronymic suffix, -ίδαι, descended from]: a family of batrachians of the order *Salientia* or *Anura*, with the vertebræ procœlian; the sacral diapophyses dilated at their extremi-

ties; the coccyx articulated by condyles; the external metacarpals bound together; the terminal phalanges articulated below to the extremity of the penultimate, swollen at the base, and with slender, curved, and claw-like ends; fronto-parietal bones shortened anteriorly, and usually embracing a fontanel; superior plate of ethmoid never covered by fronto-parietals, and usually produced anteriorly between the fronto-nasals. The family, with the limits thus given, embraces the ordinary tree-frogs of America and forms related in structure inhabiting other parts of the world. It has been thus limited by Prof. Cope, independently of adaptation to arboreal life, and solely with reference to the agreement of its members in the particulars of structure implied in the definition. Almost all the species of the family, however, are arboreal, living among the branches of trees. Some of them at least undergo their development out of water, and come out from the egg with the form of the adult, the tadpole stage being very transitory, or suppressed and limited to intraoval life. The toes are dilated at the extremities into round pellet-like extensions which act as suckers. THEODORE GILL.

Hylobati'næ [Mod. Lat.; deriv. of *hylo'bates*, kind of anthropoid apes, from Gr. ὑλοβάτης, woods-walker, one who haunts the woods; ὕλη, woods + βαίνειν, go, walk]: a subfamily of apes (embracing the long-armed GIBBONS, *q. v.*).

Hy'men (in Gr. Ὑμήν, or Ὑμέναιος): the Greek god of marriage, said by some to be a son of Apollo and Calliope, by others of Dionysos and Aphrodite. The name is probably derived from the root *ὑ* (cf. *υἱός*), so that Hymen means the Begetter. He was a very ancient god, and not, as some have thought, a mere personification of the nuptial song, and the myths that regard him as a deified mortal are all young. Later on, the name of the god was used as a common noun (*ὑμέναιος*), meaning "marriage song," and as a singer he was called a son of Apollo and Calliope; more ancient myths make Aphrodite his mother. He is represented in art as a handsome young man, with a tender, effeminate frame, dreamy, longing eyes, and long hair. He carries a torch and wreath. See Schmidt, *De Hymenæo et Talasio* (1886), and Sauer in Roscher's *Lexicon*.

J. R. S. STERRETT.

Hymenophylla'ceæ: See FERNWORTS.

Hymenop'tera [Mod. Lat.; neut. plur. of *hymenop'terus* = Gr. ὑμενόπτερος, membrane-winged; *ὑμήν*, *ὑμένος*, membrane + *πτερόν*, wing]: an extensive and interesting group of insects, comprising the bees, wasps, ants, ichneumon-flies, gall-flies, and saw-flies. (See ENTOMOLOGY.) There are estimated to be 25,000 species, of which perhaps 5,000 species inhabit the U. S., the number of ichneumon-flies and their allies carrying the number up. Their range is not confined to the tropics and temperate zone alone, but a few species occur near the north pole, a humble-bee and several species of ichneumon-flies having been found in Polaris Bay. Their geological range is not great, the earliest species known occurring in the Jurassic formation, while other well-developed insects (Neuroptera) have been found as low down as the Devonian formation.

The Hymenoptera are usually characterized by the four membranous, naked wings, the hinder pair being much smaller than the others; by the large head; the complication of the mouth-parts, the jaws being adapted for biting and seizing prey, while the maxillæ and labium are much elongated and adapted for lapping the sweets of flowers; the ligula, or so-called tongue, which is a prolongation of the labium or under lip, sometimes attaining a great length; by the presence of a well-developed ovipositor—in the ants, wasps, and bees modified to form a sting. The more important character separating the Hymenoptera from other insects is the fact that in all except the saw-flies the thorax consists of four rings, the fourth being the basal ring of the abdomen, which in the course of the transformations of the bee or wasp is thrown forward on to the thorax or middle region of the body. The young, or larvæ, are white, soft, fleshy, and worm-like, without feet, except in the young of the saw-flies, which closely resemble caterpillars. All except the latter are fed by the parents either directly or from stores of honey and pollen or animal food laid up before their birth by their parents. The pupa is inactive, closely resembling the adult, and protected by a thin silken cocoon, except in the saw-flies, which approach the Lepidoptera in spinning a dense cocoon, as well as in the caterpillar-like form of the larvæ.

The anatomy of the Hymenoptera is very complicated, and greatly modified in accordance with the varying habits of the different species. They have a sucking stomach opening into the long œsophagus. The salivary glands consist of two short ramified tufts, often contained entirely in the head. The honey is formed, by some chemical change as yet unknown, from the food contained in the crop, which is regurgitated into the honey-cells. A characteristic of those species provided with a sting is the two large poison-glands situated in the end of the abdomen. The poison secreted in them is discharged into a pear-shaped sac lodged near the base of the sting, which latter is provided with a peculiar muscular apparatus for its sudden extension and withdrawal. The poison is largely formic acid, which imparts the poisonous properties to the secretion. The sting may be seen in a rudimentary condition under the integument of the larva. At that period it consists of three pairs of simple appendages or buds, which, by their increase in length and by changes in the form of the segments at the end of the body toward the close of the pupa state, form the sting. Just previous to this period the three pairs of long blades may be separated, the two outer pairs ensheathing the inner, which are barbed, and constitute the sting proper.

Another feature of much interest in the bees is their power of secreting wax. This is accomplished by special minute one-celled glands lodged just under the skin, opening externally by pores in the integument. In the honey-bee these pores and glands are situated on the under side of the abdomen. In the stingless bees (*Trigona*) the wax is secreted on the upper side. The jaws of the bees and wasps are rounded at the extremity, with slightly marked teeth. This form is of use in the honey and pollen gathering bees, while in those species which build clay nests they are used as trowels. In the carnivorous wasps, such as the *Sphex* and *Pompilus*, the jaws are sharp and hooked, adapted for seizing and retaining large insects. The legs are also exposed to much variation in the different genera. For example, in the hind legs in the pollen-gathering bees, such as the honey and humble bee, the tibia or shank is very broad and hollowed out on the outer side, while stiff bristles project over the depression from each side, forming the honey-basket (*corbiculum*) in which the masses of honey and pollen are piled up. The mode in which the bee collects the pollen is very curious. She gathers it from the flowers with her mandible, from which it is removed by the anterior pair of legs. From there it is passed to the intermediate pair of legs by manifold scrapings and twistings of the limbs, whence it is by similar manœuvers deposited on the hind legs (Shuckard). In the fossorial species, on the contrary, the legs are slender, but very hairy. The sand-wasp, or *Sphex*, for example, by the aid of its large sickle-like mandibles, which are of use in removing small stones and gravel, digs a hole from 4 to 6 inches deep in half an hour. The hairy legs are used much as a dog does its paws, and with perhaps nearly equal intelligence. The carpenter-bee and wood-wasp by means of their powerful jaws tunnel regular holes several inches deep in solid wood, the stems of plants and shrubs, or the trunks of trees. The complicated, many-chambered nests of the ants are familiar objects. Indeed, there are no insects which in their structure are more highly differentiated than the various genera of Hymenoptera, and we find in them an intelligence and power of adaptation to new and unforeseen circumstances which evince something more than blind instinct, in fact, a reason perhaps not inferior to that shown by many of the vertebrate animals, and differing but in degree from that of man.

Not only is the individual structure of the Hymenoptera highly complicated, but in certain genera of bees, wasps, and ants there is a differentiation of the individual into three instead of two sexual forms—i. e. males, females, and workers (wrongly called neuters), the latter being sexually undeveloped females. In the bees and wasps the workers differ from the queen in having undeveloped ovaries and incomplete accessory organs, but differ externally only in size, being a little smaller than the females. In the ants, however, while the workers are much smaller, they are also wingless, and differ in the proportions of the body.

The honey-bees and certain wasps and gall-flies lay eggs which produce young without being fertilized by the male. Von Siebold discovered that only the queens' and workers' eggs are fertilized by the spermatozoa stored in the *receptaculum seminis* of the female. The queen bee can fertilize at will (the only animal known to possess this power of producing either sex at pleasure), and retains the power for a period of five years, as the muscles guarding the duct lead-

ing from the sperm-bag are supplied with a nerve, being thus rendered voluntary and subject to her will. When she wishes to lay an egg to produce a drone, the egg is allowed to slip out of the oviduct past the orifice of the receptaculum seminis, kept closed by the voluntary muscle. Drone eggs are also laid by unfertilized queen-bees, and in some cases even by worker-bees. It is well-known that bees when deprived of their queen select several worker eggs or very young larvæ for the purpose of rearing queens. "The cells in which these eggs are situated are lengthened out and the end turned downward." Whether, as Leitch (already quoted) thinks, the development into a queen is caused by the increased temperature of the queen-cell, or, as Huber previously thought, by being fed with different food (the royal paste or jelly), is not entirely settled. Probably both causes—i. e. a higher temperature and richer food—taken together, are sufficient to produce an increased development of the young and an acceleration in the development of the ovaries.

With the exception of the white ants, which belong to the Neuroptera, the Hymenoptera is the only group of insects affording species which are truly social and live in colonies. In the social species there are almost invariably three sexual forms, the workers forming the large majority and doing most of the work of the colony. They even assist largely in rearing the young, the males and females not usually laying up food or providing for their offspring. This division of labor is carried on unequally in the different species, and is best marked in the honey-bee, whose colony contains but one female, the queen. In the colonies of the ants there are numerous males and females, and in some genera (*Pheidole*, *Eciton*) two sorts of workers—one with a large head, called a worker major or soldier, and the usual form or worker minor. In the honey-ant of Texas and Mexico, while the normal workers are of the usual shape and perform the active duties of the nest, the large worker is inactive and does not quit the nest, but lies almost immovable in its gallery, and elaborates a kind of honey in its abdomen, which swells up as large as a pea. Certain ants also enslave other species, making them do the work of the colony. They also herd aphides in their underground nests, and entertain as permanent visitors certain beetles, thus adding much to their labors and to the complexity of their social life.

The following synopsis presents briefly the characters of the more important families of Hymenoptera, beginning with the lowest:

1. Body short, abdomen sessile, and provided with an ovipositor forming a saw; larvæ caterpillar-like, with nine to eleven pairs of legs: *Tenthredinidæ* (saw-flies).
2. Like saw-flies, but the body longer; larvæ with six thoracic legs, and abdomen ending in a horn: *Urocerida* (horn-tails).
3. Minute, with a short compressed abdomen, and a slender long ovipositor: *Cynipida* (gall-flies).
4. Body slender, with a long prominent ovipositor: *Ichneumonidæ* (ichneumon-flies).
5. Body usually short and small, ovipositor short, inconspicuous; antennæ elbowed; wings with one vein, with metallic colors: *Chalcididæ* (ichneumon-flies).
6. Minute; wings with one or no veins: *Proctotrypidæ* (egg-parasites).
7. Body oblong; skin very dense, with a powerful sting: *Chrysididæ* (cuckoo-flies).
8. Body slender; antennæ elbowed; wingless workers: *Formicidæ* (ants).
9. Ant-like; body very hairy, with a powerful sting: *Mutillidæ*.
10. Body hirsute, with short, hairy, spiny legs; eyes often lunate; species often of large size and gayly colored: *Scoliidæ*.
11. Antennæ long; body compressed; color usually blue: *Pompilidæ* (sand-wasps).
12. Like the Pompilidæ, but the body not compressed, and abdomen petiolated: *Sphegidæ* (sand and mud wasps).
13. Somewhat like the Sphegidæ, but with the abdomen sessile and oval, conical: *Larrida*.
14. Head large, body flattened, highly colored: *Bembecidæ*.
15. Body with a long, club-shaped, or a conical sessile abdomen; antennæ clavate: *Nyssonidæ*.
16. Head large, cubical; fore legs of males variously modified in form; body high colored, like the wasps; tongue short: *Crabronidæ* (wood-wasps).
17. Males, females, and workers; fore wings folded once longitudinally: *Vespidæ* (paper-wasps).
18. Males, females, workers; social in the higher genera. Body usually hirsute; tongue long; living in nests or underground tunnels: *Apidæ* (bees).

A. S. Packard, Jr.

Hymet'tus (in Gr. Ὑμηττός): a mountain ridge of Attica; 4½ miles E. of Athens; 2,680 feet high—now called Trelo-Vuni. The honey collected here has been famous from remote antiquity for its exquisite flavor. Its excellence is thought to be due to the fact that it is gathered almost exclusively from the wild thyme with which the mountain is covered. Revised by J. R. S. Sterrett.

Hymnol'ogy [viâ Late Lat., from Gr. ὑμνολογία, deriv. of ὑμνολόγος, singer of hymns; ὕμνος, hymn + λέγειν, speak, say]: the science of sacred lyrical poetry. A hymn, according to St. Augustine, "must be praise to God in the form of song." By the looser definition which prevails now, it is a lyric expressive of religious feeling, or celebrating, however indirectly, the object of worship. The Greek pagan hymns were in honor of gods and heroes, and were usually sung at their festivals. (See a fine example, translated, in F. T. Palgrave's *Lyrical Poems*, p. 258.) A parallel may be traced between these and the Christian hymns for saints' days. The more ancient Greek hymns, as Homer's, are chiefly descriptive, and are considered epic; the later ones, as of Callimachus and Pindar, lyric. In most of these, to a modern mind, the devotional and ethical elements are wanting; not, however, in Cleanthes's *Hymn to Zeus*, and in the noble (unmetrical) outburst of Epictetus, *Of Providence*, end of chap. xv., b. 1. The Oriental sacred books, especially the Vedas, contain many hymns, which have received no little attention of late. Of all the sacred poems of antiquity, the Jewish Psalms of course are the most familiar and the most precious. They have become practically incorporated with Christian hymnody, and their influence has been great on all its developments.

Greek.—Christian hymnody is coeval with Christianity; from the Christmas song of angels the lyrical element had large place among the belongings of the new religion. Every language in which the gospel was proclaimed had probably soon its own supply of sacred verse. The *Tersanctus*, the *Gloria in Excelsis*, and the *Te Deum* are of early though unknown date. The Syriac hymns of Ephrem (d. 381) have been translated by H. Burgess (1853); see also Mrs. Charles's *The Voice of Christian Life in Song* (1858). Clemens Alexandrinus (if he be the author of a famous hymn appended to his *Tutor*) and Gregory Nazianzen are the earliest Christian hymnists known. In later times Anatolius, Andrew of Crete, John Damascene, Cosmas, Stephen the Sabaite, Theodore and Joseph of the Studium, Methodius, Theoctistus, Metrophanes, and others supplied the wants of Greek worship till the tenth century. Some of their productions are exquisitely translated in Dr. Neale's *Hymns of the Eastern Church* (1862). See also Mrs. Browning's *Greek Christian Poets*.

Latin.—The seed of religious song was soon carried into Latin soil, where it bore yet more abundant though hardly richer fruit. (See Dr. Neale's paper on *Sacred Latin Poetry*, *Encycl. Metrop.*, vol. *Roman Literature*.) The great name here is Ambrose (d. 397); he founded a school of hymn-writers, and had many now forgotten imitators, whose work is often indistinguishable from his own. The Ambrosian hymns are marked by a severe simplicity, which to readers unfamiliar with them may seem hard and dry. After him came Prudentius (d. about 413), Venantius Fortunatus (d. 609), Gregory (d. 604), Bede (d. 735), Theodulph (d. 821), Notker (d. 912), and many others. By degrees these mediæval hymnists assume a more ornate style and a more passionate devotion. St. Bernard (d. 1153) and his namesake, the monk of Cluny, have given us glowing strains, which are still precious to English and American worshipers. Peter Damiani (d. 1072), Hildebert (d. 1133), Adam of St. Victor (d. 1192), and Thomas Aquinas (d. 1274) were also no mean poets. Some of the world's most famous hymns, produced at this period, are of doubtful origin; thus, eminent for grandeur, *Veni Creator Spiritus* and *Dies Iræ*, probably by Thomas of Celano, and for loveliness or pathos, *Veni Sancte Spiritus*, *Stabat Mater*, and *O Deus, Ego amo Te*, questionably ascribed to Xavier. One or two moderns have written good Latin hymns, as the brothers Santolius Maglorianus and Victorinus (Santeuil, d. 1684, 1697), and Charles Coffin (d. 1749). For this department of literature, see the

Roman and Parisian *Breviaries*, Daniel's *Thesaurus*, Mone's *Hymni Latini*, and in English, *Latin Hymn-writers and their Hymns*, by S. A. W. Dutfield and Dr. R. E. Thompson (1889); and for translations, the works of Newman, Chandler, Mant, Isaac Williams, Caswall, Copeland, Campbell, Blew, Neale, Chambers, Kynaston.

German.—With the Reformation came a new birth of lyric fervor, and great waves of sacred song in the vernacular rolled over the Protestantizing lands. Clement Marot rendered the Psalms into French meter, and Calvin himself wrote a hymn or two. But the effect was naturally greatest in Germany, where arose by degrees what is probably the largest, and claimed by many to be the finest, body of hymns in any language. For this subject see Miss Winkworth's *Christian Singers of Germany*, Kübler's *Historical Notes to the Lyra Germanica*, and especially Koch's *Geschichte des Kirchenlieds* (8 vols., 1847–76). Luther led the van, and was closely followed by Hans Sachs, Paul Eber, M. Weiss, and other "Bohemian Brethren," N. Hermann, Selnecker, Nicolai, etc. We can mention but a few names of the following centuries, in chronological order: Stegmann, Meyfart, John Heermann, Rinkart, Rist, Gesenius, Clausnitzer, Alberti, Paul Gerhardt (1606–76), by common consent the greatest of German hymnists; John Frank, Neumark, Scheffler or Angelus Silesius, von Rosenroth, Tersteegen; J. Neander, von Canitz, C. F. Richter, Rodigast, G. Arnold, Laurenti, A. H. Franke, Bogatzky, Zinzendorf (who was followed by other Moravian writers), S. Frank, Schmolke; Gellert, Klopstock, Novalis, Fouqué, Spitta, Knapp, Lange, Meta Heusser. An immense and valuable collection of over 3,000 hymns has been made by Albert Knapp in his *Lieder Schatz* (1837–65). Many German hymns have been rendered into English by John Wesley (1737–40); by Jacobi and Haberkorn (1722–60); by the Moravians (1754, etc.); and more recently by Miss F. E. Cox, A. T. Russell, R. Massie, Miss Borthwick, and others; specially by Miss Winkworth, whose *Lyra Germanica* (2 vols.) and *Chorale Book* have added much to the English stock.

The Scandinavian countries have their own hymnic supplies, and are proud of them, but these are little known to English readers. In Italy and France there is not so much material of this sort. Many sacred lyrics of Madame Guyon (d. 1717) were translated by Cowper in 1782.

English, till 1700.—In England hymnody was a plant of late growth; its place was long filled by psalmody. Myles Coverdale, one of the Reformers, put forth forty *Goostly Psalmes and Spiritualle Songs*, but there is no evidence of these having come into use. A better fortune attended Thomas Sternhold's *Psalms* (1549), completed by Hopkins and others in 1562; this *Old Version* became popular, and was bound up with the Prayer-book for nearly three centuries. It was afterward in part superseded by the *New Version* of Tate and Brady (1696). Meantime the Puritans used the Scotch version by Francis Rous (1645). Hymns, as such, were not written till later, for George Herbert and his contemporaries were sacred poets rather than hymnists. A beginning on a small scale was made by Bishop Jeremy Taylor (1655), and followed up by John Austin (1668), R. Baxter (1681), and eminently by John Mason (1683), whose hymns were perhaps the first to be sung to any extent in England as accessories of worship. William Barton, Joseph Stennett, Thomas Shepherd, and Bishop Ken had also the honor of preceding Dr. Watts.

English, Eighteenth Century.—Isaac Watts is properly the father of English hymnody; the appearance of his *Hymns* in 1707–09, and of his *Psalms* in 1719, introduced a new era; they were hailed with delight by the bulk of Dissenters, and for a long time were used almost exclusively by them in Britain and America. The publication of Charles Wesley's first hymns in 1739 marked another era. He is the most voluminous of sacred poets, and one of the most gifted. For fifty years he continued publishing, and his verses fill thirteen volumes. The influence of these lyrics was great in promoting the Wesleyan revival. John Wesley also wrote original hymns, though but few. His great *Collection* (1779), composed chiefly of his brother's pieces, was long used by the Methodists everywhere, and is still the basis of their various hymn-books. The other hymnists of the eighteenth century, except Addison, Pope, and Byrom, were chiefly followers either of Watts or Wesley, or of both. Much of our knowledge of these old authors is due to Daniel Sedgwick, of Bishopsgate, London (d. 1879), who for many years made hymnology a special study.

English, Nineteenth Century.—With the nineteenth century arose James Montgomery, whose services and influence in this field were great. The year 1827 was marked by the appearance of Bishop Heber's *Hymns* and of Keble's *Christian Year*. About the same time, T. Cotterill, Sir J. Bowring, Sir R. Grant, Conder, Edmeston, Reed, Lyte, Miss Auber, and Dean Milman wrote; more recently Charlotte Elliott, Dr. Bonar, George Rawson, T. T. Lynch, T. H. Gill, and many others. Faber, Caswall, and Bridges belong to the Church of Rome. The Church of England, long negligent in this particular, was awakened to its importance by the Oxford movement of 1833, and a fresh and increasing tide of lyric life has since been poured in. Dr. Neale, Dean Alford, Bishops Wordsworth, How, and Bickersteth, Dr. Monsell, Mrs. Alexander, Sir H. W. Baker, F. T. Palgrave, W. C. Dix, J. Ellerton, G. Thring, and Miss F. R. Havergal are noticeable names. New and carefully prepared hymnals are constantly appearing, and the material for them is increasing every day. In no previous age, perhaps, were more and better hymns written than now. The most successful hymnal ever published in any language is *Hymns Ancient and Modern*, which in its successive forms has had a circulation of many millions.

Various books have been written on the biography and bibliography of hymnology; the best for many years was Josiah Miller's *Singers and Songs of the Church* (1869); but the ground was never thoroughly covered till the appearance of J. Julian's monumental *Dictionary of Hymnology* (1892).

Frederic M. Bird.

Hyndman, Henry Mayers: socialistic leader; b. in England in 1842. He graduated at Trinity College, Cambridge, in 1864; studied law; was special correspondent to *The Pall Mall Gazette* during the war between France and Italy 1866. Author of *England for All* (1881); *Historic Basis of Socialism in England* (1883); *The Social Reconstruction of England*; *Socialism and Slavery*; *A Summary of the Principles of Slavery*; *Will Socialism Benefit the English People?* (1884); *The Indian Famine and the Crisis in India* (1877).

Hynobi'idæ [etymology uncertain]: a family of salamanders established by Prof. Cope, and with the cranium deficient in an anterior axial bone; the palatines contiguous and prolonged over the parasphenoid, and with teeth on their posterior external margins; the prefrontals and pterygoids are well developed; the frontal not embraced by parietals and prefrontals; the orbito-spenoid separated by a membranous wall from the proötic; the postfronto-squamosal arch is atrophied, and the occipital condyles are sessile. The family includes a single genus (*Hynobius*) from Japan, and is most nearly related to the Desmognathidæ and Plethodontidæ of the U. S.

Hyoid Bone [*hyoid* is from Mod. Lat. *hyoïdes* = Gr. *ὑοειδής*, shaped like the letter upsilon (Υ, *υ*, but anciently ϒ); *ὑ* (*ὐ*) + *εἶδος*, form, shape, likeness]: a bone which in man supports the tongue, and is joined to no other bone. Here the shape is quite like the letter U, whence the name. In the lower Vertebrata the term hyoid is given to the arch of cartilage or bone which surrounds the throat behind the articulation of the jaw. It is clearly similar to the other bony arches which are interposed between the gill-slits, as is, in the opinion of most zoölogists, the arch of the lower and upper jaws. In all vertebrates a modified gill-slit occurs between the hyoid and the mandibular arch. In the higher vertebrates this slit is known as the Eustachian tube, and comes into connection with the ear. The hyoid bone retains its primitive simplicity in only the lower vertebrates; in the others it becomes variously modified. In some a portion of it is cut off from the rest and serves to unite the lower jaw to the skull; while in man the upper part of the true hyoid is united to the skull, as the styloid process of anatomists, while the part usually recognized as the hyoid is the lower portion of the true hyoid plus a considerable portion of the gill-arch which belongs behind it.

J. S. Kingsley.

Hyop'sodus [Mod. Lat.; Gr. *ὗς*, *ὑός*, hog + *ὄψις*, look, appearance + *ὀδούς*, tooth]: an extinct genus of small mammals from the Eocene of Wyoming, named from its supposed resemblance to the suillines, but now known to belong to the Lemuroids.

Hyoscyamus: See Henbane.

Hypa'tia (in Gr. *Ὑπατία*): a daughter of Theon, a Greek of Alexandria, no less renowned for her knowledge of mathematics than of the Neo-Platonic philosophy, which she taught with applause in her native city. Her beauty and

modesty were also celebrated, but the clergy believed that she made use of her influence with Orestes, prefect of Alexandria, to the injury of St. Cyril, then the Archbishop of Alexandria. Accordingly, she was set upon by a mob led by priests, who carried her into a church, stripped her of her clothes, and then tore her in pieces (415 A. D.). Theodoret accuses Cyril of instigating this murder, but of his guilt there is no proof. According to Suidas she wrote *Commentaries* to Diophantus and Apollonius. Only a few of her letters have been preserved by Synesius. By some the history of Hypatia is thought to have given rise to the legends concerning Saint Catharine (*q. v.*). See Hoche, *Hypatia, die Tochter Theons* in *Philologus*, 15, 435 ff; Kingsley, *Hypatia*. Revised by J. R. S. Sterrett.

Hyperæsthe'sia: a condition of unusually high sensibility to feeling, especially to pain. It arises in conditions of exalted excitability of the nervous system. It may be general, as in cases of fever or nervous irritability; or local, as in the exalted sensitiveness of the skin after a burn, or during inflammation. It is the opposite of Anæsthesia (*q. v.*). J. M. B.

Hyper'bola [= Mod. Lat. *hyper bola* = Gr. ὑπερβολή, *hyper'bola*, liter., a throwing beyond, exceeding, excess, deriv. of ὑπερβάλλειν, throw beyond, exceed; ὑπέρ, over, beyond + βάλλειν, throw]: a plane curve that may be generated by a point moving in such a manner that the difference of its distances from two fixed points is always equal to a given distance. The fixed points are called *foci*, and a straight line drawn through them and limited by the curve is called the *transverse axis*. The *center* is that point of the transverse axis which is midway between the foci, and a line through this point perpendicular to the transverse axis is called the *conjugate* axis. This axis does not cut the curve, but it is limited by the condition that the diagonal of the rectangle describes upon it and the transverse axis shall be equal to the distance between the foci. The *eccentricity* is the distance from the center to either focus, divided by the semi-transverse axis. The diagonals of the rectangle described on the axes indefinitely prolonged are *asymptotes* to the curve; as we recede from the center the curve continually approaches these lines, becomes tangent to them at an infinite distance, but never crosses them. These asymptotes are the limits of the curve. If b is less than a, the angle between the asymptotes is acute and the hyperbola is *acute*; if b is greater than a, the hyperbola is *obtuse*; if b is equal to a, the hyperbola is *rectangular* or *equilateral*.

The hyperbola is one of the Conic Sections (*q. v.*). The conic surface from which every variety of hyperbola may be cut by a secant plane is a surface that may be generated by a straight line moving in such a manner as to touch a given circle and pass through a given point. The directing circle is called the *base* of the cone, the fixed point is called the *vertex*, the moving line is the *generatrix*, any position of this line is an *element*, and a line through the vertex and center of the base is the *axis*. The surface thus described consists of two parts, united at the vertex, which are called *nappes*; the lower nappe is the one that is on the side of the base; the other one is called the upper nappe. By varying the position of the vertex with respect to the base, the cone may be made right or oblique, acute or obtuse. If we pass a plane through the vertex of this general cone, it will cut out two elements, and by suitably varying the position of this plane these elements may be made to have any inclination to each other. If we pass a second secant plane parallel to the first, it will cut from the cone a hyperbola whose asymptotes are parallel to the elements cut out by the first plane. The plane of the hyperbola cuts all the elements of the cone except the two to which it is parallel, half on one nappe and half on the other. These points of intersection make up two branches, one lying on the lower and the other on the upper nappe of the cone.

Two hyperbolas which are so related that the transverse axis of either is the conjugate axis of the other are called *conjugate* hyperbolas. Two conjugate hyperbolas have the same asymptotes, and their four foci are all on the circumference of the same circle.

Two conjugate hyperbolas may be cut from a pair of conjugate cones, or from a pair of conjugate hyperboloids. Let there be two straight lines intersecting each other at right angles, and let there be a third line lying in their plane and passing through their common point; if the last line is revolved about each of the others in turn, it will generate a pair of conjugate cones tangent to each other, and any plane parallel to their axes will cut from these cones a pair of conjugate hyperbolas whose asymptotes are parallel to the elements of contact. For particular properties of the hyperbola, refer to special treatises on conic sections, of which Salmon's *Conic Sections* is probably the most full and complete. Revised by S. Newcomb.

Hyper'boloid [*hyperbole* + *-oid*, like, or Gr. ὑπερβολή, hyperbola + εἶδος, form, likeness]: a surface such that the sections made by passing planes in certain directions are hyperbolas. There are two classes—*elliptical* and *parabolic* hyperboloids. In the former all the plane sections that are not hyperbolas are ellipses, and in the latter all the sections that are not hyperbolas are parabolas. The elliptical hyperboloids are divided into two species—hyperboloids of one nappe and hyperboloids of two nappes. The former are warped surfaces, and the latter are surfaces of double curvature. In the hyperboloids of one nappe every section made by a plane parallel to a tangent plane is a hyperbola, and all other plane sections are ellipses; in the hyperboloid of two nappes every section made by a plane parallel to a tangent plane is an ellipse, and all other sections are hyperbolas. If two conjugate hyperbolas are revolved about either axis, they will generate a pair of conjugate hyperboloids of revolution, and their common asymptotes will generate a cone which separates the two and is a common asymptote to both. The hyberbola that revolves about its conjugate axis generates a hyperboloid of one nappe: that which revolves about its transverse axis generates a hyperboloid of two nappes; and the asymptotic cone is their common limit. Any plane parallel to two elements of the asymptotic cone will cut from the system of surfaces a pair of conjugate hyperbolas.

The most remarkable property of the hyperboloid of one nappe is that through any point of the surface two straight lines can always be drawn that will coincide with the surface, and the plane of these lines will be tangent to the surface at that point. Any plane parallel to a tangent plane intersects the surface in a hyperbola; every other plane, in an ellipse. Revised by S. Newcomb.

Hyperbo'reans [from Lat. *hyperbo reus* = Gr. ὑπερβόρεος, plur. Ὑπερβόρεοι, liter., beyond the north wind; ὑπέρ, over, beyond + βορέας, north wind]: a mythical people who dwelt in the far north, beyond the Rhipæan Mountains, where the sun never set, where sickness, old age, and sorrow were unknown. They were exceeding wise and virtuous. Herodotus, Strabo, and others claimed that the Hyperboreans were simply men who lived in the far north. It is plain now that the name was originally applied to the messengers who brought to the shrine of Apollo the gifts of distant peoples. See the article of O. Crusius in Roscher's *Lexicon* under *Hyperboreer*. J. R. S. Sterrett.

Hypercor'acoid [Gr. ὑπέρ, over, above + Eng. *coracoid*. See Coracoid]: the upper bone apposed to the inner surface of the great scapular cincture of the typical fishes. It is one of three bones which together are homologous with a single cartilage in the more generalized fishes—i. e. ganoids—and was regarded by Cuvier as the radius, by Owen as the ulna, and by Gegenbaur and Parker as the scapula.

Hyperei'des (in Gr. Ὑπερείδης): one of the canonical Ten Orators of Athens; statesman and fearless and unselfish patriot; voluptuary and a friend of Phryne, and a frequenter of the fish-market. Trained in the school of Isocrates, and not untouched by Platonic influences, he began as a lawyer, then went into politics, became one of the leaders of the anti-Macedonian party, and was closely associated with Demosthenes until the affair of Harpalus (*q. v.*), when he broke with his great contemporary, and actually prosecuted him. After the withdrawal of Demosthenes (324 B. C.) Hypereides became the leader of the party, and in 322 was put to death after cruel tortures by the emissaries of Antipater. According to the estimates that have come down from the ancients Hypereides was almost the peer of Demosthenes as an orator, indeed by some was preferred to him, as his equal in impressiveness and his superior in grace and wit. All this had to be taken on trust until the discovery of three of his speeches in an Egyptian papyrus in 1847, followed by the find of an important fragment of a funeral oration (Ἐπιτάφιος) in 1856, all contained in Blass's edition in the Teubner collection. Other speeches and parts of speeches have since come to light, among them the highly characteristic *Speech against Athenogenes*, discovered in 1891 and published with an English translation by Kenyon (1893), so that we are now able to understand for ourselves the high rank which he held in antiquity. See Blass, *Attische Bered-*

samkeit, vol. III., 2d part, pp. 1–76; Jebb, *Attic Orators*, vol. II., pp. 381–92. B. L. Gildersleeve.

Hypergeometry: See Geometry.

Hyperi'on (in Gr. Ὑπερίων): in Greek mythology, a Titan, the son of Uranus and Gæa, and the husband of Theia, his sister. Hesiod makes him the father of Helius, the sun-god, but the name may be a patronymic (like Κρονίων), and in that case should properly belong to Helius alone, so that the father has assumed the name of the son. The word, regarded as a proper name, means "he who walks on high" (ὁ ὑπεράνω ἡμῶν ἰών), a meaning shared also by the patronymic. J. R. S. S.

Hyperoar'tia and **Hyperotre'ta** [Mod. Lat.: Gr. ὑπερῴη, palate (deriv. of ὑπερῷος, upper, cf. ὑπερῷον, upper room) + ἄρτιος, complete, perfect (deriv. of ἄρτι, just, exactly), and τρητός, perforated]: names given to the two orders of Marsipobranchs (*q. v.*), according as there are inner nostrils (*Hyperotreta*) or not (*Hyperoartia*). To the Hyperoartia belong the lampreys, to the Hyperotreta the hag-fishes. J. S. K.

Hy'persthene [from Gr. ὑπέρ, over (in compounds) extra + σθένος, strength]: the Labrador horblende, or, more strictly, the thin-leaved, brittle, and bronze-colored variety of pyroxene, an impure ferro-silicate of magnesia. It is often quite handsome, and is cut as an ornamental stone.

Hyper'trophy [liter., overnourishment, overgrownness, from Gr. ὑπέρ, over + τρέφειν, bring up, nourish]: in pathology, the overgrowth of any part or organ resulting from equal increase of all the constituent parts of that part or organ. It may be caused, first, by an increased exercise of the part, an exemplification of which is seen in the blacksmith's arm; second, by an increased supply of blood to a part, the part being healthy. Hypertrophy, as a rule, is a desirable process, the part or organ in question increasing in size and therefore in function just as much as is necessary to supply unusual demands made upon it. This is illustrated in the blacksmith's arms, and in a heart which enlarges as a result of diseases of the blood-vessels which impede the flow of blood. Mere increase of size, as in the case of abscess or tumors, in an organ is not hypertrophy. See Heart Disease. Revised by William Pepper.

Hypnotism [from Gr. ὑπνοῦν, put to sleep, deriv. of ὕπνος, sleep]: a general word for the phenomena of hypnosis, which is a peculiar sleep-like condition of body and mind brought on by prolonged concentration of the attention upon a single object, usually at the suggestion of a second person. Hypnotism is the scientific word which covers all the facts designated by such terms as *mesmerism*, *animal magnetism*, *mental suggestion*, *clairvoyance*, *mind-reading*, *second sight*, etc.

History.—Its modern history dates from the time of Friedrich Anton Mesmer, a Swiss physician, born in 1734. About 1766 he began to use mineral magnetism as a remedy in his practice. Soon, however, he promulgated the doctrine that magnetism was a property common to all bodies, that there was a special force in the animal parts of man, and that by its influence a trance state could be produced and disease cured. This force was called by him animal magnetism, and by his disciples mesmerism. He settled in Paris, and for a time had great success, making many sensational and apparently wonderful cures. In 1784, however, the Government appointed a committee of learned men, among whom were Benjamin Franklin and Lavoisier, to investigate the subject. The report was unfavorable, the concluding words being, "Magnetism is one fact more in the history of human errors, and a great proof of the power of imagination." Soon afterward Mesmer found it expedient to go to England, where he lived for a time under an assumed name. He died in Meersburg in 1815. In the meanwhile the Marquis de Puységur had investigated somnambulism, and had eliminated many of the fallacies of Mesmer's doctrine. The whole matter, however, quickly fell into disrepute, and became the property of charlatans until 1842, when James Braid, a reputable physician of Manchester, England, published his work entitled *Neurypnology*. Braid proved that the phenomena do not depend upon any mysterious force transmitted from the operator, but upon the physical and psychical condition of the subject. He thought that eye strain, caused by looking at a bright object held near the eye, would produce the condition of hypnotism, a term which he was the first to employ. Notwithstanding his efforts to put the subject upon a scientific basis, many metaphysical and quackish doctrines were put forth. Prominent among them were Grimes's *Electro-biology* and Reichenbach's *Odology*. In 1866 Liébault, of Nancy, advocated from a scientific point of view its therapeutic use, and later Charcot made a careful study of the whole subject.

Facts of Hypnotism.—The facts upon which the current theories of hypnotism are based may be summed up under a few heads. When by any cause the attention is held fixed upon an object, say a bright button, for a sufficient time without distraction, the subject begins to lose consciousness in a progressive way. The Paris school of interpreters find three stages of progress in the hypnotic sleep: First, *catalepsy*, characterized by rigid fixity of the muscles in any position in which the limbs may be put by the experimenter, with great *suggestibility* on the side of consciousness, and anæsthesia in certain areas of the skin and in certain of the special senses; second, *lethargy*, in which consciousness seems to disappear entirely, the subject can not be aroused by any sense stimulation by eye, ear, skin, etc., and the body is flabby and pliable as in natural sleep; third, *somnambulism*, so called from its analogies to the ordinary sleep-walking condition to which many persons are subject. This last covers the phenomena of ordinary mesmeric exhibitions at which traveling mesmerists "control" persons before audiences and make them obey their commands. While other scientists properly deny these distinct stages as such, they may yet be taken as representing extreme instances of the phenomena, and serve as points of departure for further discussion.

On the mental side the general characteristics of hypnotic somnambulism are as follows: (1) *The impairing of memory* in a peculiar way. In the hypnotic condition all affairs of the ordinary life are forgotten; on the other hand, after waking, the events of the hypnotic condition are forgotten. Further, in any subsequent period of hypnosis the events of the former similar periods are remembered. So a person who is habitually hypnotized has two continuous memories, one for the events of his normal life, only when he is normal; and one for the events of his hypnotic periods, only when he is hypnotized. (2) *Suggestibility* to a remarkable degree. By this is meant the tendency of the subject to have in reality any mental condition which is suggested to him. He is subject to suggestions both on the side of his receptivity to impressions and on the side of action. He will see, hear, remember, believe, refuse to see, hear, etc., anything (with some doubtful exceptions) suggested to him by word or deed, or even by the slightest and perhaps unconscious indications of those about him. On the side of conduct his suggestibility is equally remarkable. Not only will he act in harmony with the illusions of sight, etc., suggested to him, but he will carry out, like an automaton, the actions suggested to him. These phenomena and those given below are no longer based on the mere reports of the "mesmerists," but are the recognized property of legitimate psychology. Further, pain, pleasure, and the organic accompaniments of them can be produced by suggestion. The arm may be actually scarred with a lead-pencil if the patient be told that it is red-hot iron. A suggested pain brings the vaso-motor and other bodily changes that prove, as similar tests in the other cases prove, that simulation is impossible and the phenomena are real. Again, such suggestions may be for a future time, and get themselves performed only when a determined interval has elapsed—i. e. are *deferred* and *post-hypnotic* suggestions. Post-hypnotic suggestions are those which include the command not to perform them until a certain time after the subject has returned to his normal condition; such suggestions are—if of reasonably trifling character—actually carried out afterward in the normal state, although the person is conscious of no reason why he should act in such a way, having no remembrance whatever that he had received the suggestion when hypnotized. Such post-hypnotic performances may be deferred by suggestion many months. (3) So-called *Exaltation* of the mental faculties, especially of the senses, increased acuteness of vision, hearing, touch, memory, and the mental functions generally. By reason of this great "exaltation" hypnotized patients get suggestions from experimenters which are not intended, and discover their intentions when every effort is made to conceal them. Often emotional changes in expression are discerned by them; and if it be admitted that their power of logical and imaginative insight is correspondingly exalted, there is practically no limit to the patient's ability to read, simply from physical indications, the mental states of those who experiment

with him. (4) So-called *Rapport*. This term covers all the facts known before the subject was scientifically investigated, such as "personal magnetism," "will power" over the subject, etc. It is true that one particular operator alone may be able to hypnotize a particular patient, and in this case the patient is, when hypnotized, open to suggestions only from this person. He is deaf and blind to everything enjoined by any one else. It is easy to see from what has already been said that this does not involve any occult nerve influence or mental power. A sensitive patient anybody can hypnotize, provided only that the patient have the idea or conviction that the experimenter possesses such power. Now, let a patient get the idea that only one man can hypnotize him, and that is the beginning of the hypnotic suggestion itself. It is a part of the suggestion that a certain personal *rapport* is necessary; so the patient must have this *rapport*. This is shown by the fact that when such a patient is hypnotized the operator in *rapport* with him can transfer the so-called control to any one else simply by suggesting to the patient that this third party can also hypnotize him. *Rapport*, therefore, and all the amazing claims of charlatans to powers of charming, stealing another's personality, controlling his will at a distance, all such claims are explained, as far as they have anything to rest upon, by suggestion under conditions of mental hyperæsthesia or exaltation.

Methods of Producing Hypnosis.—In general any method which fixes the attention to a single stimulus long enough is probably sufficient; but the result is quick and profound in proportion as the patient has the idea that it is going to succeed—i. e. gets the suggestion of sleep. In general it may be said therefore that the elaborate performances, such as passes, rubbings, mysterious incantations, etc., often resorted to have no physiological effect whatever, and only serve to work in the way of suggestion upon the mind of the subject. In view of this it is probable that any person in normal health can be hypnotized, provided he is not too skeptical of the operator's knowledge and powers; and, on the contrary, any one can hypnotize another, provided he do not arouse too great skepticism. It is probable, however, that susceptibility varies greatly in degree, and that race exerts an important influence. Thus in Europe the French seem to be the most susceptible, and the English and Scandinavians the least so. The impression that weak-minded persons are most available is quite mistaken; on the contrary, patients in the insane asylums and idiots, etc., are the most refractory. This is to be expected, from the fact that in these cases power of strong, steady attention is wanting. The only one class of pathological cases which seem peculiarly open to the hypnotic influence is that of the epileptico-hysterics, whose tendencies are toward extreme suggestibility. Further, one may hypnotize himself, especially after having been put into the trance more than once by others (so-called *auto-suggestion*). It is further evident that frequent hypnotization is very damaging if done by the same operator, since then the patient contracts a habit of responding to the same class of suggestions, and this may influence his normal life. A further danger arises from the possibility that all suggestions have not been removed from the patient's mind before his awaking. Competent scientific observers always make it a point to do this. It is possible also that damaging effects result to a man from frequent hypnotizing, and it is probable to a degree simply from the fact that the state is abnormal and, while it lasts, pathological. Consequently all general exhibitions in public, as well as all individual exercises of this kind, should be prohibited by law, and the whole practical application as well as observation of hypnosis should be left in the hands of physicians who have proved their fitness by an examination and secured a certificate of license. Further, Liégeois suggests (what is quite an unnecessary resource) that every child should be hypnotized by a special official, and the suggestion made to him, once for all, that no one under any circumstances shall be able to throw him into hypnosis again. In Russia (summer, 1893) a decree permits physicians to practice hypnotism for purposes of cure under such certificates. In France public exhibitions are forbidden.

Theories of Hypnosis.—Two rival theories are held as to the general character of hypnosis. The Paris school already referred to, led by Charcot, hold that it is a pathological condition which can be induced only in patients already mentally diseased or having neuropathic tendencies. They claim that the three stages described above are a discovery of great importance. The best books on this side are Binet and Féré, *Animal Magnetism* (New York, 1888); Janet, *Automatisme Psychologique* (Paris, 1889); Charcot's medical treatises (*Œuvres complètes*, vol. ix., Paris, 1893); numerous articles in the *Revue Philosophique*. The so-called Nancy school, on the other hand, led by Bernheim, deny the pathological character of hypnosis altogether, claiming that the hypnotic condition is nothing more than a special form of ordinary sleep brought on artificially by suggestion. Suggestion, they say, is only an exaggeration of an influence to which all persons are normally subject. All the variations, stages, curious phenomena, etc., of the Paris school, say they, can be explained by this "suggestion" hypothesis. The Nancy school is completely victorious as far as the great mass of the facts are concerned. Their best books are Moll, *Hypnotism* (New York, 1893); Bernheim, *Suggestive Therapeutics* (New York, 1889); *Études nouvelles sur l'Hypnotisme* (Paris, 1891).

Criminal Suggestion.—Applied to so-called suggestions of crime made in the hypnotic state. Cases have been tried in the French courts in which evidence for and against such influence of a third person over the criminal has been admitted. The reality of the phenomenon, however, is in dispute. The Paris school claims that criminal acts can be suggested to the hypnotized subject which are just as certain to be performed by him as any other acts. Such a subject will discharge a blank-loaded pistol at any one, when told to do so, or stab him with a paper dagger. While admitting the facts the Nancy theorists claim that the subject knows the performance to be a farce; gets suggestions of the unreality of it from the experimenters, and so acquiesces. This is probably true, as is seen in frequent cases in which patients have refused, in the hypnotic sleep, to perform suggested acts which shocked their modesty, veracity, etc. This goes to show that the Nancy school are right in saying that while, in hypnosis, suggestibility is exaggerated to an enormous degree, still it has limits in the more well-knit habits, moral sentiments, social opinions, etc., of the subjects. And it further shows that hypnosis is probably, as they claim, a temporary disturbance rather than a pathological condition of mind and body.

Therapeutic Value of Hypnotism.—There have been many remarkable and sensational cases of cure of disease reported, especially in France. That hysteria in all of its manifold manifestations has been relieved is certainly true, but that any organic, structural disease has ever been cured by hypnotism is unproven. In the U. S. it is not regarded by medical authorities as an agent of much therapeutic value, and is rarely employed; but it is doubtful, in view of the natural prejudice caused by the pretensions of charlatans, if its merits have been fairly tested. On the European Continent it has been successfully applied in a great variety of cases, and Bernheim has shown that minor nervous troubles, insomnia, migraines, drunkenness, lighter cases of rheumatism, sexual and digestive disorders, together with a host of smaller temporary causes of pain—corns, cricks in back and side, etc.—may be cured or very materially alleviated by suggestions conveyed in the hypnotic state. In many cases such cures are permanently effected with aid from no other remedies. In a number of great city hospitals patients of recognized classes are at once hypnotized and suggestions of cure made. Liébault, the founder of the Nancy school, has the credit of having first made use of hypnosis as a remedial agent. It is also becoming more and more recognized as a method of controlling refractory and violent patients in asylums and reformatory institutions. It must be added, however, that in general psychological theory rather than medical practice is seriously concerning itself with this subject. The facts show an intimacy of interaction between mind and body to which current psychology in its psycho-physical theories is beginning to do justice.

Further References.—James, *Principles of Psychology* (New York, 1890), vol. ii., ch. xxvii.; Lehmann, *Die Hypnose* (Leipzig, 1890); Wundt, *Hypnotismus und Suggestion* (Leipzig, 1893); Dessoir, *Bibliographie der Modernen Hypnotismus* (with supplement, Berlin, 1891); Schmidkunz, *Psychologie der Suggestion*; Meyers, *The Subliminal Consciousness*, *Proc. Lond. Soc. for Psychical Research*, 1892-93; Ochorowicz, *Mental Suggestion* (New York, 1892); Baldwin, *Among the Psychologists of Paris* and *With Bernheim at Nancy*, letters in the New York *Nation*, July 28 and Aug. 11, 1892. See Mesmer, Telepathy, and Suggestion.

J. Mark Baldwin.

Hyp'num [Mod. Lat. = Gr. ὕπνον, moss growing on trees]: a very large genus of mosses of the family *Hypnaceæ*. Many

of them are large, and grow on wet ground or on old logs. Nearly 200 species occur in North America, many of which are European also. There are many sub-genera, some of which are probably worthy of being considered genera.

Hypochlo'rous Anhydride [*hypochlorous* is from *hypo-*, lower, weaker (from Gr. *ὑπό*, under) + *chlorous*, deriv. of *chlorine*]: a substance formerly called hypochlorous acid (a name now used for the product of its union with water), having the composition Cl_2O. It is a pale-yellow gas which explodes, though without much energy, when heated. It differs much in odor from chlorine, and is condensed by snow and salt to a deep red, very explosive liquid. It is prepared in the gaseous form by reaction of dry precipitated mercuric oxide on chlorine gas: $HgO + 2Cl_2 = HgCl_2 + Cl_2O$. The compound acts upon water to form hypochlorous acid: $Cl_2O + H_2O = 2HClO$. It is of course a very powerful, and would be a very useful, bleaching and oxidizing agent, were it not for its instability, which unfits it for storage and transportation. The immensely valuable properties of this substance must be secured, therefore, by means of compounds which are capable of evolving or producing it. See HYPOCHLORITES.

Revised by IRA REMSEN.

Hypochlo'rites, or **Bleaching-salts**: salts of hypochlorous anhydride, being many of the most valuable bleaching and disinfecting agents.

Potassium hypochlorite, KClO, is the active ingredient of what has been known as *Javelle water*, or *eau de Javelle*; also called "chloride of potash." This is a colorless liquid, of peculiar smell, which is prepared by passing chlorine gas through a cold solution of potassium carbonate: $K_2CO_3 + Cl_2 = KCl + KClO + CO_2$. It therefore contains both potassium hypochlorite and potassium chloride. Another method of preparing Javelle water is by adding to a solution of "bleaching-powder" or "chloride of lime" (see below) a solution of potassium carbonate, in quantity sufficient to precipitate all the lime as calcium carbonate. The clear decanted liquid will contain the same constituents as before, but will be likely to be less potent, or to contain less, in proportion, of the active constituent. Javelle water is used for taking out stains, such as those of fruit, from white textile fabrics, and for bleaching wood, straw, etc.

Sodium hypochlorite, in solution, constitutes what is called "Labarraque's disinfecting liquor," after a Parisian druggist who manufactured and sold it for disinfecting purposes. It is also called "chloride of soda," and in medicine "chlorinated soda." The methods of preparation are precisely similar to those given above for the potash-hypochlorite, using sodium instead of potassium carbonate. The sodic hypochlorite solution, as prepared for commerce, has a feeble chlorine-like odor, alkaline reaction, and strong bleaching and disinfecting powers. It is considered a very valuable medicinal material.

Calcium Hypochlorite.—Under this head it is proper to treat the important commercial product known as *bleaching-powder* or *chloride of lime* (Germ. *Chlorkalk*; Fr. *chlorure de chaux*). It is proved, however, by recent researches that *solid dry* bleaching-powder does not contain calcium hypochlorite, which is first formed by the action of water or moisture upon it. The chloride of lime of commerce is prepared by exposure of dry or slightly damp slacked lime to chlorine gas. The lime is spread on trays placed in a stone chamber whose interior can be inspected through glass windows. The gas must be passed in slowly at first, to prevent heating of the lime, which would promote the formation of chloride of calcium, to the detriment of the product. The whole time required is about four days. It forms a dry or slightly moist grayish-white powder, having a peculiar, highly nauseous odor, differing from, though suggesting, that of chlorine. It gradually decomposes and deteriorates with time, and can not be preserved in sealed packages, by reason of slowly evolved gas. The main action of chlorine on lime takes place according to the equation

$$\underset{\text{Lime.}}{2Ca(OH)_2} + 4Cl = CaCl_2 + \underset{\text{Bleaching-powder.}}{Ca(ClO)_2} + 2H_2O.$$

According to this, the powder is a mixture of calcium chloride and calcium hypochlorite. But bleaching-powder does not conduct itself as if it were such a mixture, and it is now generally conceded that it is a compound of the formula $CaOCl_2$. When treated with water this compound appears to be resolved into a mixture of the hypochlorite and the chloride. It is regarded now as proved that in the atmosphere, by virtue of its moisture, the same breaking up occurs as represented above with liquid water, and that then, by the carbonic acid of the air, hypochlorous acid is set free from the hypochlorite that has been formed; to which latter acid the disinfecting action is due, and not to the evolution of free chlorine, as has been most generally believed.

Chlorimetry—Testing the Value of Bleaching-powder.—This is a highly important laboratory operation. The practical point to be settled is of course the relative amount of active chlorine, or its equivalent, that is present. This must be, and is almost altogether, affected by rapid methods of the volumetric class, in which very closely and accurately measured quantities are employed, of solutions of known strength or value, of appropriate reagents. One simple method that has been much used is to prepare a solution of the lower oxide of iron (ferrous oxide) of known strength, and ascertain how much of it a certain weight of the bleaching-powder will oxidize up to the higher, or ferric oxide; the point being determined by testing—after every addition of the normal ferrous solution—a drop of the solution examined with red prussiate of potash. Another method is to mix the weighed bleaching-powder with muriatic acid and iodide of potassium, iodine being thus set free in amount equivalent to the effective chlorine, and coloring the liquid brown. A normal solution of hyposulphite of soda is then added, in successive measured quantities, until the color vanishes, when the quantity of hyposulphite that has been used will be a datum for the calculation of the value. Many other methods, similar in principle, have been used. A first-class, fresh-made article should furnish 28 to 30 per cent. of effective chlorine.

Magnesium Hypochlorite.—This, in solution (formed either by passing chlorine into a mixture of magnesia with water, or by precipitating a solution of chloride of lime with sulphate of magnesia) is recommended for bleaching uses by Bolley, on the grounds that its action is more rapid than common bleaching-powder by reason of the more ready decomposition of the magnesia compound, and that magnesium hydrate is less caustic, and hence less liable to injure delicate fabrics than the calcium hydrate.

Revised by IRA REMSEN.

Hypochon'dria [= Gr. *ὑποχόνδρια*, plur. of *ὑποχόνδριον*, the upper part of the abdomen; *ὑπό*, under + *χόνδρος*, cartilage, breast bone]: in anatomy, the regions of the abdomen on either side of the epigastrium. The name is also given to the diseased condition more frequently called hypochondriasis by the medical profession.

Hypochondri'asis [Mod. Lat.: *hypochondrium* + suffix *-iasis* for names of diseases]: a morbid state of mind, deriving its name from the old belief that the hypochondria were the seat of the disease. It is more common in men than in women. The patient imagines that he suffers from diseases which he does not possess, and in which he suffers from subjective sensations entirely unaccounted for by the objective signs of disease in his case. The disease itself is real. It may result from dyspepsia, from sexual excess, or from other causes interfering with the nutrition of the nerve-centers. The disease may amount to positive insanity, and is then classed as *melancholia*. Medicine and hygienic regimen often do but little good. Cheerful companionship, fishing, hunting, and boating, long journeys, even the reading of well-selected novels—in fact, anything which will divert the mind from its habit of morbid self-observation—will be found useful. An aphorism which has been introduced in medicine, and which is partly true, is that diseases above the diaphragm, e. g. pulmonary consumption, are characterized by hopefulness and cheerfulness, while those below the diaphragm tend to hypochondriasis, as, e. g., in liver diseases.

Revised by WILLIAM PEPPER.

Hypocor'acoid [Gr. *ὑπό*, under + *coracoid*]: the inferior bone connected with the inside of the great scapular girdle of the typical fishes. It is one of three bones which together are homologous with the intrascapular or coracoid cartilage of the ganoid fishes, and was regarded by Cuvier as the ulna, by Owen as the radius, by Gegenbaur as the precoracoid, and by Parker as the coracoid.

Hypocy'cloid [Gr. *ὑπό*, under + *cycloid*: Gr. *κύκλος*, circle (: Eng. *wheel*) + suffix *-oid*, like]: a curve whose course is generated by a point in the circumference of a circle rolling on a concave side of a fixed circle. When the rolling circle has a radius equal to just half that of the fixed circle, one revolution of the smaller circle will generate a hypocycloid equal to the diameter of the greater circle. If the rolling circle is the larger, the hypocycloid becomes equivalent to

an epicycloid. If the generating point of a hypocycloid be in the plane of the rolling circle, but not in its circumference, the curve generated is a hypotrochoid; and if the radius of the fixed circle is double that of the rolling one, the hypotrochoid becomes an ellipse.

Hypodermic Medication [Gr. *ὑπό*, under + *δερμα*, skin]: a method of administering drugs by the use of a hollow needle attached to a syringe. This was first brought into practical use by Dr. Alexander Wood, of Edinburgh, who in 1843 injected a solution of morphine through an opening made in the skin. It was not until 1855 that Wood published an account of his completed method. Previous to this, however, a number of physicians of Edinburgh and Dublin, who had received information from Dr. Wood, had used the method quite largely. For the carrying out of hypodermic medication it is necessary to have a small hollow needle made from a metal which will give it considerable strength, and a syringe which should hold from 20 to 30 minims of water. The medicament having been drawn into the syringe and all the air driven out, the needle is attached and then its point is introduced a considerable distance beneath the skin in such a way that when the fluid is discharged it will find a resting-place in the loose connective tissue, and not immediately beneath the skin where it would separate the derm from its nourishing blood-vessels.

The injection should be slowly made, but the insertion of the needle should be done rapidly, as it is less painful. The injection is generally given in the arm or on the thigh, care being taken to avoid veins, since should the drug enter a vein it might be carried directly to the heart, and exert too great an influence. In giving the hypodermic injection in the forearm it is best to insert the needle upon the extensor surface, as it is much less apt to produce pain when given in this place. Care must be taken that the needles and syringes employed are absolutely aseptic, and if this detail be carefully attended to there is no danger of abscess resulting from ordinary injections. Irritating substances ought never to be used hypodermically. The dose for hypodermic medication is about one-quarter to one-half that generally used by the mouth, and the advantage of this method is the rapid absorption of the drug in cases where an immediate effect is desirable.

Strictly speaking, the word hypodermatic is etymologically correct, but the word hypodermic is so universally employed that it is sanctioned by usage. H. A. Hare.

Hy'pogene [Gr. *ὑπό*, under + *-γενης*, produced, from root of *γενεσθαι*, become]: a term proposed in 1830 by Lyell for those crystalline rocks which were "nether formed," or produced below thick overlying accumulations of sedimentary or volcanic materials themselves formed at the earth's surface. In this sense the term is nearly synonymous with *plutonic*, although this usually refers more particularly to massive or igneous rocks which have solidified below the surface, while Lyell's use of hypogene includes also the foliated crystalline rocks. Granite, syenite, diorite, and gneiss, are examples of hypogene rocks. Geikie has proposed to use the term *hypogene* for all those geological forces and processes dependent on the interior heat of the globe or chemical action, and contrasts them with *epigene* forces which act on the earth's surface chiefly through the circulation of air and water brought about by the sun's heat.

G. H. Williams.

Hyponi'tric Acid: See Nitrogen.

Hypophar'ynx: See Entomology.

Hypophos'phites [*hypo-*, lowest, weakest (Gr. *ὑπό*, under) + *phosphite*, deriv. of *phosphorus*]: salts of hypophosphorous acid. In medicine the term is currently used as referring to potassium, sodium, and calcium hypophosphite, which are considered by some to yield the medicinal effects of phosphorus, while free from the latter's poisonous qualities, which is absolutely untrue and impossible. They were not long since highly vaunted as remedies in the treatment of consumption, but have not sustained their reputation in that particular. Probably they are never useful in this disease unless there is present faulty bone growth or rickets or scrofulosis. See Phosphorus. Revised by H. A. Hare.

Hypophos'phorous Acid: See Phosphorus.

Hypophthal'midæ [Gr. *ὑπό*, under + *ὀφθαλμός*, eye + patronymic suffix *-ίδης*, descended from]: a family of South American nematognathi or siluroids distinguished from all other representatives of the order in the concentration of the anterior vertebræ in contradistinction to their expansion in one, as in the other members of the group; the eyes are situated very low down behind and below the angle of the mouth; and from this peculiarity the typical genus and family have received their names. In other respects they have considerable superficial resemblance to the catfishes of the waters of the U. S. Revised by D. S. Jordan.

Hypoph'ysis [Mod. Lat., from Gr. *ὑπό*, beneath + *φύειν* to grow]: a structure of uncertain functions and problematical origin occurring on the ventral surface of the thalamencephalon, or twixt brain of the vertebrate brain. In its development it is seen to consist of two portions, one derived from the distal portion of that outgrowth from the brain known as the infundibulum, the other, the hypophysis proper, which arises in various forms, either from the roof of the mouth, from the nasal epithelium (*Petromyzon*), or from the region between the two. This latter portion wanders upward and backward until it joins the infundibular downpushing, and joins with it, losing all connection with the region from which it arose. In its histological structure it exhibits a nervous and a glandular portion, the former, at least in the lower vertebrates, producing a secretion which is connected with the ventricles of the brain. The hypophysis has played an important part in connection with various theories of speculative zoölogy. By some it is regarded as connected in one way or another with the primitive mouth; others regard it as the sense organs connected with a lost gill-cleft, while still others would compare it with the so-called ciliated groove of the Tunicata. By many authors the hypophysis is termed the pituitary body.

J. S. Kingsley.

Hyporha'chis: See Feathers.

Hyposul'phites [*hypo-* (in chem.), weakest, lowest (Gr. *ὑπό*, under) + *sulphite*, deriv. of *sulphur*]: salts of hyposulphurous acid. Medicinally, the alkaline hyposulphites may be used for the same purpose as the corresponding sulphites. See Sulphites and Sulphur.

Hyposulphurous and **Hyposulphuric Acids. Hyposulphites** and **Hyposulphates**: See Sulphur.

Hypothecation [from Gr. *ὑποθήκη*, pledge, deposit, mortgage, deriv. of *ὑποθεῖναι*, put away]: in the civil law, a kind of pledge in which the possession of the thing pledged remained with the debtor instead of being delivered to the creditor or lender, as in cases of pledge properly so called. Strictly speaking it applies to immovable things, not susceptible of delivery from hand to hand. (See Pledge.) The term is but little used at common law, but is sometimes employed with reference to bottomry bonds, which are given to obtain a loan of money by making a vessel security for the repayment. (See Bottomry.) The contract of hypothecation is distinguished from a mortgage at common law, and from a pledge, in that while a mortgage transfers the property in the chattel, and the pledge gives a lien which is void without actual possession of the chattel itself, hypothecation simply confers a right to have the chattel sold in order to have the debt paid out of the price. Hypothecation is not to be confounded with respondentia. The latter term properly applies only to a loan of money secured upon the merchandise laden, or to be laden, on board a ship, payment being conditioned on the arrival of the cargo at the port of destination. Revised by Henry Wade Rogers.

Hypoth'esis [Gr. *ὑπόθεσις*, from *ὑποτιθέναι*, to place under, to suppose]: a judgment which is provisionally proposed as an explanation for some fact or group of facts in science, and which may be discarded if found untrue. When an examination of a sufficient number of the facts of the case shows that the hypothesis will stand the tests of experience, and is not inconsistent with known facts and principles, it becomes a *theory*. The *hypothesis* is the work of imagination, the *theory* the fruit of observation and reasoning. The *hypothesis* is the temporary scaffolding by means of which the arch, the perfect theory, is constructed. See Judgment.

Hypsom'etry [Gr. *ὕψος*, height + *μέτρον*, measure]: that branch of geodesy which treats of the measurement of heights, either absolute, when referring to the sea-level, or relative, between any two distant places on the earth's surface. There are three principal and independent methods in use. The first and most accurate depends on the property of fluids when at rest to present their surfaces at right angles to the direction of gravity; the second depends on the angular measure of elevation, in combination with the known distance of the object, and having regard to the effect of atmospheric refraction; the third and least

accurate method depends on the law of the decrease of pressure of the atmosphere with an increase of altitude. The first method employs the leveling instrument, the second the theodolite, the third the barometer. Since the introduction of the aneroid barometer (an instrument of precision and of great simplicity and portability) the method of measuring differences of elevations by means of the temperature of boiling water has almost been abandoned; it depends on the known relation between the variations in the atmospheric pressure and the corresponding changes in the boiling-point of water as measured by a very sensitive thermometer; the results, however, are subject to considerable uncertainty. The second or trigonometrical method is the only one applicable in case one or both stations are inaccessible. See LEVELS AND LEVELING.

(1) *Spirit-leveling* is generally conducted as follows: The leveling instrument is set up nearly midway between any two consecutive stations, A and B, on the line of levels, and after its adjustment the readings of the staves placed over the stations are successively taken; the line of sight having been made horizontal, the difference in the readings equals the difference of heights (A—B). The instrument is next placed midway between stations B and C, and the difference

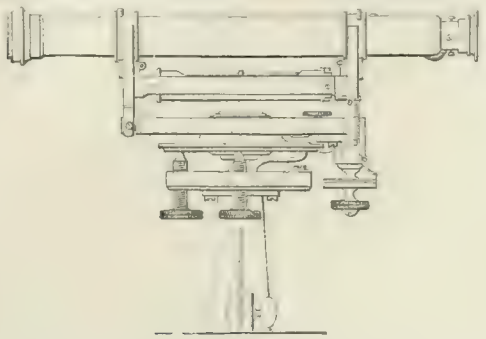

FIG. 1.—Level.

of heights (B—C) is ascertained in a similar way; this process is repeated until the terminal point is reached. The principal adjustment of the instrument consists in placing the optical axis or line of collimation, as determined by the center of the objective and the intersection of the cross-threads parallel to a tangent to the level, thus rendering the sight-line horizontal. For accurate measure the level must be very sensitive; it is filled with alcohol or ether, and its inner surface is generally ground to a radius between 50 and 250 meters, and its least count usually varies between a few seconds and less than a single second for the best levels.

Respecting the accuracy attainable, the mean error may be stated to be about $\frac{1}{70000}$th of the distance for telescopes magnifying ten times, but will decrease to about $\frac{1}{200000}$th with the best instruments. By convention, the surface of the ocean at mean tide-level has been chosen as the zero-level from which to count absolute heights; to connect a line of levels with it a series of consecutive high and low waters must be observed, from which the mean or half-tide level is to be deduced. It follows that if we could level from the equator to the pole, we should find no difference of height, though we approached the earth's center by nearly 13 miles. The difference of height between any two distant stations should be the same, no matter over what route the levels have been carried; that is, the local deflections of the direction of gravity will not affect the result, provided the intermediate stations have not been too far apart in passing over a region of rapidly changing deviations of the plumb-line.

(2) *Trigonometrical leveling* consists in measuring the vertical angle between the zenith of the station occupied and the distant object the height of which is to be determined; the horizontal distance to this object must be known, and is generally given by triangulation, and the measured angle must be increased on account of refraction, which may be taken roughly as proportional to the length of arc of junction, and ordinarily equal to about $\frac{1}{14}$th of the corresponding angle at the earth's center. All measures of zenith distances are affected by any deflection of the plumb-lines which may exist in the vertical planes of the stations, but the uncertainties in the results for height depend chiefly on the variations of the atmospheric refraction, on account of which, for accurate work, the distances may be limited to about 20 to 25 km. (say 12 to 15 statute miles). For such distances very accurate results may be had by observing only within about two hours of apparent noon, during which period the refraction is steady and is near its minimum value; observations taken on objects at great distances, say 100 km. and above, should of necessity be restricted to this period of the day (from 10 A. M. to 2 P. M.).

In Nos. 1478–1480 and 1587–1590 of the *Astronomische Nachrichten*, Dr. Bauernfeind has developed at length the equation to the path of a ray of light passing through the atmosphere, based upon Laplace's differential equation for the atmospheric refraction. (*Mécanique Céleste*, tome iv., p. 246.)

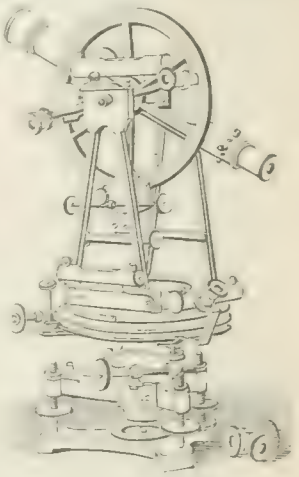

FIG. 2.—Theodolite.

(3) *Measurement of Heights by means of the Barometer.* — This instrument, in the form of a mercurial barometer, may be regarded as essentially a balance in which, under the influence of gravity the mass of the superincumbent atmosphere is equilibrated by a mass of mercury; in the aneroid barometer, on the contrary, the atmospheric pressure is counteracted by the elasticity of a corrugated metallic vessel (generally filled with gas, sometimes supplied with a spring). A change of gravity could not therefore be indicated by an instrument of the first form, but would be by one of the second form. Thus if two such instruments, side by side, were to read alike at the equator, they would, if they could be transported to the pole, differ at the latter place, the mercurial barometer remaining unchanged, but the aneroid indicating the greater pressure existing at the pole. This distinction should be kept in view in hypsometry; the aneroid barometer, however, is generally used only as a differential instrument, and as such may possess great accuracy, especially when the reductions are carefully attended to.

For tables and formulas useful in inferring heights from readings of the barometer, see *Die barometrischen Höhenmessungen*, etc., by Dr. R. Rühlmann (Leipzig, 1870), and the *Meteorological and Physiological Tables*, by Dr. A. Guyot, published by the Smithsonian Institution, Washington, D. C.

Revised by S. NEWCOMB.

Hyracoi'dea [Gr. *ὕραξ*, mouse + *-oidea*, the super-family affix]: an order of educabilian placental or monodelph mammals, with feet whose soles are furnished with pads (as in rodents and carnivores), toes (four to the front, three to the hind feet) with the terminal phalanges incased in hoofs (inner nail of hind foot curved); fore feet with the carpal bones in two interlocking rows; hind feet much deflected inward, articulating in front only with the navicular; teeth peculiar, the molars resembling those of the rhinoceros, and the incisors four in each jaw, those of the upper jaw next to the symphysis with persistent pulps, long and curved, and those of the lower straight and normal. There are from twenty-eight to thirty dorso-lumbar vertebræ, the greatest number found in terrestrial mammals. The placenta is deciduous and zonary. This order has been constituted for the reception of the *Hyracidæ*, which were formerly supposed by naturalists to be related to the rodents, but were later (e. g. by Cuvier, etc.) referred next to the rhinoceros.

Revised by F. A. LUCAS.

Hyrax [Mod. Lat., from Gr. *ὕραξ*, mouse]: a genus of herbivorous mammals belonging to the order HYRACOIDEA (*q. v.*), adopted as a common name for the various members of the group. All the species are small, about the size of a rabbit, an animal which they slightly resemble in external appearance. The tail is short or wanting, the body is covered with fur, and the snout or muffle is split, as in the rodents. Several species have been described, but they are found only in Syria and Africa, where they inhabit rocky places and are known as damans. The best-known species is perhaps the klipdas (*H. capensis*) from South Africa. *H. sinaiticus* or *H. syriacus* is the coney of the Bible, where it is erroneously

regarded as a ruminant, from its habit of moving the jaws constantly from side to side. The tree hyraxes (*Dendrohyrax*, which climb to the lower branches of trees, have the pads of the feet so arranged as to act as sucking disks, by means of which they cling firmly to smooth rocks or tree-trunks. Revised by F. A. Lucas.

Hyrca'nia (in Gr. *Ὑρκανία*): an ancient district of Asia, the present Djordjan; was bounded N. by the Caspian Sea, E. and S. by Parthia, and W. by Media. It was inhabited by nomads of rude and savage habits, and its extensive forests swarmed with wild beasts, of which the Hyrcanian tiger is often mentioned. The honey of its bees was much appreciated. Revised by J. R. S. Sterrett.

Hyrca'nus (*Ὑρκανός*): the name of several historic Jews of the Maccabæan period, of whom the most noteworthy are (1) John Hyrcanus, son and successor of Simon Maccabæus, prince and high priest of the Jews, restorer of the independence of Judæa, and founder of the monarchy, which continued in his family till the accession of Herod. When, in 137 B. C., Antiochus VII. had established himself on the throne of Syria, he determined to reduce Judæa to its former condition of a tributary province of the Syrian monarchy. His general, Cendebeus, invaded the country with a great force, but was defeated by Judas and John Hyrcanus, two sons of Simon Maccabæus. Shortly after, however, in 135 B. C., Simon, together with his two sons, Judas and Mattathias, was assassinated by his son-in-law, Ptolemy. Hyrcanus now assumed the title of prince and high priest, and led an army against Ptolemy, whom he shut up in the fortress of Dagon. Meanwhile, Antiochus Sidetes invaded Judæa with a large army, and Hyrcanus, unable to meet him in the field, retreated to Jerusalem, where he was besieged and pressed hard by Antiochus. At last a treaty of peace was concluded in 133 B. C., according to which the fortifications of Jerusalem were to be demolished and an annual tribute paid to Syria. Four years afterward he followed Antiochus with a force of Jewish auxiliaries on his expedition against Parthia, but was fortunate enough to escape the disaster which overtook the Syrian king and army by an earlier return to Judæa. As soon as Antiochus was dead, Hyrcanus hastened to secure the independence of his own realm, and sent an embassy to Rome in order to get the alliance concluded during the reign of Simon confirmed by the senate. In this he succeeded. He also conquered Sichem in Samaria, destroyed the temple of Gerizim, subdued Idumæa, and extended the boundaries of Judæa. Meanwhile Demetrius II., the brother and successor of Antiochus, returned from his captivity in Parthia, and prepared himself to invade Judæa, but was prevented by an internal war, in which he was killed, 125 B. C. Hyrcanus now ruled for several years in peace, but at last, deeming himself strong enough for the task, he invaded Samaria with a great army and laid siege to the capital. The Samarians invoked the assistance of Antiochus Cyzicenus, but this king was defeated by Antigonus and Aristobulus, two sons of Hyrcanus, and Samaria was taken and razed to the ground, 109 B. C. Hyrcanus reigned three years longer, but these latter years of his government were disturbed not a little by the quarrels of the two powerful sects, the Pharisees and Sadducees. Hyrcanus belonged originally to the former party, but left it and allied himself to the latter; he died 105 B. C. (2) John Hyrcanus II., grandson of the foregoing, son of Alexander Jannæus; was appointed high priest by Alexandra, his mother, 78 B. C., and on her death (69 B. C.) assumed the sovereignty, which in 66 he resigned to his more energetic brother, Aristobulus; fled for protection and assistance to Aretas, King of Stony Arabia, 65; engaged in a civil war, but without success until 63, when he was reinstated by Pompey and made high priest and ethnarch; in 49 was deprived of the latter title, but in 47 the actual sovereignty was restored to him by Julius Cæsar. Meanwhile his brother Aristobulus and Alexander, son of Aristobulus, who made him much trouble, were put to death by the Romans. Antipater, the lieutenant of Hyrcanus, was poisoned with the consent of the high priest 44 B. C., and the young Herod, afterward called the Great, became the virtual ruler. In 40 B. C., Antigonus, son of Aristobulus, induced the Parthians to send an army against Hyrcanus, who was by treachery taken prisoner, deprived of his ears, and then allowed to live in peace at Babylon, where he remained until 33 B. C., when he returned to Jerusalem. Being suspected of plotting against Herod, who had married his daughter, he was put to death in 30 B. C. Revised by S. M. Jackson.

Hyria: See Uria.

Hyrtl, Joseph, von: anatomist; b. at Eisenstadt, Hungary, Dec. 7, 1811; was educated at Vienna, where in 1833 he became prosector in anatomy; was Professor of Anatomy at Prague 1837–45; Professor of Anatomy at Vienna 1845–74 and for a part of the time was rector of the university. He founded the Vienna Museum of Comparative Anatomy, and made many discoveries in human and comparative histology. Author of *Topographische Anatomie* (2 vols., 1847); *Lehrbuch der Anatomie* (1847; many editions since); *Handbuch der praktischen Zergliederungskunst* (1860); *Ueber endlose Nerven* (1865); *Ueber Ampullen am Ductus Cysticus der Fische* (1868); *Die Blutgefässe der menschlichen Nachgeburt in normalen und abnormalen Verhältnissen* (1870); *Das Nervenbrechen der Säugthiere und des Menschen* (1870); *Das Arabische und Hebräische in der Anatomie* (1879); *Die alten deutschen Kunstworte der Anatomie* (1884), and other works. D. in Vienna, July 16, 1894. Revised by C. H. Thurber.

Hys'iæ (in Gr. *Ὑσιαί*): town of Bœotia, at the northern foot of Mt. Cithæron. It was situated on the high road from Thebes to Athens, and formed an important point in the strategic disposition to the battle of Platæa. In the time of Pausanias it was in ruins; an unfinished temple of Apollo and a sacred well were still extant; now nearly every trace of it has disappeared. Another place of the same name was situated on the southern frontier of Argolis, where the Spartans were defeated by the Argives in 669 B. C., when it still remained in the possession of Argos.
Revised by J. R. S. Sterrett.

Hyssop [Gr. *ὕσσωπος*, from Heb. *ēzōbh*]: the *Hyssopus officinalis*, a half-shrubby labiate plant, a native of Europe, sparingly naturalized in the U. S. It is an aromatic stimulant, abounding in a volatile oil. In domestic medicine it is a very useful expectorant. Hedge hyssop is the popular name of various species of *Gratiola*, of the family *Scrophulariaceæ*. As the hyssop of Greek authors is conceded to be the common plant of that name, it has been inferred that it was also that of the Old and New Testaments, but this is by no means certain. Celsius has enumerated eighteen different plants which have been considered as the scriptural hyssop. Dioscorides, a Greek botanist, described two kinds, and the Talmudists have done the same, distinguishing the wild hyssop from the garden plant used for food. It is mentioned of Solomon that he "spake of trees, from the cedar tree that is in Lebanon even unto the hyssop that springeth out of the wall"; and in Psalm li. it is said, "Purge me with hyssop and I shall be clean," etc.; from which indications Dr. J. F. Royle has, after a careful study of the ancient and modern notices, identified the hyssop of Scripture with the modern caper-plant (*Capparis spinosa*, Linn.), which is still found in abundance in Egypt, Sinai, and Palestine.

Hystas'pes: author of a prophetico-apocalyptic work, *Prophecies of Hystaspes*, which was much read by the early Christians, and believed to contain predictions of Christ and the future of his kingdom. Of his life nothing is known, and the book itself has vanished; but it is mentioned by Justin, Clement of Alexandria, and Lactantius. Justin (*Apol.*, i., 20) says: "The Sibyl and Hystaspes said that there should be a dissolution by God of things corruptible," and (*Apol.*, i., 44) says, further: "By the agency of demons death has been decreed against those who read the books of Hystaspes, or of the Sibyl, or of the prophets, that through fear they may prevent men who read them from receiving the knowledge of the good, and may retain them in slavery to themselves; which, however, they could not always effect. For not only do we fearlessly read them, but, as you see, bring them for your inspection, knowing that their contents will be pleasing to all." Clement of Alexandria says (*Strom.*, vi., 5): "Taking Hystaspes read, and you will find much more luminously and distinctly the Son of God described, and how many kings shall draw up their forces against Christ, hating Him and those that bear His name, and His faithful ones, and His patience, and His coming." Lactantius says (*Int. Div.*, vii., 15): "Hystaspes, who was a very ancient king of the Medes, . . . handed down to the memory of posterity a wonderful dream, upon the interpretation of a boy who uttered divinations, announcing, long before the founding of the Trojan nation, that the Roman empire and name should be taken away from the world." (Cf. *Int. Div.*, vii., 18.) Revised by S. M. Jackson.

Hyste'ria [Mod. Lat., from Gr. *ὑστέρα*, womb]: a bodily state defined by Möbius as one "in which ideas control the

body and produce morbid changes in its functions." As the name indicates, it was anciently believed to be due to disease of the womb, indeed it was thought that this organ wandered from place to place, and so caused the varying local symptoms. It is well established, however, that the seat of the disease is in the cerebral functions. It should also be remembered that the popular idea that hysteria is a trifling matter, and that patients could be well if they wished, is false. It may be one of the most serious affections in the catalogue of disease.

The predisposing tendencies are both inherited and acquired. The former may be direct, i. e. from an hysteric parent, or from epilepsy, insanity, or drunkenness. Indeed, a parent vitally weak from any cause may have hysteric offspring. Bad education is the most important of the acquired predisposing tendencies. A spoiled child, untrained to govern temper and desires, alternately petted and crossed, is fertile soil for the disease. Women from the age of puberty until the menopause are the most frequent victims, but it is often met with in men, and is quite common in boys and girls. Sexual excess, masturbation, hard work with excessive worry, are common causes. Sudden or prolonged grief, or any emotional shock, may precipitate an attack, but purely mental work, no matter how excessive, if free from worry, apparently exerts but little influence. Race influences susceptibility greatly, the disease being most frequent and most violent among the French. Savages are exempt, and dwellers in towns much more liable than the agricultural class. As mentioned above, disorders of the generative organs have always been regarded as holding a high causative rank, but usually they are not in themselves grave, and though the removal of the local disturbance sometimes gives relief, quite as frequently it is without influence. "Moral contagion" is sometimes a cause, as is seen in epidemics of hysterical chorea in girls' boarding-schools.

Hysteria may manifest itself in many ways. There is no disease it does not counterfeit. The hysterical fit is the commonest form. This usually follows some emotional disturbance. The patient laughs and cries, complains of a ball rising from the stomach to the throat and choking her —*globus hystericus*. Wild and disorderly movements of the trunk and extremities set in, and the patient sinks to the ground, or may even go to a chair or lounge. Very rarely is she thrown to the ground, and she is almost never injured. She bites at others and at her clothing. The tongue is never bitten. Consciousness is usually preserved, to some extent at least. The paroxysm passes off and a period of emotional disturbance sets in. Subsequently she may pass a large amount of pale, limpid urine.

Paralysis often occurs and may affect one side of the body (hemiplegia), the two legs (paraplegia), or a single member or group of muscles (monoplegia). Laryngeal palsy causes loss of voice, so that the patient can only whisper. If the tongue be also palsied all power of speech is lost. Paralysis of the bladder with retention of urine occurs. Contracture, i. e. rigidity of the muscles in tonic spasm so that the limb or limbs are fixed in a certain position, is quite common. It may last only a short time or for many years, and yet finally be recovered from. These are the cases so often cured by "wonder-workers." Hysterical trismus, which is characterized by fixation of the jaws, occurs occasionally. It usually lasts only a short time, but is apt to recur. Phantom tumor, in which the lower part of the abdomen becomes swollen and appears to be pushed forward by a mass within, is also due to muscular contracture. Similar tumors are sometimes found in large bellied muscles in other parts of the body. Tremor of the hands is very common, and is most apt to occur on voluntary movement or during emotional excitement. Sometimes local clonic spasms appear and the leg or arm is thrown about in the wildest manner, or the movements may be general, causing an hysterical chorea. Hysterical hydrophobia (pseudo-rabies) is almost as frequent as true hydrophobia. The patient in a shorter or longer time, sometimes many months, after being bitten by a dog becomes irritable and depressed. He affirms he is going mad. He has paroxysms in which he alleges he can not drink, grasps at his throat, and barks more or less like a dog. There is no fever and the disease lasts much longer than true rabies.

Anæsthesia is the commonest disorder of sensation. It is usually one-sided, and is accurately limited by the middle line, and involves the mucous surfaces as well as the skin. Sometimes only sensation to touch or pain is affected. Hyperæsthesia also occurs. The sensation of a nail being driven into the head—*clavus hystericus*—is the most frequent manifestation. Neuralgias, painful points in the abdomen and chest, pressure on which may cause a convulsion, backache, sometimes limited to a certain area of the spine, are all met with. The abdominal pain may be so severe as to mimic peritonitis, especially if slight fever be present.

Loss of taste and smell, or subjective odors and savors occur. Complete deafness may appear. The eyes may be supersensitive to light, or there may be blindness. Contraction of the field of vision is quite common and may persist for years, but reversal of the fields is much more frequent in France than with us. In hysterical dyspnœa there is no real difficulty in breathing, but simply an increase in the number of respirations, sometimes amounting to 160 per minute. It may be accompanied by a paroxysmal hoarse, croaking cough. True dyspnœa accompanies laryngeal spasm.

The appetite is often depraved. Patients will eat slate-pencils, dirt, or even more repulsive objects. The cases of "fasting girls" so frequently reported in the newspapers are really instances of hysterical loss of appetite. Usually there is an element of fraud. The patient, though vomiting after every attempt at eating, retains some food, however little, and when the body is at complete rest very little suffices. In the cases in which the patient lives month after month, apparently taking no nourishment, not losing weight, and with the excretory functions carried on normally, food is obtained surreptitiously. The hysteric can, however, go for a longer time without food than the normal man. Besides these cases of fraud there is also a true nervous anorexia in which there is so great a loathing for food as to cause spasm when it is brought near. The skin becomes dry and covered with bran-like scales, the tongue parched and brown. Emaciation is as great as in cancer of the œsophagus. One case weighed only 68 lb. Death may follow and no cause be found, or proper treatment may result in cure.

The secretion of urine may be greatly decreased, and for a time cease entirely without the development of uræmic symptoms. Vomiting always accompanies this condition, and at times the perspiration is so rich in urea as to leave a thin film on the skin. The pulse is sometimes much increased in frequency, sometimes it is slowed. Palpitation is common. Vasomotor disturbances are shown by unilateral sweating, local œdema, and extravasations of blood under the skin. "Bloody vomit" has its source in the gums or in pricking the inside of the nose.

Among the most interesting symptoms are those referable to the joints. The knee or hip is most apt to be affected, and a slight injury has usually preceded. The joint is fixed, sensitive, and swollen. The surface may be cool or slightly warm. The slightest movement causes intense pain. In cases which have lasted some time there is wasting of the neighboring muscles.

Moderate fever may be a part of hysteria, but the cases in which the temperature is alleged to have gone to 110° or 120° F. are fraudulent. The hysteric loves to be exhibited, to be made a wonder of, and she will stoop to any device to secure her end. This is the explanation of the strange objects alleged to be passed with the urine, the fæces, or *per vaginam*. There is also an inordinate desire for sympathy. Moral perversion dominates her nature, she occupies the narrow land between sanity and insanity. Indeed, insanity itself may develop, with hallucinations and delirium lasting sometimes for months. Trance and catalepsy may also occur. For treatment, see Rest-cure.

William Pepper and C. W. Burr.

Hyster'ics: See Hysteria.

Hystero-epilepsy: a form of Hysteria (*q. v.*) in which the manifestations are of a convulsive nature, and therefore resemble the attacks in epilepsy. The causes and nature of this diseased state are in nowise different from those present in other forms of hysteria; and the fact that such violent seizures take place can only be explained by assuming that the motor-cells of the brain are in a highly charged or excitable condition and easily disturbed, whereas in other individuals such a state does not maintain. It is to Professor Charcot, of Paris, that the world owes the accurate description of this disease, and, what is of greatest importance, the ability to distinguish it from the serious and generally incurable disease which it simulates—viz., true epilepsy. Like the latter, hystero-epilepsy is a paroxysmal dis-

case, the attacks occurring with greater or less frequency, according to the mental and physical condition of the patient and according to the environments.

Very generally the patient has a premonition, taking the form of a peculiar sensation in the abdomen or elsewhere, and this is usually sufficiently in advance of the paroxysm that the patient may place herself in a safe position. In falling the subject of hystero-epilepsy rarely is injured, as so frequently occurs in true epilepsy. There may be at the moment of seizure a sharp, piercing cry, an hysterical cry, after which the patient becomes convulsed. At first the limbs are rigidly contracted, but this soon gives place to irregular contractions, with frothing at the mouth and apparently or really loss of consciousness. A peculiar feature of the whole attack is its dramatic quality. Charcot particularly called attention to the position assumed by many—that of a cross, both arms being extended outward, the body and legs being rigid and straight. The contractions and the tossing of the body in the later part of the attack may be violent, but it is noticeable that the patient rarely is injured. Consciousness is apparently lost, but very often a threat will instantly break up the attack, showing that in reality the patient remains conscious throughout. In other individuals there is genuine unconsciousness.

During the attack, especially in the last part of it, the patient becomes talkative or noisy. Often she sings or declaims, and generally the words are accompanied by gestures, and indeed this apparently purposive action, or, as was said before, this dramatic element, is generally noted throughout the attack. After various lengths of time the patient recovers and may fall into a quiet sleep, or may be tranquil and awake. In some instances temporary palsy of a limb or of one side of the body may follow, or indeed this may persist for years. Contractures of the muscles of the hand or foot and alterations of sensation are also frequent sequels, and are distinguished by their general hysterical features.

The work of Charcot which led to the accurate distinction of hystero-epilepsy from true epilepsy is one of the great achievements of this distinguished teacher. Hystero-epilepsy is eminently benign and manageable in comparison with genuine epilepsy, and its treatment is essentially different. The principal points of distinctions are these: the disease occurs more frequently in girls, and especially those of a distinctly hysterical nature; the attack is usually ushered in with a cry; is not often attended by danger of injury; is noisy, dramatic, and not accompanied by the extreme unconsciousness of true epilepsy; urine is not voided during the seizure. Sometimes a dash of cold water, or pressure on the superorbital nerve, will instantly terminate the paroxysm; and by suggestion other parts of the body may be made to assume the same *rôle*.

The treatment must be conducted as in hysteria of other types: by moral training, physical development, and by control. Magnets and plates of metal have been found to stop the seizures when applied to the parts involved in the attacks. Manifestly suggestion is the important factor in this treatment. Harsh measures may succeed in breaking up the paroxysms, but will probably substitute some less apparent form of hysteria, and rarely accomplishes anything but harm. WILLIAM PEPPER.

Hysterot'omy [from Gr. *ὑστέρα*, womb + *ταμεῖν*, cut], or **Cæsarean Operation**: the delivery of a child by opening the abdomen of the mother. Pliny (lib. vii., cap. ix.) says that Cæsar was so called from being taken by excision out of the womb of his mother, and that such persons were called *cæsones*, from the Lat. *cædo*, to cut. There is an obvious improbability in this story, for there were other Cæsars in the family before the man who made the name illustrious. It may be that Julius Cæsar was born in the manner described, but it is very unlikely that this was the origin of his name. If the story be true, the mother must have survived, as Aurelia was alive when her son invaded Britain. The incision is made in or near the middle line of the body, to the length of 6 or 7 inches. This operation has been done by savage tribes in Africa and Asia, probably for centuries, and according to certain travelers, with considerable success. The uterus is exposed, carefully opened, the child lifted out, and then the after-birth. The uterus contracts, the wound is closed, and opium is given to allay pain and nervous irritability. Anæsthetics must of course be given. In recent times the Cæsarean operation has repeatedly been performed with complete success, the life not only of the child but the mother having been saved. Some women, indeed, have had several children, each removed through an abdominal incision. Practitioners are not quite agreed as to all the circumstances which justify the performance of this operation. Dr. Gibson, of Philadelphia, who performed the operation twice on the same woman with entire success, considered the operation comparatively safe if begun early, before the patient's strength has been impaired by labor. Advances in surgical procedure generally, and in this operation particularly, have made it a fairly safe operation under favorable circumstances, though it still ranks as the most serious operation of obstetrics. The so-called Porro operation is a modification in which the womb is removed at the operation.

Revised by WILLIAM PEPPER.

Hystric'idæ [Mod. Lat., from Gr. *ὕστριξ*, porcupine]: a family of simplicidentate rodents, of moderate size, with a large anteorbital foramen; four molar teeth (on each side of the upper as well as lower jaw), traversed by re-entering valleys from the inner as well as outer walls, and with pit-like excavations of the surface; the alveolar portion of the supramaxillary normally connected; the clavicles rudimentary or obsolete; the fibula and tibia separate from each other, the claws of all the feet acute or little blunt, and hairs developed as robust spines. To this group belong the porcupines of the Old World, but not those of the New, which are distinguished from the former by the completely developed clavicles, as well as differences of the skull and dentition. About a dozen species are distributed in the tropical as well as temperate portions of the Old World, and especially in Africa and India. They have been combined under three genera, *Hystrix*, *Acanthion*, and *Atherura*. See PORCUPINE. THEODORE GILL.

Hythe [O. Eng. *hyð*, port, haven]: a parliamentary and municipal borough and market-town in the county of Kent, England; 15 miles S. of Canterbury. Though formerly one of the Cinque Ports, it is now half a mile from the sea, while the adjacent ancient Roman port of Lymne (*Portus Lemanis*) is now nearly 3 miles from the coast. In ancient times an important battle must have taken place here, as is shown by the piles, containing many hundreds of human bones and skulls, still to be seen under the chancel of the well-preserved Norman church. Many of the skulls are of extraordinary size, and have deep sword-cuts in them; local traditions make them Danes, and fix the date of the battle at about 1000 A. D., but no certain account has been preserved. During the eighteenth century smuggling was carried on at Hythe to a great extent, but since it became a summer watering-place and the seat of the national school of musketry (1854) smuggling has ceased. A sea-wall and parade extends 3 miles eastward to Sandgate. Pop. of parliamentary borough, which includes Sandgate, Folkestone, and West Hythe (1891), and sends one member to the House of Commons, 35,540.

I

: the ninth letter of the English alphabet.

Form.—Its form is derived through the Roman alphabet from the Chalcidian Greek I, which was also the form in most of the Greek alphabets except those of Thera, Melos, Crete, Corinth, Corcyra, Phlius, and Achæa. These preserve the old three-line form ≤ or ≥, representing the original Phœnician *yōd* ☿.

Name.—The present name (pron. *aī*) is derived from the Latin name *ī*, which had displaced the Greek name *iōta*; cf. Eng. *jot*.

Sound.—The commonest values of the letter are the following: (1) The so-called "long" *i*, which is really diphthongal in character (pron. *aī*), the initial part being a vowel varying according to dialect between the extremes of *a* in *art* and *e* in *set*; (2) the so-called "short" *i* in *bit*, *pin*, which is a high-front vowel, distinguished from the corresponding sounds in Germ. *bitten* and Fr. *vif* by a slackness of the tongue and greater openness of the channel between tongue and palate; (3) the high-front narrow vowel *i* in *pique*, *intrigue*, *machine*, from which the Germ. *ie* in *bieten* and Fr. *i* of *lire*, *rive*, are distinguished by their still greater tensity and narrowness. The sound of *i* in *pique*, etc., is the same as that of *ee* in *feet*, *e* in *mete*, *ei* in *deceive*, *ea* in *seam*, etc.; (4) the mid-front mixed vowel before *r* in *sir*, *mirth*, *fir*, etc.; (5) the consonant sound of *y*, as in *million*, *filial*. It often also serves to denote with the preceding consonant the sound *sh*, *zh*, or *ch*, as in *nation*, *fusion*, *question*.

Sources.—The chief sources of vowel are: (1) Of "long" *i*; (*a*) O. Eng. *ī*, *tide* < O. Eng. *tīd*: Germ. *zeit*; *ride* < O. Eng. *rīdan*: Germ. *reiten*; *mine* < O. Eng. *mīn*: Germ. *mein*; (*b*) O. Eng. *ȳ*, umlaut of *ū*; *mice* < O. Eng. *mȳs* (sing. *mūs*: Germ. *maus*); *hide* < O. Eng. *hȳd*: Germ. *haut* < O. H. G. *hūt*; (*c*) O. Eng. *i*(*n*), *i*(*l*), *i*(*g*), *i*(*h*); *find* < O. Eng. *findan*; *child* < O. Eng. *cild*; *stile* < O. Eng. *stigel*; *nine* < O. Eng. *nigon*; *night* < O. Eng. *niht*; *knight* < O. Eng. *cniht*; (2) of "short" *i*; (*a*) O. Eng. *i*; *smith* < O. Eng. *smid*; *rim* < O. Eng. *rima*; *ship* < O. Eng. *y*; *bridge* < O. Eng. *brycg*; (*c*) O. Eng. *e* (umlaut of *a*); *think* < O. Eng. *đencan*; (*d*) shortening of O. Eng. *ī*; *fifth* < O. Eng. *fīfta*; *Christmas* < O. Eng. *Crīstes mæsse*; (3) of close *i*; the sound occurs exclusively in late loan-words from the French, as: *intrigue*, *critique*, *fatigue*, *pique*, *machine*.

Value as Symbol.—In the Roman notation the number one. In chemistry the symbol for iodine; in astronomy *i* = inclination. The abbreviation *i. e.* = Lat. *id est*, that is; *i. q.* = Lat. *idem quod*, the same as. Benj. Ide Wheeler.

Iaba'dius: the name under which Ptolemy described a vast island of the East Indies, near the Golden Chersonesus. It was fertile in grain and produced gold; the capital was called Argyre. From the similarity of names, both of which mean "barley," it is generally thought to be identical with *Java*, though Humboldt argues for Sumatra.

Iac'chus (in Gr. Ἴακχος): in Greek mythology, one of the chief gods of the Eleusinian mysteries. The myth-making fancy never painted him in fixed outlines with a definite character. We hear of him as the son of Demeter, the son of Persephone, the husband of Demeter, the son of Dionysus, and as the equal of Dionysus, from whom he was expressly distinguished, though some regarded him as identical. The story of Iacchus is the story of the Eleusinian mysteries. (See Eleusinian Mysteries.) The name is usually derived from ἰαχή, the cry that was on the lips of every one at his festivals. The more correct etymology is that of Roscher, Curtius, and others, to the effect that Ἴακχος is but a reduplication of Βάκχος, arising from *FιFακχος*, after the loss of the digamma. See Höfer in Roscher's *Lexicon*, under *Iakchos*, where the abundant literature of the subject is cited. J. R. S. Sterrett.

Ia'khontov, Alexandr Nikolaevich: poet; b. in St. Petersburg, Russia, in 1820. A large part of his life has been passed in the service of the government, though he traveled for four years. His original poems are in the style of Nekrasov, but he is perhaps best known for his translations from the German (Goethe's *Iphigenia* and *Tasso*, Lessing's *Emilia Galotti*, etc.). A complete edition of his poetical works appeared in 1884 (1 vol., St. Petersburg).

A. C. Coolidge.

Ial'ysus (in Gr. Ἰάλυσος): a colony of the Phœnicians in the island of Rhodes. It was conquered by Dorians about 1100 B. C., and was very flourishing in the time of the Homeric poems. It was a member of the Dorian Hexapolis, and being the chief city in the island, it was regarded by Pliny as a synonym of the island itself. In 408 B. C. the three principal cities of the island—Ialysus, Cameirus, and Lindus—combined and founded the city of Rhodes, according to the plans of Hippodamus. Some traces of the ancient greatness of Ialysus are still seen at the modern village of Ialiso. According to Pindar, Ialysos, Cameirus, and Lindus were sons of Helius by Rhodus, and gave their names to the cities founded by them (Pind., *Ol.*, viii.).

J. R. S. Sterrett.

Iambic Meters [*iambic* is from Lat. *iam'bicus* = Gr. *ἰαμβικός*, iambic, deriv. of *ἴαμβος*, iambus, a word of doubtful origin]: meters or verses in which the fundamental foot is the iambus ⏑ –. In Greek and Latin the measure is the dipody (Gr. ⏑ – ⏑ –, Lat. also ⏑ – ⏑ –).

Iambic Trimeter.—The most common verse is the *trimeter* = three dipodies. There is nearly always cæsura in the third or the fourth foot. The substitutions of the irrational (>) for the short, and the resolutions of a long, lead to the following results: In Greek tragedy the tribrach (⏑ ⏑ ⏑) may be used in any place but the last; the "spondee" (really an irrational iambus, > –) in the first, third, and fifth places; the "dactyl" (irrational tribrach, > ⏑ ⏑) in the first and third places; the "anapæst" (light ⏑ ⏑ – or ⏑ ⏑ –) in the first place. In Greek comedy, in addition, the dactyl may be used in the fifth place, and the anapæst in any place but the last.

The Romans of the early period employed any of the irrational feet also in the second and fourth places.

The composition of the verse is subject to many delicate laws, which vary in different kinds of poetry, and to some extent with different authors. Its invention was (probably erroneously) ascribed to Archilochus. It was the prevailing meter of dramatic dialogue. Examples are

> – ⏑ – > – – ⏑ – ⏑ –
> οὗτοι συνεχθειν ἀλλὰ συμφιλεῖν ἔφυν
>
> ⏑ – ⏑ – – – ⏑ –
> quid obseratis | auribus fundis preces.

Choliambus (χωλός, lame—called also *Hipponactean*, *Mimiambus*, *Scazon* = *σκάζων*, limping).—Hipponax substituted a long for the short of the sixth foot of the trimeter, thus:

> ⏑ – ⏑ – ⏑ – – ⏑ – – –
> δὺ' ἡμέραι γυναικός εἰσιν ἥδισται.

Whether the last dipody is ⏑ – – ⏑ or ⏑ – > – is disputed. This verse was used in humorous or satirical compositions. In Latin and Late Greek the penultimate syllable always had the accent.

Iambic Tetrameter Catalectic.—A dicolic verse with cæsura (strictly *diæresis*) in the middle, and the second colon catalectic; as

> – – – – – – – – – – – –
> ἅπαντα ταῦτ' ἐναντίαις γνωμαισι συνταραξαι
>
> – – ⏑ – – – ⏑ – – – – –
> deprensa navis in mari | vesaniente vento.

This verse was used in comedy and frivolous compositions.

Iambic Dimeter and Hypermeter.—A series of dimeters (with an occasional monometer) closing with a catalectic dimeter, sometimes forms a *hypermeter* or *system* of indefinite length, read with synaphea, and sometimes even having a word divided between two lines (cola). The dimeter catalectic was also used in the (late) Anacreontics, as

> ⏑ – – ⏑ – –
> θέλω λέγειν Ἀτρείδας.

Anacrusis.—Iambic verses may be regarded as trochaic, with a syllable, called "anacrusis," prefixed.

Ictus.—The position of the chief ictus of each dipody is disputed. Almost certainly in Latin, and possibly in Greek, it fell on the second, though it is now usually placed on the first foot of the dipody.

English Iambics. In English an ascending dissyllabic foot is in effect an iambus, but the verses are named from the number of feet, so that six feet, for instance, form a *hexameter*. Nearly every conceivable form of verse occurs from the monometer to the heptameter with an added syllable; but the longer verses are usually separated into cola, and so become distichs. The most common verse is the pentameter, which has been long used chiefly without rhyme, and allows an added syllable. It is the *heroic blank verse*, the verse of dramatic and epic poetry, of Shakspeare and of Milton. Examples are

> I to the world am like a drop of water,
> That in the ocean seeks another drop.

See METERS, PROSODY, QUANTITY, and RHYTHM.

MILTON W. HUMPHREYS.

Iam'blichus: a Neo-Platonic philosopher of the fourth century after Christ. He was a disciple of Porphyry, and resided in Cœle-Syria. With him that combination of Greek philosophy with Oriental mysticism which was the characteristic of the Neo-Platonic philosophy reached its Oriental extreme. He assumes an absolutely first One above the One of Plotinus, a first principle utterly ineffable and unknowable, like the Brahm of the East Indians. Proclus follows him in this. Five books of his work on Pythagoras, and his (reputed) book on the Egyptian theology, together with four treatises on arithmetic and philosophy, are extant. Thomas Taylor, the Platonist, translated the *Life of Pythagoras* (1818) and *The Egyptian Mysteries* (1821). D. about 330 A. D. See NEO-PLATONISM, PLOTINUS, and PROCLUS.

Revised by W. T. HARRIS.

Ian'thina [Mod. Lat., from Gr. *ἰάνθινος*, violet-colored, deriv. of *ἴον*, violet + *ἄνθος*, flower]: a genus of molluscs the members of which are called purple-shells on account of their color. The purple-shells, of which about a dozen species are known, live upon the high seas, where they float at the surface, feeding upon the numerous animals occurring there. They are remarkable for forming an enormous float to support the eggs. This is composed of a gelatinous matter secreted by the foot, and on its under surface the eggs are fastened. During the reproductive season the formation of the float goes on continuously, and thus that portion nearest the body may contain newly laid eggs while they have hatched from the distal portions. J. S. KINGSLEY.

Iap'etus (in Gr. *Ἰαπετός*): in Greek mythology, a son of Uranus and Ge, brother of Cronus and Oceanus, and father of Atlas, Menœtius, Prometheus, and Epimetheus. He was regarded by the Greeks as the father of all the human race, and the name is supposed to be the same as the Japheth of Genesis (see JAPHETH), though Max. Meyer, *Giganten und Titanen* (Berlin, 1887), denies the identification with Japeth. Revised by J. R. S. STERRETT.

Iatro-chemistry: See CHEMISTRY.

Ĭazy'kov, NIKOLAĬ MIKHAĬLOVICH: poet; b. in Russia, Mar. 4, 1803. His youth was idle and dissipated, but as a student at the University of Dorpat he became celebrated as a writer of anacreontic verses. These won him the friendship of Pushkin, and were superior to his subsequent efforts of the same kind. He devoted himself to literature as a career with success, for his poems were eagerly read by the public. D. at Moscow, Dec. 25, 1846. Ĭazykov's poems are chiefly remarkable for their finish and harmony. Many of the later ones are religious or patriotic. The best edition (2 vols.) was published at St. Petersburg, 1858.

A. C. COOLIDGE.

Ibadan: a town of Western Africa: in the Yoruba country. It stands in the valley of the river Onay, and is inclosed by a mud wall 18 miles in circuit. Millson estimates the population at 120,000 (1892). The principal occupation of the inhabitants is agriculture, and the surrounding country is well cultivated. See Anna Hinderer, *Seventeen Years in the Yoruba Country* (London, 1877).

Ibagué, ē̆-bāā-gwā', or **San Bonifacio de Ibagué**: capital and chief town of the department of Tolima, Colombia (see map of South America, ref. 2–B); on a beautiful plain, watered by the small rivers Chipalo and Combeima, western affluents of the Magdalena; 17 miles N. W. of the NEVADO DE TOLIMA (*q. v.*), and 4,300 feet above the sea. It is in the midst of a rich agricultural region, producing temperate or semi-tropical crops according to the elevation; and the town has a large trade in transit, being the point of departure for pack-trains to the west by the Quindío pass. The climate is delightful and very healthful. Ibagué was founded in 1550. In 1854 it was the temporary capital of the republic. Pop. (1892) about 12,000. HERBERT H. SMITH.

Ibarra, ē̆-baa'rāă: capital and principal town of the province of Imbabura, Ecuador (see map of South America, ref. 3–B); on the Andean plateau, at the foot of the Imbabura volcano, 7,300 feet above the sea, and about 65 miles N. E. of Quito. Founded at the end of the sixteenth century, it was long important for its trade with New Granada: in 1865 it is said to have had 16,000 inhabitants. On Aug. 16, 1868, it was destroyed by a tremendous earthquake. It is slowly recovering from this disaster, and, owing to its temperate climate and advantageous situation, is likely to regain its former prosperity. Present pop. (1893) about 7,000. The vicinity was a noted region in Inca history. H. H. S.

Ibe'a: the name of British East Africa; adopted about 1890 and becoming gradually accepted. It is made from the initials of Imperial British East Africa, the name of the company intrusted with the development of British trade in the territory. Its position is S. of the eastern horn of Africa, and E. of Victoria or Ukerewe Nyanza. The coast extends from the mouth of the small river Umbe, just opposite the northwest angle of the island of Pemba, northeastward to the mouth of the Juba river, near where the equator crosses the coast. The line separating it from German East Africa on the S. extends northwestward to the eastern coast of Victoria Nyanza in nearly a straight line, except where it bends around Kilimanjaro, leaving this mountain in the German possessions. On the west coast of Victoria it starts near the mouth of the Kagera river and passes W. to the boundary of the Congo Free State, making only a detour to the S. around Mifumburo Mountain. The Juba, its affluent the Bushana and sub-affluent the Abula (the two latter practically unexplored), form the eastern boundary, while the northern and northwestern are undefined, except that from the Abula to meridian 35° E. the parallel of 6° N. separates the British from the Italian spheres of influence. It includes a part of Somaliland and Gallaland, Uganda, Unyoro, Usoga, and the lands of many extensive tribes like the Karamoyo, Kavirondo, Makanda, Mamiro, and is claimed to include Emin Pasha's Equatorial Province and parts of Kordofan and Darfur. Thus defined it contains an area of 1,000,000 sq. miles. The population is unknown, but the average in this part of Africa is 10 to 15 per sq. mile.

The Sultan of Zanzibar ceded the coast to the British East Africa Company in 1888 and 1891 for an annual payment of $80,000. The boundaries between the British and German and Italian spheres were agreed upon by those governments. Treaties have been made with the tribes between Mombasa and the lake and with the King of Uganda, but the latter treaty has been much criticised in Great Britain because it was believed to have been obtained by threats and a trick. Catholic propagandism is there prosperous, and the missionaries were opposed to the operations of the company. The company agreed to retire, and the government was placed in the hands of Moranga and the leading chiefs, assisted by a British resident. Treaties have also been made with Somali tribes, and Gallaland has been made accessible.

The coast is about 400 miles long, and contains several good ports. Mombasa is the administrative center. The interior, so far as known, is generally mountainous except to the N. and E. The principal river in the S. is the Tana. North of this river lies Lake Rudolf in an independent basin, with its large affluent, the Omo, coming in from the N. In the northern part of the territory is the White Nile, with the Albert Nyanza and the northern half of Victoria Nyanza.

The company holds a royal charter dated 1888. Its capital is £2,000,000, of which half has been offered to the public. The principal exports are cloves, sesame seed, ivory, rubber, coco products, gum, orchella, and hides. The chief imports are Manchester goods, iron and copper wire, and beads. The trade is for the most part in the hands of the East Indian merchants. The coast ports from Witu southward are connected by telegraph with Mombasa and Zanzibar. A railway of 600 miles from Mombasa to Victoria Nyanza has been surveyed, and a few miles on the coast constructed. The Tana has been navigated for 300 miles, roads are being constructed along the slave routes, and the

native tribes within reach are settling down to peaceful husbandry. The most advanced permanent posts occupied by Europeans, except on or near Victoria Nyanza, are 250 or 300 miles inland. See Uganda. Mark W. Harrington.

Iberá, or **Yberá**: See Corrientes.

Ibe'ria: one of the names under which Spain was known to the ancients. It was chiefly used by the Greeks, and probably was derived from *Iberus*, the Ebro.

Ibernia: See Hibernia.

Iberville, dĕĕ'bâr'vēēl', Pierre Lemoine, d': founder of Louisiana; the brother of the Sieur de Bienville and of five other able public men; b. at Montreal, July 20, 1661; captured Fort Nelson 1686; served in the Schenectady affair 1690; in 1696 destroyed St. Johns, and took nearly all of Newfoundland from the British, whom he defeated in Hudson Bay in the naval fights of 1697. In 1699 he fortified Biloxi, and in 1700 ascended the Mississippi river. In 1702 he fortified Dauphin island and founded a settlement near Mobile. In 1706, with three ships, he attacked and captured the Isle of Nevis. D. at Havana, Cuba, July 9, 1706.

I'bex [from Lat. *ibex*, kind of goat]: a name given to several wild goats characterized by very long, recurved horns, having numerous prominences or partial rings on the front edge. They frequent mountainous regions, and are very wary. The ibex *par excellence* is the bouquetin, *Capra ibex*, found in the Alps, and now extremely rare. (See Bouquetin.) An allied species inhabits the Pyrenees, and others occur in Africa and India. F. A. L.

I'bis [Gr. *ἶβις*, from an Egypt. word]: the generic name of several wading birds of the family *Ibididæ*, used as a common name for the various members of the group. The ibises are good-sized birds, with long, curved, blunt bills, grooved along the side; the nostrils are schizorhinal, the breast bone four-notched, the angle of the mandible recurved; the wings are long and rounded. Ibises are inhabitants of the warm regions of the globe. The most famous is the sacred ibis (*Ibis æthiopica*), a bird about 28 inches long, white, with bare black neck, and long, loose, purplish black tertials which cover the tail like the plumes of an egret. The sacred ibis is now extremely rare in Egypt, although, if ancient writers are to be trusted, it was once common, even in the streets of Alexandria, where it performed the duties of a scavenger. It is found mummied in great numbers. The scarlet ibis (*Guara rubra*) of Northern South America is suspected to be a variety of the white ibis (*Guara alba*) of the Southern U. S., as the birds are identical in everything save color. The glossy ibis (*Plegadis autumnalis*), whose general color is purplish chestnut, is common to the Old and New Worlds. The straw-necked ibis (*Geronticus spinicollis*), a large species having the feathers of the lower neck stiff and pointed, is a resident of Australia. The wood ibis (*Tantalus loculator*) is now placed with the storks, but the popular name still clings to it. It is about 4 feet long, white, with black primaries, wing coverts and tail. The head of the adult is bare, wrinkled, and bluish in color. The stout bill is 9 inches in length. This bird is not uncommon in the Southern U. S., and related species occur in Africa and Southern Asia. The ibises are so closely related to the spoonbills (*Platelea*) that they are placed by some authorities in the same family. F. A. Lucas.

Sacred ibis.

Ibn-Roshd: See Averroes.

Ib'rahim Pasha: Viceroy of Egypt; a son of Mehemet Ali; b. at Kavala in 1789. His father was appointed Viceroy of Egypt in 1806. Ibrahim gave proofs of his own abilities by subduing the wild tribes of Upper Egypt in 1812, by reducing the Wahabees and conquering a portion of Arabia in 1819, by reorganizing the Egyptian army after European models, and founding a navy. During the Greek revolution he subdued and ravaged the Peloponnesus (1824–28). In 1831, his father having rebelled against the sultan, Ibrahim invaded Syria, captured Acre and Damascus, gained the battles of Homs, Beilan, and Konieh, and advanced to Broussa, a day's journey from Constantinople. France and Great Britain persuaded the sultan to submit, although he was supported by Russia. Syria was ceded to Mehemet Ali; Ibrahim was made governor of the new province, and showed himself a sagacious though despotic administrator. In 1839 Mehemet Ali again revolted, declaring himself independent, and (June 23) Ibrahim destroyed the main Ottoman army at Nezib, capturing 160 cannon. The entire Ottoman fleet joined the revolt. Great Britain, Austria, Prussia, and Russia formed alliance with the new sultan, Abdul Medjid, against Mehemet Ali, who, counting upon the aid of France, resisted the five powers. Ibrahim, his father's generalissimo, was defeated by British troops in the Lebanon, lost Acre and all his other strongholds in Syria, and retreated upon Egypt, which the allies allowed his father to retain, though stripping him of all his other possessions. For several years Ibrahim Pasha lived as a retired gentleman, cultivating cotton and olives on his vast estates at Heliopolis. Mehemet Ali falling into dotage, Ibrahim was appointed viceroy in 1848, for which purpose he went to Constantinople, but died very soon after his return to Cairo (Nov. 9, 1848). His father survived him nine months.

Edwin A. Grosvenor.

Ibsen, Henrik: dramatist; b. at Skien, Norway, Mar. 20, 1828; was at first apprenticed to a druggist, but soon abandoned that business in order to devote himself to literature; was by the influence of Ole Bull appointed director of the newly erected Norwegian theater in Bergen in 1854, and in 1857 took charge of the theater in Christiania; in 1866 he obtained a pension from the Norwegian Storthing, and from that time up to 1891 he resided abroad, most of the time in Dresden, Munich, and Rome. Since 1891 he has lived in Christiania. He was created an honorary doctor of philosophy by the University of Upsala, Sweden, in 1877, and has received the grand cross of the order of St. Olaf for literary merits from the Norwegian Government. His first drama, *Catilina* (1850), a tragedy, was, on the whole, not a success, although in many places it bore evidence of the genius that was to manifest itself in the author's later-day creations. After his first attempt at dramatic production, Ibsen turned to Norwegian historical subjects, treating them in a romantic manner: *Gildet paa Solhaug*, *Fru Inger til Østraat* (1857); *Hærmændene paa Helgeland* (1858); *Kongsæmnerne* (6th ed. 1888); each of which represents an advance in technical skill and dramatic force over its predecessor. The two last named of these dramas are still very popular in Norway. *Kjærlighedens Komedie* (*The Comedy of Love*, 1863), a stinging satire of everyday love, was followed by *Brand* (1866), and *Peer Gynt* (1867), both satirical dramas in verse, which have attained an immense popularity in the Scandinavian countries, and also been translated into most of the European languages. A singular position among Ibsen's writings is held by *Emperor and Galilean* (1873), an historical drama in two parts treating of Emperor Julian the Apostate's attempt at reintroducing paganism. Although the drama is very interesting, Ibsen does not reach the level of his previous satirical creations. With *Samfundets Støtter* (*The Pillars of Society*, 1875), Ibsen began that series of realistic pictures of everyday life that has made him famous as a dramatist of the first order all the world over. The dramas of this kind are *Et Dukkehjem* (*A Doll's Home*, 1878); *Gjengangere* (*Ghosts*, 1881); *En Folkefiende* (*An Enemy of the People*, 1882); *Vildanden* (*The Wild-duck*, 1884); *Rosmersholm* (1886); *Fruen fra Havet* (*The Lady from the Sea*, 1888); *Hedda Gabler* (1890); *Bygmester Solness* (*The Master Builder*, 1892). Most of these dramas have been played in Germany, and several of them (*A Doll's Home*, *The Pillars of Society*, *Ghosts*, *Hedda Gabler*) have been played in New York and other cities of the U. S. Wherever Ibsen's plays are acted, he gains a host of admirers and a host of detractors. These latter object to the moral tendency of his plays, or they find them "devoid of idealism," etc.; while the former see in them pictures full of true idealism and moral meaning. All, however, agree about the technical skill displayed in them, and the realistic force and vigor with which he treats his subjects.

P. Groth.

I'bycus (Gr. *Ἴβυκος*): a Greek lyric poet who was born at Rhegium in the sixth century, and lived for some time in Samos at the court of Polycrates. He is grouped by Cicero with Alcæus and Anacreon, and his great Doric strophes seem to have had the swirl and swing of the passion that is ascribed to his poetry. So much is discernible in the few fragments that are left. Known to all, chiefly through the poem of Schiller, *The Cranes of Ibycus*, is the story of his end. Ibycus was a wandering bard, and while traveling

through a desert place near Corinth, was attacked by robbers and mortally wounded, but before dying called upon a flock of cranes flying over him to avenge his death. Shortly after it happened at Corinth that a flock of cranes flew over the theater while a performance was going on, and one of the murderers cried out involuntarily, "Behold the avengers of Ibycus!" which led to the discovery and punishment of the crime. The fragments of his poems were edited by Schneidewin (Göttingen, 1833), and are also to be found in the *Poetæ Lyrici Græci* of Bergk, vol. ii., 3d ed., pp. 235–252. Revised by B. L. Gildersleeve.

Ica, ee'kȧ: a department of Peru, created in 1866; bounded N. by Lima and Huancavelica, N. E. by Ayacucho, S. E. by Arequipa, and S. W. by the Pacific. Area, 14,504 sq. miles. Pop. (1893) 80,000. Lying between the Western Cordillera of the Andes and the ocean, it has high mountains, but the surface is broken by numerous ridges and hills. The climate is hot and dry, and much of the soil is arid desert; but running through this desert land there are valleys of great fertility, and in these the whole population is gathered. Such are the valleys of Chincha, Condor, San Miguel, and others, famed for their vineyards and sugar plantations. The wine produced is largely made into brandy. The only streams of importance are the Pisco, the Ica, and the Palpa. Ica (formerly Huananica), the capital and largest city, is on the right bank of the river Ica, 1,575 feet above the sea (see map of South America, ref. 5–B). It is connected by a railway with the port of Pisco, 46 miles distant, and is noted for its wines and brandy. The city was founded in 1563, and has been several times partially destroyed by earthquakes. Pop. about 10,000.
Herbert H. Smith.

Içá, ee̊-saa' (so called by Brazilians; the *Putumayo* of Spanish-Americans): a river of South America, rising near Pasto, Colombia, flowing S. E. to its confluence with the Sacanhi, and thence E. to the Amazon; length along the main curves over 1,000 miles. Except near its source it is unobstructed by rapids; steamers drawing 6 feet of water have ascended it to Cuemby, hardly 100 miles from the head. It receives over thirty affluents, some of them navigable. The value of the Içá as a means of communication between Colombia and the Amazon can hardly be overestimated; yet it was practically unknown until 1874, when a Colombian cinchona-gatherer named Rafael Reyes descended it in a canoe. Since then it has been carefully explored by Crevaux and Simson, and the lower portion has been mapped by Brazilian engineers. The Içá flows through a vast forest region, very sparsely inhabited by a few Indian tribes—the Ticunas, Peguas, Orejones, and Macaguages. The middle course is in territory claimed by Colombia, Ecuador, and Brazil: the lower portion is undoubtedly Brazilian. See Souza, *Do Purú a Colombia* (1881); Crevaux, *Les Fleuves de l'Amérique du Sud* (1883); Simson, in *Proc. Roy. Geog. Soc. London* (1877). Herbert H. Smith.

Ica'ria, or **Ic'arus** (*Nikaria*): an island of the Ægean Sea; W. of Samos; about 15 miles long from N. E. to S. W., and rather narrow. Area, 50 sq. miles. Its population of 8,000 support themselves chiefly by the sale of charcoal and firewood. The island belongs to Turkey.

Ica'rius (in Gr. Ἰκάριος): a resident of Attica in the reign of Pandion. Dionysus, newly come to Greece, visited him, was hospitably entertained, and upon leaving instructed Icarius in the art of wine-culture. The shepherds of the neighborhood drank of the unmixed wine freely, became drunk, and, not knowing the cause of their exhilaration, imagined that they had been poisoned. Thereupon they killed Icarius as being their poisoner, but when, on the next day, they found that they had not been poisoned they repented them of their deed and buried Icarius with honor. Erigone, his daughter, sought for him everywhere in vain, until his dog Maira found his grave. Erigone hung herself in despair, and both she and the dog were transported to the starry firmament because of their faithfulness. Erigone is to this day the Virgo in the zodiac, and the dog is the smaller Procyon, not far from Orion. The deme Icaria was "the first home in Attica of the god Dionysus, and the birthplace of the Greek drama." It lies at the foot of the northeast slope of Mt. Pentelicus, near the ruins of a Byzantine church, and has been known from time immemorial as Dionyso. Excavations carried on by the American School of Classical Studies at Athens have been epoch-making, and have resulted in the unearthing of a museum of antiquities in the shape of inscriptions, votive slabs, statues, bas-reliefs, including a colossal head of the bearded Dionysus. See *American Journal of Archæology*, 1888, pp. 44–46, 421–426; 1889, pp. 9–33, 154–181, 304–319. J. R. S. Sterrett.

Ic'arus (in Gr. Ἴκαρος): in Greek mythology, the son of Dædalus. He forgot, according to the old myth, his father's advice on their flight from Crete, and flew so high that the sun melted the wax with which the wings were attached to his shoulders, and he fell down and was drowned in the sea, near the island of Doliche on the coast of Asia Minor. After him the island was thenceforth called Icaria or Icarus, and the sea also was known as the Icarian.
Revised by J. R. S. Sterrett.

Ice [M. Eng. *ise* < O. Eng. *īs*: Dutch *ijs*: Icel. *íss*: O. H. Germ. *īs* > Mod. Germ. *eis*]: the crystalline solid formed by the freezing of water.

Its Physical Properties.—Ice is transparent and nearly colorless. It has a density of 0·92 at 0° C. (water at 4° C. being taken as the standard); or, according to Bunsen, 0·91674 compared with water at 0° C. The system of crystallization of ice is the hexagonal. Under ordinary circumstances the crystals are crowded together, owing to the increase in volume due to freezing, forming a compact and homogeneous block, so that the structure is not apparent. When a piece of ice is allowed to melt slowly, however, particularly under the action of radiant heat applied from one direction, as in the case of a slab in the rays of the magic lantern, thawing takes place unevenly, and hexagonal, star-like forms, such as are shown in Fig. 1, appear.

Fig. 1.—Ice-crystals.

In the same way, during warm weather in winter, ice gradually changes its crystalline condition, assuming columnar structures somewhat similar to the basalt columns found in cooling lava. Well-marked vertical cleavage planes develop, and the ice loses its power of resistance to forces acting along the axes of the columns. Such ice, even when thick, is incapable of sustaining any considerable weight upon its surface, and when broken it falls into small crystals, which are rapidly melted. When solidification takes place under conditions which permit the full development of the individual crystals, some of the most elaborate and beautiful examples known to the crystallographer occur. Some familiar typical forms, drawn by Glaisher,* are shown in Fig. 2.

It is a general law in physics that materials occupying greater volume in the solid than in the liquid form have their melting-points lowered by pressure. Ice belongs to this class, and is no exception to the rule. As pointed out by Prof. James Thomson, and verified by his brother, Lord Kelvin, for a range of sixteen atmospheres the melting-point is lowered about 0·0075° C. per atmosphere. Mousson (Poggendorff's *Annalen*, 105), by means of a steel screw en-

* Rev. James Glaisher, *Quarterly Journal of Microscopical Science*, p. 179, 1855.

tering a massive steel cylinder filled with solid ice obtained by freezing previously boiled water within the cylinder itself, carried the experiment to several thousand atmospheres. He was able to liquefy ice with his apparatus at a temperature of − 18° C.

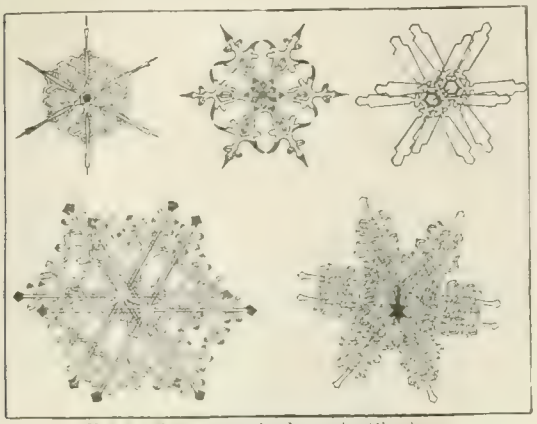

Fig. 2.—Snow-crystals (drawn by Glaisher).

Strictly speaking, then, the melting-point of ice is not constant. Nevertheless, for all ordinary pressures it may be so considered. In thermometry, for example, the correction for pressure is an altogether inappreciable quantity.

The following are some of the principal properties of ice:

(1) Specific gravity at 0° C..... 0·91800
Specific gravity at − 19° C..... 0·92013

according to Brunner, from which observations the mean coefficient of cubical expansion would be 0·00012.

Other observers have obtained quite different values, viz.:

Marchand (−12°–−1°)..... 0·000105
Struve (−26°–−2°)..... 0·000154
Struve (−27·5°–−1°)..... 0·000159

Ice being crystalline, precise observations would doubtless show different linear coefficients in different directions with reference to the axis of crystallization.

(2) The specific heat of ice is about one-half as great as that of water in the liquid form (mean specific heat between − 78° C. and 0° C. = 0·4627, according to Regnault; between − 30° C. and 0° C. = 0·505, according to Person).

(3) The heat of fusion also is very large, probably larger than that of any other solid. The accepted value is 80·025 calories at 0° C. (Brunner).

(4) As regards thermal conducting power, the data for absolute conductivity, a quantity difficult to determine with precision, differ between 0·002 (Forbes, *Proceedings of the Royal Society of Edinburgh*, 1873) and 0·005 (Neumann). All writers, however, agree in giving ice a somewhat higher conductivity than such rocks as granite and marble, and much lower conductivity than the metals (about $\frac{1}{35}$th that of iron). The absolute conductivity of water in the liquid state is somewhat smaller than that of ice (0·0015, Winkelmann).

Electrically, ice is a good insulator, its specific resistance, according to Ayrton and Perry, being as follows:

SPECIFIC RESISTANCE OF ICE (IN C. G. S. UNITS).

Temp.	Sp. resistance.	Temp.	Sp. resistance.
12·4° C.	2·240 × 10¹⁵	3·0° C.	5·993 × 10¹⁷
6·2° C.	1·023 × 10¹⁶	2·46° C.	4·814 × 10¹⁷
5·02° C.	9·486 × 10¹⁶	1·5° C.	3·856 × 10¹⁷
3·5° C.	6·428 × 10¹⁷	0·2° C.	2·840 × 10¹⁷

(See Everett's *Units and Physical Constants*, p. 145; also *Proceedings of the Royal Society of London*, vol. ii., p. 178.) The same authors have determined the dielectric constant, comparing ice with distilled water as a dielectric. It was found that the specific inductive capacity of water at +8·7° C. is about 2,240 times that of ice at − 13·5°. The index of refraction of ice is 1·31, a value somewhat smaller than that of water. While fairly transparent, transmitting a considerable proportion of the rays of the visible spectrum, ice is opaque to the longer wave-lengths. Melloni, for example, found no effect upon a thermopile subjected to radiation from a Leslie cube at 100°, from copper at 400° C., or even from incandescent platinum when an ice block was interposed. No quantitative exploration of the transmission spectrum of ice has as yet been made.

At the temperatures under which most determinations of its properties have been made, ice, although a solid, shows many indications of its close proximity to the melting-point. It acts as an electrolyte, for example, and exhibits the phenomenon of voltaic polarization to a marked degree; it is slightly volatile, evaporating at an easily appreciable rate at temperatures considerably below its melting-point, and it is to a high degree plastic, suffering permanent deformation under the continued action of moderate forces without rupture. This last property is strikingly shown in the flow of glacier ice, for an excellent description of the phenomena relating to which the reader is referred to Tyndall's book entitled *The Forms of Water*.

The remarkable behavior of ice under continued stress is due not only to ordinary plasticity, but also to the process known as regelation. This property, which follows directly from the fact that the melting-point of ice is lowered by pressure, is exhibited in a striking manner by the following experiment, due to Bottomley:

A block of ice rests upon two supports between which hang weights attached to a wire. The wire at the beginning of the operation bears upon the middle of the upper surface of the ice (Fig. 3); but, under the pressure due to the weights, it works its way through the block, partly by regelation and partly on account of the true plasticity of the material.

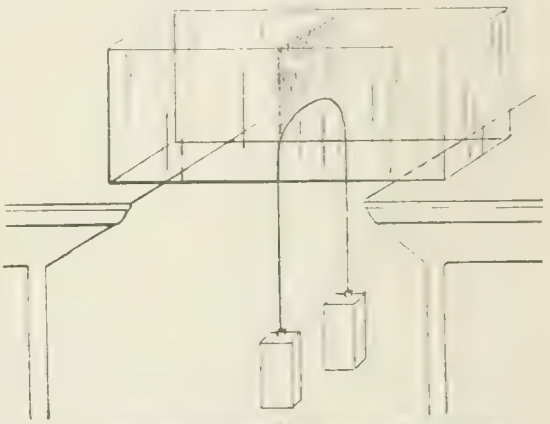

Fig. 3.—Showing behavior of ice under continued stress.

Under the wire the melting-point of the ice is lowered by pressure, liquefaction follows, and the wire sinks. At the same time eighty heat-units per gramme of water melted are abstracted from the surrounding materials, chiefly from the wire itself, owing to its high conductivity. The temperature of the latter is lowered sufficiently to freeze the water upon its upper surface, so that the seam is closed by "regelation," and the block of ice after the passage of the wire is still intact. The trace of the wire through the ice can be followed by means of symmetrical rearrangement of the minute air-bubbles it contains. For the manufacture of ice, see Ice-making.

E. L. Nichols.

Ice in Commerce.—The first demand for ice as an article of commerce was in tropical and semi-tropical countries, for the purpose of cooling the wine and other beverages of the wealthy and for making drinking water palatable. Where ice could not be obtained, snow was gathered and stored till needed, and various expedients were adopted for cooling the domestic receptacles of water. Early Greek and Roman writers describe methods in use for preserving snow, and Nero established storehouses in Rome for both snow and ice. In cold countries ice-houses have been common on private estates and farms for two or three centuries, being filled from the most accessible lake, pond, river, or mountain stream. These storage places have been wholly underground, partially underground, or, as preferred in the U. S., wholly above ground, according to the experience or means of the people. Some were mere holes in the ground, floored and with boarded sides, and board and thatch roofs; others were excavations in sloping shaded ground; and more costly ones were built of wood, brick, or stone. For many years the U. S. was the largest ice-exporting country in the world. The exportation began in 1805 when Frederick Tudor, of Boston, shipped 130 tons to Martinique. In 1815 the trade was extended to Cuba; about 1820 he began shipping to various

points in the Southern States; in 1833 the first shipment was made to the East Indies; and from that time the trade increased rapidly and extended to the Straits Settlement, China, and Japan. Although the act of freezing expels from the crystallized mass the salt and other mineral ingredients, leaving it when in a frozen state very nearly pure fresh water, yet ice formed from or floating in salt water gathers in the interstices between the crystals so much salt, brackish, or impure water that it becomes unfit for household purposes. Hence the ice-crop is gathered from fresh-water ponds or lakes, or from rivers above tide-water. The supply of Boston, both for domestic use and for export, is derived from several small lakes comparatively near the city, such as Fresh Pond in Cambridge, Wenham Lake, Saugus Lake or Pond, etc. Portland and Bangor derive their supply from the Kennebec, Penobscot, and Androscoggin rivers, above tide-water, and from some of the great lakes of Maine; New York, from the Hudson above tide-water, and from Rockland, Mahopac, Greenwood, and other lakes; Philadelphia, from the Delaware and Schuylkill above the Falls, and from several lakes of Pennsylvania and New Jersey; the northwestern cities, from the Great Lakes and the numerous smaller lakes of Wisconsin, Minnesota, and the Dakotas; and the Pacific coast cities from the waters of Washington, Oregon, and Alaska. In the U. S., as elsewhere, the constantly increasing demand for ice and the irregularity of the crops have led to the establishment of factories for the manufacture of ice by chemical processes, and to a great decrease in the gathering of the natural product. Ice is also in demand as an antiseptic or preserving agent. That meats and the carcases of animals intended for food could be transported without injury for a great distance when frozen was a fact well known ages ago; but the practicability of using ice to preserve such meats and carcases, even without freezing them, does not seem to have occurred to the keenest observers for several centuries. Equally slow was the growth of the idea of preserving dead bodies by surrounding them with ice. Now, however, ice is regarded as absolutely necessary during the summer months in preserving the bodies of the dead until the time of burial; and it forms in the refrigerating closet or chest one of the almost indispensable articles of household use for the preservation of meats, milk, butter, vegetables, or fruits; but its antiseptic value does not stop here. Refrigerating cars convey to Eastern markets in the U. S. beef from Chicago, and choice ripe fruits, game, and other articles from San Francisco, which it would otherwise be impossible to obtain in the Eastern markets, and return with oysters and other shellfish, condensed milk, butter, and other articles from the Atlantic coast. Steamers fitted up with refrigerating chambers take to Northern ports beef and mutton from Texas, ripe oranges, lemons, bananas, and guavas from the West Indies, South American fruits from Brazil, and return with milk, butter, oysters, apples, peaches, pears, and other products not obtainable otherwise in tropical climates, and ocean steamships carry large quantities of fresh meat, dressed in the U. S., to the great food-distributing ports of Europe. Cold storage-houses in many cities of the U. S. preserve, with a slight percentage of loss, oranges, lemons, grapes, apples, pears, peaches, etc., from one to three years.

Ice-harvesting.—In the U. S., in most cases, the ice companies secure the right to harvest ice from lakes and ponds by purchasing the land bordering on them. Storehouses are erected on the shore for the reception of the crop and its preservation till needed for shipment. These ice-houses are built chiefly of wood, from 100 to 200 feet in width and from 200 to 400 feet in length, with double, triple, or quadruple walls, and generally three, four, or five stories in height, with strong floors and doors closing tightly on each floor. There are numerous inclined planes, movable and adapted to each story. The spaces between the walls are filled with sawdust, spent tan-bark, or some other poor conductor of heat. The capacity of these storehouses varies with the locality and the conveniences for shipping ice from them, many being capable of holding from 20,000 to 40,000 tons. Before it is cut the usual practice is to remove the snow from the surface of the ice by a broad scraper drawn by a horse, after which the soft porous ice is planed off by another scraper to the depth of 2 inches, or more if necessary. The surface being cleared, the marker begins his work, using a kind of plow drawn by one horse, which makes a narrow groove about 3 inches deep, running the lines 5 feet apart, and then turning and crossing these by another series of grooves, also 5 feet apart, so as to make square blocks 5 feet each way. The ice should be not less than a foot thick when cut, and a thickness of 2 feet is preferable. If the ice is thick, these blocks are reduced by an implement like a harrow with three parallel rows of long, sharp teeth, one row running in a groove as a guide, and, if necessary to increase their depth, a long-bladed plow is rapidly run through the principal grooves. One row of blocks is then cut through by means of hand-saws, and the blocks are pushed under or hauled up on the ice, and run to the inclined planes or loaded on sleds. The succeeding blocks are pried off with a crowbar by one gang of men, and another gang catches them with boat-hooks and drags them up, or tows a sheet of perhaps fifty blocks, with a grappling-iron and rope or chain, by horse-power, toward the storehouse. There it is broken into blocks, run up the inclined plane by the elevator, and packed away, the blocks standing on end and being separated by sawdust, shavings, rice-hulls, or spent tan-bark. As soon as a floor or story is filled the doors are closed tightly, and the inclined planes raised to the next story, which is filled in the same way. Near the walls there are gutters and drain-ways which receive and carry off the drainings from the melting ice.

Iceberg [from Scandin. *isberg* (Dan. *isbjerg*; Germ. *eisberg*); *is*, ice + *berg*, mountain]: a large, floating mass of ice. The term is practically restricted to fragments detached from glaciers. When a glacier descends to the level of the sea, portions of its mass break away and float upon the water. By favorable currents they are often carried to great distances before completely melting. With them is carried whatever glacial detritus they originally contained, and this falls to the bottom as they melt. It is believed that the banks of Newfoundland, lying where the ice-laden Labrador current meets the warm Gulf Stream, receive in this way important deposits of earth and rock derived from Greenland and other northern lands. An iceberg floats with about one-eighth of its mass above the water, and its summit sometimes rises to a height of 200 or 300 feet. The greatest bergs are seen in the southern ocean and are tabular in form, with a height above the sea of 150 to 200 feet. See GLACIERS. G. K. GILBERT.

Iceland (in Dan. Island): a part of the Danish kingdom, enjoying home rule; with the exception of Great Britain the largest island in the North Atlantic; extending from 63° 24′ to 66° 33′ N. lat., and from 13° 22′ to 24° 35′ W. of Greenwich. Situated 600 miles W. of Norway, but only 250 miles E. of Greenland, it belongs geographically to the western hemisphere, while in history and politics it belongs to Europe. Its area is estimated at 39,000 sq. miles, 7,000 more than that of Ireland.

Physical Features, Soil, Climate, etc.—The whole of the south coast is unbroken by fjords or inlets, while that of the east, west, and north, and particularly the northwest, abounds in fjords of varying length and breadth. With the exception of the south, which swells out into a broad arch, the whole coast is high and precipitous, not unlike that of Norway. The interior is a high table-land, with an average elevation of about 2,000 feet, while there are snow-capped mountains that attain an altitude of nearly 5,000 feet above the sea-level: indeed one, Oræfa Jökull, is more than 6,000 feet in height. The island rests on Plutonic rocks and is largely covered with immense beds of lava. Sandstone and limestone formations are rare. The island still has several active volcanoes, among which Mt. Hecla and Mt. Katla are the most important. There are numerous and extensive ice-fields or ice-hills called jokuls (Icel. *jökull*, pl. *jöklar*), the largest one being the Vatnajokul, situated in the southeast and covering about 4,000 sq. miles. There are several broad and deep rivers fed by the jokuls, but they have so many rapids and cataracts that they can not be navigated even by small boats. Of lakes, Myvatn in the north, Thingvallavatn in the south, and Hvítárvatn in the east, are the three largest. In connection with the general geological formation, and as a direct result of the great volcanic activity, there are frequent earthquakes, no less than seventy-five having occurred in the nineteenth century, and a great number of hot springs, among which Geyser and Strokkr are the most noted. (See GEYSER.) The climate is not very severe. The summers are cool, and the winters, considering the latitude, are mild. The Gulf Stream bathes the southern, eastern, and western shores, while a polar current flowing toward Greenland frequently fills the northern fjords with ice.

Products and Industries.—Two-thirds of the population

are farmers, or rather stock-growers, raising sheep, cattle, and horses. Next in importance to the stock-raising are the extensive fisheries, which employ about 7,000 men. The principal minerals are sulphur, lignite, and Iceland spar. The mineral resources are not yet developed. The summers are too short for the growth of cereals, and there is not a forest in the whole country. The only trees found are the dwarf birch, small willows, and here and there a stunted mountain ash. Garden vegetables, such as potatoes, turnips, carrots, and cabbage, are cultivated with considerable success. The only mammal peculiar to Iceland is the snow-mouse (*Mus islandicus*), while the only wild animal found there is the fox. The domestic animals are the cow, the horse, the sheep, the dog, and the cat. Reindeer were imported in the eighteenth century, but they fled to the mountains, became wild, and are now nearly extinct. There are about ninety species of birds, among which are the eagle, the falcon, the raven, the ptarmigan, and the eider duck. The killing of the eider duck is prohibited by law on account of its valuable down. The rivers abound in salmon and trout, and the sea around the coast contains cod, haddock, halibut, seals, and whales. Fish, wool—generally made into socks and mittens—tallow, fish oil, and live horses are the chief articles of export.

Race, Religion, and Education.—The Icelanders belong exclusively to the Scandinavian branch of the Teutonic race, and their religion is the Evangelical Lutheran. The public schools have in recent years been greatly developed. There are in Reykjavik a theological seminary, a medical college, a nautical academy, a gymnasium, and an elementary school. A few primary schools have been established in the various trading and fishing stations. There is a flourishing academy in Modruvellir, in the north of Iceland, an agricultural college at Olafsfjord, and the island supports four seminaries for young women, the first one having been established in Reykjavik in 1876. Nearly all the children in Iceland are taught by their parents under the direction of the clergy. Iceland supports several well-edited newspapers, publishes annually a number of books and periodicals, and nowhere else in the world are the people in corresponding conditions so well educated. A child ten years old who is not able to read is not to be found in the whole island, and there are many peasants who, besides being well versed in Icelandic literature, read foreign languages fluently.

History.—Iceland is believed by many to be the Thule referred to by Pytheas (340 B. C.), by Strabo, Mela, Pliny, and Ptolemy. In the eighth century there are traces of the so-called Culdee anchorites, who sought solitude in the various western islands for religious exercises, a class not likely to people a country; but in their cells they left books, bells, and crosiers, as evidence of their visits. There is positive evidence of these anchorites in a work called *De Mensura Orbis Terræ*, written in 825 by the Irish monk Deculus, who relates that in 795 he had talked with monks who had been in "Thile," as he calls it. The Norse discoverers found many relics of these anchorites. The first Norseman who saw Iceland was the Farey viking Nadodd. He entered one of its eastern fjords about the year 850, and called the country Snowland. In 864 the island was circumnavigated by the Swede Gardar, who named it Gardarsholm. In 866 Raven Floke, a Norse viking, spent the winter at Bardastrand in Breidafjord, and he gave the country its present name, Iceland. The settlement of Iceland began in 874, when Ingolf built his house on the present site of Reykjavik, two years after the Hafersfjord battle, by which all Norway became subject to King Harald Fairhair. Harald had abolished the freehold tenure of land in Norway, a measure to which its inhabitants would not submit. They disdained to give up their time-honored independence and be degraded, and the flower of the population resolved to emigrate. By far the greater number of them went to the newly discovered Iceland. Ingolf and his companion Leif became the first two settlers there, but they were soon followed by a large stream of immigrants, chiefly from Norway. By the year 1100 Iceland had fully 50,000 inhabitants. In 930 a political organization was effected which resulted in the adoption of the Ulfljot constitution, an adaptation of the law of the Gula-moot in Norway. By this constitution an Icelandic republic was established which flourished for more than 300 years. Ulfljot created a central moot—the Althing—which met for two weeks every summer at the famous Thingvellir, in the southwestern part of Iceland. The first president of this republic, "the speaker of laws," as he was styled, was Ulfljot himself, and from 930 to 1262 the country was ruled by thirty-seven presidents, among whom was Snorre Sturleson, the author of *Heimskringla*. The whole island was divided into four districts, and each district was required to send twelve representatives to the Althing, in which all legislative and judicial power was vested. This Icelandic republic may be characterized as aristocratic, with strong tendencies to fine-spun litigation, and to great respect for the letter of the law. Christianity was adopted by the Althing in the year 1000. With it the Icelanders obtained pens, ink, and parchment, and they developed a marvelous literary activity, producing the eddas and sagas which constitute the undying glory of this remarkable people. (See ICELANDIC LANGUAGE and ICELANDIC LITERATURE.) The latter days of the republic developed a series of jealousies and internecine feuds between prominent families, in which many lives were lost and much property destroyed. These feuds weakened the country in every way, and the warring Icelanders fell into the habit of appealing to the Kings of Norway as arbitrators, and thus the way was paved for making Iceland a dependency of Norway, which took place quarter by quarter 1262–64. In 1380, in connection with Norway, Iceland became united with Denmark, and remained with the latter country after the union of Norway with Sweden in 1814. With the fall of the republic Iceland lapsed into a prolonged lethargy, and her history—1264 to the middle of the nineteenth century—is a series of physical and political calamities. It is one continuous story of famines, epidemics, and misrule. The introduction of the Lutheran Reformation in 1530–75 was attended with bloodshed, and the last Roman Catholic bishop, Jon Arason, was murdered for his fidelity to the pope. In 1809 a Danish captain, Jörgen Jörgenson, proclaimed himself King of Iceland, and he actually ascended its throne, but he had ruled only a couple of months when he was taken prisoner and sent to Australia. The new political ideas which agitated Europe in 1848 also found their way to Iceland, and gradually crystallized into a demand for complete home rule. This was granted by Denmark in 1874, in connection with the celebration of the one thousandth anniversary of the colonization of Iceland by Ingolf and Leif. The new constitution makes the king govern Iceland through a member of his cabinet, who is responsible to the Icelandic Althing, and through the governor appointed by the king and residing at Reykjavik as chief executive officer. The new Althing consists of two chambers, with full legislative powers, and is composed of six crown nominees and thirty members chosen by the people, who enjoy almost universal suffrage. In short, the new constitution brought many valuable reforms to Iceland and made many others possible. Under it a national bank was established in 1885 and a savings-bank in 1888. In 1886 a limited suffrage was granted to women, permitting them to vote in the selection of clergy for the parishes. In the same year women were admitted as students to the higher institutions of learning.

The history of Iceland may be divided into periods as follows: The heroic age, 850–1030; the saga and literary age, 1030–1284; the age of continental influence, chiefly Norse, 1284–1413; the dark age, 1413–1530; the age of the Reformation, 1530–75; the age of renaissance, 1575–1700; the age of gradual decay, 1700–1850; the age of recovery 1850. Since 1870 the increase in population has been very small, owing largely to the fact that several thousand Icelanders have emigrated to Canada (Manitoba) and to the U. S. Pop. (1880) 72,442; (1888) 69,224. Reykjavik is the capital, and has a population of 2,500.

For works on Iceland, see Thorwald Solberg's *Bibliography of Scandinavia*, published as appendix to R. B. Anderson's translation of F. W. Horn's *History of the Literature of the Scandinavian North*. RASMUS B. ANDERSON.

Icelandic Language: genetically a member of the Scandinavian branch of the Germanic group of languages. With Old Norwegian and the modern popular dialects of Norway it forms the minor branch, West Norse, as distinguished from East Norse, which includes Danish and Swedish. The history of Icelandic, strictly speaking, begins with the Norwegian settlement of Iceland, after the year 874, but down to the beginning of the eleventh century the differences between it and the parent language of Norway are entirely insignificant, and they are to all purposes still but a single language included under the common term Old Norse. As a separate Scandinavian dialect Icelandic first

ranges itself beside Norwegian, Swedish, and Danish, with the introduction of Christianity in the year 1000. Chronologically the history of Icelandic falls into two main divisions, Old and New. Old Icelandic, in its turn, had three periods of development. Of these the first may be considered to extend from the settlement in the ninth century, as already noted, to about the year 1200, down to which time the language still scarcely differentiates itself from contemporaneous Old Norwegian. The second or classical period, from 1200 to about 1350, on the contrary, shows characteristic forms. The extraordinarily abundant literature of the period gives a picture of the language from almost every possible point of view. Important differences between it and Norwegian are an Icelandic lengthening of vowel quantity, viz., of *a*, *o*, *u* before *l* + consonant, and somewhat later of *a*, *i*, *u*, *y* before *ng*, *nk*, in all of which cases it remains short in Norwegian. Initial *h* before *l*, *n*, *r*, which at an early period is lost in Norwegian, is retained in Icelandic. After 1250 the Icelandic medio-passive, instead of the older *-k*, *-sk*, *-zk*, ends in *z*. About 1300 a parasitic *u* develops itself between a final *r* and a preceding consonant, and although it occurs sporadically in Norwegian, it is in Icelandic alone consistently carried through. Not less characteristic is the palatalization of *é* to *jé* in Icelandic, which falls in about the same period, and the somewhat subsequent further change of the ending of the medio-passive to *-zt* or *-st*. The latest period of Old Icelandic from 1350 to 1530, or down to the Reformation, marks the transition from the Old to the New. In it are to be found traces of most of the changes characteristic of New Icelandic, and some of them are already consummated. In this period, for instance, falls the beginning of the afterward universal change of *ll*, *rl* to *ddl*, and of *nn*, *rn* to *ddn*. The beginning of the New Icelandic period is coincident with the Reformation, and its first literary monument is the first book printed in Icelandic, the New Testament of 1540. In many important points the modern language shows further phonetic change. The medio-passive, for instance, at the middle of the sixteenth century ends in *-st*. In the vowels fifty years later, to give characteristic differentiations, *y*, *ý*, *ey* have been merged in *i*, *í*, *ei*, and a little later still *á*, *æ*, *ó* have become the diphthongs *au*, *ai*, *ou*. In the consonants initial *kn* has been merged in *hn*; initial *g* has been lost in pronunciation before *n*, before *i* it has become *j* after vowels and *dj* after consonants. With Danish sovereignty in Iceland, as the result of the Calmar union of 1397, the influence of the Danish language became unavoidable, and subsequently manifested itself in vocabulary and syntax. A reactionary tendency, however, set in at the end of the eighteenth century, and a movement was begun which has had in view a purification of the vocabulary and a normalization of orthography and grammatical forms. In all of these points the conditions of the classical period have been kept in view, with the result that at the present time the language presents outwardly a much older form than it did early in the modern period or even in Middle Icelandic, and apparently has a much more archaic phonetic condition than is actually warranted by the facts of pronunciation. Such changes, for instance, as those to *ddl* and *ddu*, and the diphthongation of *á*, *æ*, *ó*, noted above, find no justification in the orthography, which still gives the old forms. The introduction of the Svarabhakti *u*, already mentioned, has been, on the other hand, consistently carried out, and is one of the most apparent external characteristics of the modern language. The material for the history of Icelandic is contained in a phenomenal literature which begins with the middle of the twelfth century and has extended without a single actual break in its continuity down to the present day. Runic inscriptions, which in the other Scandinavian lands contain the earliest recorded language forms, are in Iceland few and unimportant; the oldest dates from the thirteenth century, and is subsequent to the earliest MSS. The oldest extant Icelandic MSS. are from the end of the twelfth century. A view of the language even as far back as the ninth century is to be found, however, in MSS. of the thirteenth century in scaldic verses, cited either as single strophes or as long poems, in the sagas which recount in prose of a later period the circumstances that evoked them. The MSS. of the classical period end with the middle of the fourteenth century. Icelandic through its whole development has been remarkably homogeneous; and though minor local differences occur even in early times and some few still exist, well-defined dialects have never arisen. Modern Icelandic, although in some points radically changed in phonetic conditions, has still notably retained its inflections, and its vocabulary is astonishingly free from foreign elements. Not only on the printed page, where, however, its phonology is not accurately represented, but as a spoken language it has, on the whole, of all the Germanic languages best preserved an archaic form.

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William H. Carpenter.

Icelandic Literature: the literature developed in Iceland after the settlement of the island by Norwegians in the ninth and tenth centuries. The peculiar conditions of life imposed by the nature of the country upon the early settlers of Iceland were singularly adapted for the development of those germs of a literature which they had brought with them from their mother-country. Scaldic poetry had been cultivated in Norway before the discovery of Iceland, and the tales of the great deeds of valiant ancestors had no doubt resounded at the feasts of the Norsemen. The settlers in Iceland were through the greater part of the year confined within the limits of their valleys, or even their houses; the Althing gathered them once a year from all over the country, and outside of that large meeting near relatives and friends met from time to time in great social gatherings. On these occasions were told the tales of the first settlers, the *landnámsmenn* and their varied adventures and struggles; on these occasions were recited the old lays and scaldic poems, and these assemblies must be regarded as the sources of Icelandic literature. Icelandic literature may be divided into a *prose* and a *poetic* literature. The former is chiefly represented by the *sagas* and the *laws*, the latter by the mythical and heroic, *eddic* poetry, and the artificial, *scaldic* poetry.

The *saga* is a literary form peculiar to Iceland. According to the subject, and the manner in which it is treated, the sagas are divided into *Icelandic family sagas*, Scandinavian, chiefly Norwegian, *historical sagas*, and *legendary* and *mythical sagas*. The Icelandic family sagas are of a typical form, and begin with that member of the family who first settled in the country, sometimes even going a couple of generations back to the Norwegian ancestors of the family, then giving the history of the hero through childhood, youth, voyages abroad, and mature manhood in Iceland, relating his fights and struggles with the representatives of other families, and ending with his death; sometimes also relating the fate of his descendants. If the hero happens to be a scald, a poet, which is often the case, then the prose narrative is interspersed with his poems. Among the most remarkable of these sagas may be mentioned *Egils Saga* (ed. Copenhagen, 1809, 1856, 1888); *Njals Saga* (ed. Copenhagen, 1875), the latter having always, and justly, been considered the classical representative of Icelandic saga art. It is a story of love and friendship, of treachery and cunning, of cruel vendetta, of heroism and devotion, the superior of which can be found in no other literature. Besides these are *Eyrbyggja Saga* (ed. by Vigfusson, Leipzig, 1864); *Laxdœla Saga* (ed. Copenhagen, 1891); *Grettis Saga*; *Gunnlaugs Saga Ormstunga*; *Kormaks Saga*; *Vatzdœla Saga*; and many others. Chiefly relating to Greenland and the discovery of Wineland are *Eiriks Saga Rauða*, *Fostbræðra Saga*, and *Grœnlendinga-þáttr* in the *Flatey-bók* (all edited by Rafn in *Antiquitates Americanæ*, and by A. M. Reeves, *The Finding of Wineland the Good*). Most of these sagas are preserved in manuscripts of the thirteenth and fourteenth centuries, but they were probably put in writing about 1140–1220, and "the weight of proof is entirely against any saga being written down before c. 1110" (Vigfusson, prolegomena to *Sturlunga Saga*, lxv.). *Sturlunga Saga* occupies a position different from the sagas mentioned above, because we can here trace the authorship to a certain name, that of *Sturla Thord'sson* (1214–84), who also wrote a history of King Haakon Haakonson of Norway.

The sagas having for their subject the history of the

Scandinavian countries, chiefly Norway, or rather the lives of the kings, distinguish themselves from those treating of Icelandic persons or families, inasmuch as the former we are in a great many cases able to refer to certain authors. The first important name met with is that of the learned priest Ari hinn fróði (1067–1148), who is very often quoted by later Icelandic writers on points of Norwegian chronology, and we may infer, although his work on the history of the kings (*Konunga ævi*) is not extant, that he was chiefly distinguished as an historian. Besides, he wrote the *Íslendinga bók*, of which an abridged revision made by Ari himself, *libellus* (ed. by Th. Möbius, Leipzig, 1869), as he calls it himself, is still extant in its original shape, and shows us the characteristics of this author. "His sagacity, his careful and orderly method, and plain, straightforward style enhance the value of the immense amount of information which he carefully gathered from the best sources, the worth of which he gauges minutely" (Vigfusson, prolegomena to *Sturlunga Saga*, lxxxiv.). The next important name that we meet is Snorri Sturluson (1178–1241), the author of the kings' lives commonly called *Heimskringla* (ed. by C. R. Unger, Christiania, 1868). Snorri was a great and influential chieftain, twice lawman (1215–18 and 1222–32), and after an unusually eventful life was slain in 1241, by his own sons-in-law, at the instigation of the Norwegian king Hákon. Snorri was a great poet and grammarian, but greater still as an historian. "Able to value at its real worth the careful truthseeking of Ari, he yet takes his own path as an historian; seizing on character and situation with the truest dramatic feeling, letting his heroes speak for themselves; working boldly and vigorously, but with the surest skill, and so creating works which for deep political insight, truth of conception, vividness of color, and knowledge of mankind must ever retain their place beside the masterpieces of the greatest historians" (Vigf., *l. c.*, lxxv.). Snorri's familiarity with the intricacies of Icelandic poetic art, of which his prose *Edda* (ed. Copenhagen, 1875) bears witness, allowed him to a formerly unknown degree to use the contemporaneous scaldic poetry as a source and support of his narrative. His *Edda*, besides laying down the metrical and rhetorical rules to be followed in poetry, also is a true repertory of old Scandinavian mythology, ranking in this respect second only to the poetic *Edda* (see below). Other histories of Norway or Norwegian kings are the *Life of King Olaf Tryggvason*, by Odd Snorrason, the monk, originally written in Latin, but only extant in two independent translations; the large *King Olaf Tryggvason's Saga*; the saga of *St. Olaf*, written by Snorri; the *Ágrip*; the *Fagrskinna*; the *Morkinskinna*, etc., that can not be attributed to any certain author. An important collection of lives of Norwegian kings is the *Flateyjar-bók* (ed. by Unger and Vigfusson, Christiania, 1859–68), giving all the most extensive recensions of the lives of the Norwegian kings, besides inserting numerous other sagas or stories (*þættir*) wherever an opportunity presents itself. Historical sagas referring to other countries than Iceland or Norway are *Knytlinga Saga*, giving the history of the Danish kings; *Orkneyinga Saga*, or *Jarla Saga*, giving the history of the Earls of the Orkneys; *Jomsvikinga Saga*; *Færeyinga Saga*, etc.

Of mythical and heroical contents are *Volsunga Saga*, treating of the myths of the Nibelungen cycle, and giving in certain parts a prose paraphrase of the heroic lays of the poetic Edda, *Hervarar Saga*, *Fridthjofs Saga*. Dating from the last two centuries of the Mediæval period are the *romantic sagas*, translations and adaptations of romances of English, German, or French origin. Finally, we may mention the *fictitious* or *spurious sagas* (*Skrök sögur*), of slight literary and no historical value.

The *laws* and *annals* of the last centuries of the Mediæval period are not important from a literary point of view, but all scholars admit the priceless literary and mythological value of the songs and lays of the *poetic Edda* discovered in 1643 (also called the *Elder* or *Sæmundar Edda*), edited by S. Bugge (Christiania, 1867), and by Ludv. F. A. Wimmer and Finnur Jónsson (Copenhagen, 1891, this latter being a phototype and diplomatic edition). The *Edda* is a collection of mythical and heroical lays, most of them older than the discovery of Iceland, but all of them preserved through Icelandic tradition. This collection was formerly generally—but hardly justly—ascribed to the priest Sæmundr hinn fróði, a contemporary of the above-mentioned Ari. Half of the poems are mythological in their contents, and present to us the theogony, cosmogony, theology, and eschatology of the Norsemen in the time immediately preceding the introduction of Christianity into the Scandinavian countries. In many instances these poems have been shown to have been influenced by Christian thought (Bugge, *Nordiske Gude-og Heltesagns Oprindelse*, Christiania, 1881–89); so, although invaluable as an aid to the study of Norse and Teutonic mythology, they must not be considered as pure representatives of Teutonic spirit and ideals. The other half of these poems consists of heroic lays, treating for the most part the same cycle of traditions as are represented by the German *Nibelungenlied*. At least one of these poems, the *Atlamál*, is shown by its title to have been composed in Greenland. See Edda.

In pronounced contrast to the eddic poetry, with its relative metrical simplicity and the straightforwardness of its diction, is the scaldic art poetry, where the poesy has been drowned in rhymery and art has given place to artificiality. The rhyme in all Icelandic poetry is dependent on the old Teutonic principle of alliteration; but this scaldic poetry, the chief meter of which is the *dróttkvætt* (court poetry), employs in addition thereto, in strict regularity, two kinds of syllabic rhymes (*hendingar*), at the same time taking into account number of syllables, accent, and quantity, the latter according to rules discovered by Prof. E. Sievers, of Leipzig. Characteristic of the scaldic poetry are the numerous periphrases (*kenningar*), which render the reading and understanding of these poems extremely difficult, and in which all poetic beauty and vigor is lost sight of. Among the chief Icelandic scalds may be mentioned Egill Skallagrimsson (author of the poems *Hofuðlausn*, *Sonartorrek*, and *Arinbjarnar drapa*, all preserved in his saga), Hallfreðr Ottarsson, called Vandræðaskald (the court poet of King Olaf Tryggvason), and Sighvat Thord'sson (the court poet of St. Olaf), besides Snorri Sturluson and Sturla Thord'sson, mentioned above. In the thirteenth and fourteenth centuries there developed in Iceland a kind of religious poetry, employing the forms of the old court poetry (the chief poems of this kind being the *Geisli* and the *Lilja*), and later still the so-called *rimur*, rhymed ballads, being to a great extent merely poetic periphrases of sagas. All the chief Icelandic poems (eddic as well as scaldic) have been edited by Vigfusson (*Corpus Poeticum Boreale*, Oxford, 1883); scaldic poetry by Theod. Wisén (*Carmina Norræna*, Lund, 1886–89). The Reformation was preceded in Iceland as elsewhere by a decay of learning and literary interest. Jon Arason, the last Roman Catholic Bishop of Holar (about 1530), wrote the religious poems *Ljómr* and *Pislargrátr*. In the sixteenth century a revival of the old learning took place, but, as was to be expected from the very nature of things, Icelandic literature of later days could never attain the value and the merits of the early classical productions. Odd Gotskalkson made a translation of the New Testament (printed in Roeskilde, 1540). Arnegrim Jonsson wrote on historical subjects, *Brevis Commentarius* (1593); *Crymogæa* (1609). Jon Vidalin's (1666–1720) *Postibl-book* was long used in Iceland. The literary activity of the Icelanders has mostly centered around the study of the old literature; thus we are indebted to Icelanders for the lexicographic works: Björn Halldorsson's *Dictionary*, Icelandic and Latin, published by Rafn (Copenhagen, 1814); *Lexicon Poeticum, Antiquæ Linguæ Septentrionalis*, by Sveinbjorn Egilsson (Copenhagen, 1845–60); Konráð Gislason, *Dansk-Islandsk Ordbog* (Danish-Icelandic Dictionary, 1851); and finally to Gudbrand Vigfusson for his part of the *Icelandic-English Dictionary*, published by the Clarendon Press (Oxford, 1874). Among poets worth mentioning are Stefán Olafsson, composer of psalms, *rimur*, etc. (d. 1688); Jón Thorlákkson (1744–1819); Bjarni Thorarinsson (1787–1841). Sveinbjorn Egilsson translated the *Odyssey* (*Odysseifs-kvæði*), and Benedikt Gröndal the *Iliad* (*Ilions-kvæði*). Eggert Olafsson (d. 1768) is author of the *Búnaðarbálkr*, a Georgic poem, and of the first modern work on Icelandic topography (*Iter per patriam*). Wherever Icelandic literature is mentioned due honor must be given to Arni Magnusson (1663–1730), whose collection of Icelandic manuscripts preserved in the university library of Copenhagen contains some of the greatest treasures of Icelandic literary production. It is owing to his arduous zeal in collecting, preserving, copying, and arranging the manuscripts that we are still in possession of so much of the old classical Icelandic literature. On account of the slight difference existing between the present Icelandic language and that of the past, the old literature is still commonly read in Iceland, and in almost every house a copy of the *Njala*, the *Egla*, the *Gretla*, etc., will be found.

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Iceland Moss: a lichen (*Cetraria islandica*) which grows abundantly in the colder portions of America and the Old World. It is a tufted, erect, subfoliaceous, irregularly branched thallus, of an olivaceous or brownish color. Its spores are ellipsoid, simple, and colorless. It is a common constituent of medicines used in pulmonary complaints, and supplies a nutritious food to the Esquimaux and other natives of high northern latitudes.

Iceland moss, natural size.

Charles E. Bessey.

Iceland Spar: transparent calc-spar, of which the best specimens are obtained from Iceland. It displays in great perfection the phenomena of double refraction.

Ice-making: the production of artificial ice (so called to distinguish it from that produced by nature), by mechanical or chemical means. The various machines designed for cooling will not be discussed at this point, as they are fully described in the article on Refrigerating Processes, but a brief outline will be given of the general method of obtaining cold at the expense of heat, and that portion of the manufacture which is peculiar to ice-making will be treated of, and a description given of the special appliances that are added to refrigerating-machines in order to make an ice-making plant.

The cooling is usually accomplished by employing a volatile liquid, such as ammonia, sulphur dioxide, or ether, which on being evaporated absorbs heat. The liquid most commonly employed is anhydrous ammonia, which at atmospheric pressure boils at a temperature of — 27° F. If this anhydrous ammonia is introduced in a coil submerged in a brine tank the heat of the brine will boil the ammonia, and the brine will be cooled and may be used for either refrigerating or ice-making purposes. The ammonia in some cases abstracts heat directly from the water to be frozen instead of through the agency of brine; in either case the evaporation takes place in an inclosed cooling coil or chamber, so that the resulting vapor may be converted to the liquid state and used over again.

After the ammonia has evaporated and performed its work of cooling it is at a low pressure. To convert the vapor to a liquid state it must be raised to a high pressure. Thus if ammonia be condensed at a temperature of 80° F., the pressure is 140 lb. per square inch above the atmosphere, and if evaporated in the cooling coils at 5° F. the pressure is 19 lb. per square inch above the atmosphere. To raise the pressure from 19 to 140 lb. we may employ two methods—a compressor driven by an engine may be used, or we may absorb the vapor in cold water and introduce the aqueous ammonia into a still, where it is heated and the gas is driven off at the high pressure. In either case there is an expenditure of heat to perform this operation, for in the case of mechanical compression we must furnish heat to drive the engine, and in the absorption system we must furnish heat to drive off the ammonia at the still.

After the vapor is raised from the lower to the higher pressure it is passed into a condenser, where heat is abstracted and it is reduced to a liquid state. It is then used over again in the cooling coils.

We thus see that we are enabled to employ heat in order to produce cold, in one case through the agency of an engine, and in the other through the chemical affinity of ammonia for water.

Commercial artificial ice is produced by two systems, known as the *can system* and the *plate system*. In the can system the water to be frozen is placed in cans, and immersed in a tank of cold brine. The ice produced in this way is in small cakes, not greater than 300 lb. each. With a temperature of brine of from 16° to 18° F., the time required to freeze a cake is about sixty hours. In the plate system the ice is formed on the sides of cooled surfaces in from nine to fourteen days to a thickness of about 14 inches. The cooling surfaces are hollow plates 10 by 14 feet in area, in which the cooling fluid circulates. In the can system distilled water is used for freezing; in the plate system the water is not distilled. With the can system distilled water produces a clear and transparent ice, whereas, if the water is not distilled, the ice will be opaque, and, in most cases, of a brownish color. In the plate system a clear ice is made without distilling the water.

The distilled water from which ice is made is furnished by condensing the exhaust steam from the refrigerating-machine, and by condensing live steam. In a large economical plant the steam required to run the plant is less than the amount of ice that can be produced, provided the water that is frozen is not distilled. If the water is distilled the weight of ice made per pound of coal is limited by the evaporation of the boilers, because the ice made can not be greater than the steam produced, less the amount lost by drip from the steam-pipes and through other causes. It is possible, therefore, to make more ice per pound of coal by the plate method where the water is not distilled than it is by the can system as ordinarily operated. In an economical compression plant a single cylinder engine working without a vacuum will consume less steam than the weight of ice which is produced, so that, if distilled water is used for freezing, it will not increase the efficiency to employ a more economical engine. In the plate system, however, a compound engine may be used with a corresponding gain in the efficiency.

The exhaust steam from the refrigerating-machine in most cases contains oil, and when distilled water ice is made this flows from the condensers along with the water to be frozen. To eliminate this oil, together with any air that may be contained in the water, it is violently reboiled in an open tank directly after it leaves the condenser, by means of a jet of live steam, then cooled and run into an oil separator. It is then usually run through charcoal filters, and finally stored in a supply-tank.

In order to avoid these cleansing processes it has been proposed to employ a triple-effect evaporator, similar to that used in the production of sugar, but the first cost of the apparatus has so far prohibited its use. If such an apparatus were used the distilled water produced might be greater than the steam evaporated at the boilers, and the ice made would not be limited by the amount of steam evaporated.

There is usually a thin feather of air-bubbles near the center of the cake, and at the top of the cake where the water expands over the ice first frozen the ice is white. All other portions of the cake should be transparent. If the oil has been imperfectly removed from the distilled water the ice at the center of the cake, when freshly broken open, will have a slight smell resembling that of tar. In ice of the best manufacture the smell is barely discernible. The presence of a slight trace of oil can be detected by the odor when it can not be detected by the taste; so that the test by odor is a crucial one for the presence of oil, and is universally resorted to in ice-making.

The following distribution of cost for the two systems, taking the cost for the can or distilled water system as 100, which represents an actual cost of about $1.25 per net ton, is taken from the revised edition of M. Ledoux's work on *Ice-making Machines*.

ITEMS.	Can system	Plate system.
Hoisting and storing ice	14·2	2·8
Engineers, firemen, and coal-passer	15·0	13·9
Coal at $3 50 per gross ton	42·2	20·0
Water pumped directly from a natural source at 5 cents per 1,000 cubic feet	1·3	2·6
Interest and depreciation at 10 per cent.	24·6	32·7
Repairs	2·7	3·4
Totals	100·0	75·4

In the estimate of cost a compound condensing engine is assumed to be used by the plate system.

Another form of ice-machine which is now in the experimental stage, but which has given practical results when tried on a small scale, is one in which the water is cooled below the freezing-point by its own evaporation. In these machines water is injected into a chamber in which a strong vacuum is maintained, a portion of the water being evaporated and a portion frozen by the cooling effect of the evaporation. The ice produced is white, opaque, and hard. To maintain the vacuum by mechanical means a very large vapor cylinder is required in comparison to that used by other machines. One machine constructed on this principle had a vapor-cylinder 20 feet in diameter and a stroke of 10 feet, moved at twenty revolutions per minute. Another method of maintaining the vacuum consists in absorbing the water vapor in strong sulphuric acid. If this is done the vapor cylinder, or vacuum pump, is of much smaller dimensions than is the case where the vacuum is maintained entirely by mechanical means. The weak sulphuric acid resulting from the mixture of water with the strong sulphuric acid is heated to drive off the water, and after concentration it is returned to the vapor vessel and used over again as an absorbent. D. S. Jacobus.

Ice-plant: an herb of Southern Europe and Northern and Western Africa, the *Mesembryanthemum crystallinum*, of the family *Ficoideæ*. Its succulent leaves are covered with vesicles which appear like crystals of ice. It is often seen in house-culture, and has demulcent, diuretic, and expectorant properties.

Ichang, ee'chaang': a foo or departmental city of the province of Hupeh, China; on the left bank of the Yang-tse, 1,100 miles from its mouth, and 15 E. of the Yang-tse gorges (see map of China, ref. 5–I). It stands high, on a conglomerate cliff which overhangs a long low sandspit plentifully sprinkled with large loose bowlders carried down by the river as it rushes through the gorges when in flood. From its position at the outlet of these gorges Ichang has always been an important shipping-point, most cargoes being transshipped here to other junks specially fitted for the voyage up or down. Besides 2,020 chartered junks (56,097 tons) entered at the foreign inspectorate of customs in 1892, no fewer than 12,000 native craft of all sizes passed up or down. The gross value of the foreign trade in the same year was 10,389,433 custom-house taels ($10,909,380 U. S. gold), of which 6,091,517 taels represented foreign imports, Indian cotton and yarn being the chief items. In 1892 262 steamers (132,250 tons) entered port, of which 168 (89,724 tons) were British and 94 (42,526 tons) were Chinese. Ichang stands on the edge of one of the richest coal-fields in the world, that of Sze-chuen. Pop. (1892) 35,000, of whom about 20 were foreigners. R. Lilley.

Ichneu'mon [Gr. *ἰχνεύμων*, liter., tracker, deriv. of *ἰχνεύειν*, to track, deriv. of *ἴχνος*, a track, footstep]: a name in its largest sense applicable to the numerous genera of small quadrupeds of the family *Viverridæ*, sub-family *Herpestinæ*—all Old World carnivorous mammals of active habits and fierce disposition, preying upon serpents, birds, and small game of many kinds. But strictly, the name designates the *Herpestes ichneumon* of Egypt. It is famous as the devourer of the eggs of the crocodile and as a destroyer of venomous serpents. Hence it was worshiped by the ancient Egyptians. Spain has an ichneumon, *Herpestes widdringtonii*. See Mungoos. Revised by F. A. Lucas.

Ichneumon-flies: a great family (*Ichneumonidæ*) of hymenopterous insects which are of the greatest service to the agriculturist and to mankind, since they deposit their eggs either upon or within the eggs or larvæ of larger insects and spiders, the future larva of the ichneumon-fly devouring the insect upon which it is hatched. Immense numbers of noxious insects are thus destroyed. There are about 5,000 known species. See, for many details, Entomology and Hymenoptera.

Ichnol'ogy [Gr. *ἴχνος*, track + *λόγος*, discourse, reason]: or the science of tracks, a name proposed by Dr. Buckland. The animals whose existence is made known by their markings upon stone may be called *Ichnozoa*. President Hitchcock has detailed sixteen permanent characters in markings which serve to distinguish satisfactorily different classes of animals. The following are examples of characters: tracks of feet; trails made by the body or its caudal extremity drawn along in the mud; width of the trackway; relative size of hind and front feet; length of step; number of toes; mode of progression; spread of the toes; formation of the heel and of the claws. See Fossil Footprints.

Ichthyocol, or **Isinglass**: See Gelatin.

Ichthyol: a medicinal substance occurring as ammonium and sodium ichthyol sulphonate, the two most important salts of ichthyolsulphonic acid, which is prepared from a bituminous mineral of the Tyrol, which contains large amounts of fossilized remains of fish and other sea animals. Ichthyol was first introduced into medicine by Unna, of Hamburg, and has proved very valuable when applied externally in certain diseases of the skin and for the purpose of removing pain and induration about the inflamed joints. The ammonium salt is liquid, but the sodium salt is solid, and the latter is therefore most frequently employed when the drug is given internally for the purpose of affecting the alimentary canal or the general system. H. A. Hare.

Ichthyol'ogy [Gr. *ἰχθύς*, fish, and *λόγος*, discourse, reason]: that branch of zoölogy which treats of the vertebrated animals formerly collectively known under the name of fishes, but which are now usually distributed among the classes (1) Fishes, (2) Selachians or Elasmobranchiates, (3) Marsipobranchiates, and (4) Leptocardians. Referring to the articles under those several heads, as well as that under Vertebrates, for information respecting the structure and relations of each, remarks will be here confined to the most important facts in the bibliography and history of the group of classes. In order to insure clearness of conception (1) the great general works on fishes will be first noticed, and then (2) the principal stages in the systematic arrangement of the class or its primary constituents.

I. *General Works and Numerical Acquisitions.*—Many ancient and mediæval authors had published compilations containing descriptions of various species of fishes, but none can be said to have advanced ichthyology. The chief authors after the revival of learning were Belon, Salviàni, Rondelet, Gesner, etc. Their works, however, were chiefly of local interest, and related mostly to the fishes of the Mediterranean. The first general work that deserves special mention was the *Historia Piscium* of Willughby and Ray, published in 1686. In 1735 Linnæus, in the first edition of the famous *Systema Naturæ*, first introduced to the world a synopsis of the arrangement of fishes and digest of known species, which Artedi, his fellow student, had elaborated; but that author having come to an untimely death, his manuscripts were left to Linnæus, and published under his editorship in 1738 in five parts. In these parts were successively considered in his own words—(1) ichthyological bibliography, or the literary history of fishes, in which was given an enumeration of the authors who had written on fishes; (2) ichthyological philosophy, in which were elucidated the fundamental principles of the science; (3) the genera of fishes, in which a complete system of ichthyology was proposed, with classes, orders, characters of genera, specific differences, and many observations: (4) the synonomy of almost all fishes, in which was given an enumeration of the names of fishes mentioned by all authors who had ever written of them; and (5) descriptions of the species of fishes which Artedi had dissected and examined alive; these subjects being entitled at length in Latin, with corresponding titles. Artedi admitted into the system 242 nominal species under 52 genera, but these are to be divided among 228 species and 45 genera of true fishes, and 14 species and 7 genera of *Plagiuri* or cetaceans, Artedi having, like all his predecessors, confounded these two groups in the same class. Linnæus, in (1) the first edition of the *Systema Naturæ*, which was published in 1735, enumerated 145 nominal species of fishes under 36 genera, and 10 cetaceans in 5 genera; (2) in the fourth titular (or second original) edition he had 238 species of fishes under 48 genera, and 8 cetaceans under 5 genera; (3) in the sixth titular (or third original) edition, published in 1748, he recognized 281 species of fishes, distributed under 47 genera, and 12 cetaceans under 6 genera; (4) in the tenth titular (or fifth original) edition (wherein the class was first restricted to the fishes proper, and the cetaceans separated to be united with the mammals) he increased the number to 414 species (including, however, the *Amphibia Nantes*), ranged under 57 genera; and (5) in the twelfth titular (or sixth original) edition (which was the last one in the lifetime of Linnæus) 477 nominal species of fishes (including the *Amphibia Nantes*) were described and placed in 61 genera. The eighth titu-

far as the original edition was limited to the vegetable kingdom.

Between 1749 and 1749 Jacob Theodor Klein, Secretary of State of Dantzic, published five numbers or "missus" of a work on ichthyology, remarkable for its erudity, which has had a considerable reputation. In this work 518 nominal species of fishes were described and referred to 61 genera, quite different from those of Artedi or Linnæus. From 1782 to 1795 a great work on fishes was published in two sections—one of three * and the other of nine † volumes—by Dr. Mark Elieser Bloch, a physician of Berlin, in which about 418 species of fishes were described and illustrated, in fine large oblong folio volumes of plates, but the drawings are often very inaccurate, and the coloring still more erroneous. During the time the work of Bloch was being published, several compilations were issued from different European presses.

In 1787 René Just Haüy (better known as "the crystallographer") contributed, anonymously, a volume ‡ to the natural history department of the *Encyclopédie Méthodique*, describing the fishes in an alphabetical sequence under their French names, and with tabular synopses, each on a special page, giving the classes, genera, and species under their French names, in connection with the descriptions.

In the following year (1788) the Abbé J. P. Bonnaterre § contributed also to the same series a volume under the title *Ichthyologie*, in which the species were arranged according to the Linnæan classification, and illustrated in 102 plates, representing about 400 species, which he had collected from all sources. Also in 1788 Johann Friedrich Gmelin issued an edition of the *Systema Naturæ* of Linnæus, in which he collected together from many sources descriptions of species which were, however, referred to their places in the system with very little judgment; he raised the apparent number of species to 826, which he grouped in 65 genera, but many of these were identical with each other, and the number of real species was therefore much less. A few years later (in 1792) the work of Linnæus's friend (Artedi) also found an editor in Johann Julius Walbaum, who used the *Genera Piscium* as a nucleus around which he brought, in the form of footnotes and appendices, all the species which he could collect from all sources, and which amounted to about 965, grouped under 228 genera; of these also a considerable proportion were synonymous with other species.

Between 1798 and 1803 ‖ Bernard Germain Étienne de la Ville-sur-Illon, Comte de Lacépède, published an extensive work on fishes in the French language, entitled *Histoire Naturelle des Poissons*, in which he introduced, with very great modifications in the system, numerous generic divisions and many species based on figures made chiefly by French naturalists and travelers; very little wholesome criticism was exercised in this work. Fourteen hundred and sixty-three nominal species were described.

In 1801 the Greek scholar, Johann Gottlieb Schneider,¶ who had paid considerable attention to natural history, and especially ichthyology, published a posthumous work of Bloch's, which doubtless owed considerable to himself, under the title *Systema Ichthyologiæ iconibus ex. illustratum*. In this work the species were primarily grouped in classes, distinguished nominally by the number of fins, although very often the species referred to the classes did not support the characters attributed to them. The classes were again divided into orders distinguished by the position of the ventral fins.

In 1803 and 1804 George Shaw published the fourth and fifth volumes (in four parts) of his *General Zoölogy, or Systematic Natural History*, which were exclusively devoted to the fishes. He adopted, with a few trifling modifications, the system of Linnæus, as rectified by Gmelin, and described 1,230 nominal species of fishes.

With Shaw the age of mere compilations of descriptions of species of fishes came to an end, and although the subsequent works devoted to such descriptions were few, they were far more valuable in every respect, and based chiefly on original materials and observation, and a comparison of the fishes themselves.

In 1828 Baron Georges Cuvier commenced the publication, in connection with Achille Valenciennes,* of a great work on fishes (*Histoire Naturelle des Poissons*), which was continued through many years (1828–49), and was only brought to a stop in 1849, when twenty-two volumes had been published; all of the apodal fishes, almost all of the ganoids, and all of the elasmobranchiates, marsipobranchiates, and leptocardians being left undescribed. The first ten volumes were prepared by Cuvier and Valenciennes, each elaborating special groups, but on the death of Cuvier, and after the publication of the manuscript he left behind, the work was carried on by Valenciennes alone. Owing to the length of time during which the work was published, a great inequality in its proportions necessarily resulted, the last volumes describing a larger proportion of the now known species than the earlier ones; 4,514 nominal species of fishes were described in the twenty-two volumes, almost all of which belong to the typical fishes.

In connection with the work of Cuvier and Valenciennes may be considered one by A. Duméril,† bearing, in part, the same title—i. e. *Histoire Naturelle des Poissons, ou Ichthyologie générale*. This work is complementary to the preceding, as it embraces the selachians, ganoids, and lophobranchiates, groups which had not been described by Cuvier and Valenciennes. Two large volumes were published between 1865 and 1870, when the death of its author arrested its further progress. Six hundred and twenty-six nominal species were described in the volumes issued.

Between 1859 and 1870, in the form of a *Catalogue of the Fishes in the British Museum*, by Albert Günther, M. D.,‡ all the species recognized by the author, as well from autopsy as descriptions of species unknown to him, were described. This is the only work published since the early part of the nineteenth century which contains a complete conspectus of the living fishes. It is in eight volumes, which were issued every one or two years. The author adopted 6,843 species as established, while 1,682 others are considered as doubtful, and referred to by name only in footnotes to the genera to which they are supposed to belong. It is assumed that about 1,000, however, of the doubtful species will be ultimately confirmed, and, allowing 2,000 species to have been described during the course of publication of the series, it is estimated that we may put the total number of fishes known at present as about 10,000. This monumental work of Dr. Günther, although not without serious imperfections, has been the foundation of nearly all the systematic work on fishes for many years.

II. *Progress of Classification.*—Nothing like a scientific classification of fishes was known to the ancient or mediæval authors, Aristotle in this respect being but little if any in advance of others, and none of his followers or successors are better. The first germ of a regular system based on anything like scientific principles was not published till near the end of the seventeenth century. In 1686 Ray published the *Historia Piscium* left by his friend Willughby, in which the species were dichotomously divided, primarily, (*a*) into (I.) Cartilaginei, and (II.) Ossei; (*b*) the former (I.) into *Longi* (including sharks) and *Lati* (including rays); and the latter (II.) into Plani and Non-Plani; (*c*) the Plani included only the flat-fishes; the Non-Plani were distinguished according to the form of the body, whether eel-shaped (*Anguilliformes*) or more contracted (*Corpore contractiore*), and (*d*) those according to the absence of ventrals (*sine ventralibus*) or their presence (*cum ventralibus*); (*e*) those without ventrals were only differentiated into genera; those with, into *Malacopterygii*, or soft-rayed fishes, and *Acanthopterygii*, or spiny-rayed fishes. This scheme exhibits some idea of system, but in most respects, and in its details, it is quite defective.

Artedi classified the forty-five genera known to him under five orders, accepting to a considerable extent the views announced in the work of Willughby and Ray. These orders were (1) *Malacopterygii*, (2) *Acanthopterygii*, (3) *Branchiostegii*, (4) *Chondropterygii*, and (5) *Plagiuri*. It is only nec-

* Bloch's (D. Marcus) *Oekonomische Naturgeschichte der Fische Deutschlands*, Berlin, 1782–84 (text, 3 vols. 4to; atlas, 3 vols., obl. fol.).

† Bloch's (D. Marcus) *Naturgeschichte der ausländischen Fische*, Berlin, 1785–95 (text, 9 vols. 4to; atlas, 9 vols. fol.).

‡ Haüy (René Just), *Encyclopédie Méthodique. Histoire Naturelle. Tome troisième. Contenant les Poissons.* Liege, 1787, 4to.

§ Bonnaterre (J. P.), *Tableau Encyclopédique et Méthodique des trois règnes de la Nature. Ichthyologie.* Paris, 1788, 4to, with 102 pl.

‖ Lacépède (Comte de), *Histoire Naturelle des Poissons.* Paris, 1798–1803 (4to, 5 vols.).

¶ Bloch (M. E.), *Systema Ichthyologiæ iconibus ex. illustratum. Post obitum auctoris opus inchoatum absolvit, correxit, interpolavit Jo. Gottlieb Schneider*, Berlin, 1801, 8vo.

* Cuvier (Baron Georges) and Achille Valenciennes, *Histoire Naturelle des Poissons*, Paris, 1828–49 (22 vols. 8vo).

† Duméril (Auguste), *Histoire Naturelle des Poissons, ou Ichthyologie générale*, ouvrage accompagné de planches, Paris, 1865–70 (text, 2 vols. 8vo; atlas, larger 8vo).

‡ Günther (Albert C. L. G.), *Catalogue of the Fishes in the British Museum*, London, 1859–70 (8 vols. 8vo).

essary to observe that among the Malacopterygians he included the genera *Syngnathus*, *Stromateus*, and *Anarrhichas*, as well as the true Malacopterygians of later authors; and under the Branchiostegi he combined the genera *Balistes*, *Ostracion*, *Cyclopterus*, and *Lophius*.

In 1758 Linnæus published an original system of ichthyology, and (*a*) rejected (as Brisson had previously done) the cetaceans from the class of fishes; (*b*) applied the binomial system of nomenclature to the species; and (*c*) introduced a new system of classification, based chiefly upon the position of the ventral fins, and recognizing five orders, distinguished severally (1) by the supposed structure of the branchiæ (*Branchiostegi*), (2) the want of ventral fins (*Apodes*), or their presence (3) under the throat (*Jugulares*), or (4) at the thorax (*Thoracici*), or (5) behind the ventrals (*Abdominales*). Linnæus ran to an opposite extreme from his predecessors in limiting the class, and not only excluded the cetaceans, but committed a grave error in separating from the fishes and referring to the amphibians the *Chondropterygii* of Artedi. He was led into this mistake by erroneous information respecting the air-bladder, communicated to him by Dr. Garden, of Charleston, S. C., and this error was still further aggravated in the succeeding edition (the twelfth, or the last published during his life).

The true fishes were again brought together by Gmelin in his edition of the *Systema Naturæ*, and the class, remaining purged of the cetaceans, was retained with the constituents generally accorded to it till within a recent period.

In 1801 Bloch and Schneider published their *Systema Ichthyologiæ*, in which they distributed the genera under eleven classes, distinguished by the number of fins from eleven down to one—i. e. *Hendecapterygii*, *Decapterygii*, *Enneapterygii*, *Octopterygii*, *Heptapterygii*, *Hexapterygii*, *Pentapterygii*, *Tetrapterygii*, *Tripterygii*, *Dipterygii*, and *Monopterygii*. Within the classes orders were recognized based upon the ventral fins—i. e. whether jugular, thoracic, abdominal, or wanting. This system had not even the merit of being based upon a correct appreciation or count of the fins; and independently of this, it was in the highest degree unnatural, bringing together forms that were in no wise related, and separating others that were very closely allied, or even congeneric. It must be remembered, in this connection, that a greater or less number of fins is often simply the expression of more or less abbreviated or shortened rays, and more or less deeply incised membrane—e. g. differences such as may be found between the species of black bass or species and genera of *Serranidæ*, etc.

Nearly contemporaneously, from 1799 to 1804, appeared the work of Lacépède, in which the classification adopted is a procrustean system of (1) sub-classes, (2) divisions, and (3) orders. *First.—Sub-classes* based on the supposed consistence of the skeleton (Sous-classes, (1) Poissons cartilagineux, (2) Poissons osseux.) *Second.—Divisions*, under each sub-class, established on the supposed presence or absence and various combinations (4) of the opercula and branchiostegal membrane—that is, the presence of both, of one, or the other, or none. *Third.—Orders*, distinguished by the presence of ventrals (Apodes), or their presence at different regions (*Jugulaires*, *Thoraciens*, *Abdominaux*). Several of these categories are non-existent in nature, and the reference of species to them is due to erroneous observation or supposition. Numerous new genera were in this work for the first time instituted, but most of them were very badly defined, and congeneric species were frequently combined with other types.

In 1806 Duméril, in his *Zoologie Analytique*, published a system of fishes which was to a considerable extent simply a modification of Lacépède, but he for the first time introduced the category of "families" in the classification of fishes; his arrangement, however, was as artificial as that of Lacépède.

Several other authors published new arrangements or introduced modifications in the classification of the class; among them were Rafinesque in 1810, Pallas in 1811, Rafinesque anew in 1815, de Blainville and Oken in 1816, Goldfuss in 1820, and Risso in 1827. Almost all of their modifications, however, were devoid of merit.

In 1817 Cuvier, who had previously published numerous special memoirs on fishes, and rectified many details in their classification, introduced his complete system in the first edition of the *Règne Animal*. He primarily distinguished fishes into *Chondropterygiens* and *Osseux*. The chondropterygian fishes were disintegrated into those with attached branchiæ (*à branchies fixes*) and those with free branchiæ (*à branchies libres*): the former were subdivided into *Suceurs* (Marsipobranchiates), and into *Sélaciens* (Elasmobranchiates); the latter included only the sturgeons and paddle-fish (Sturioniens). The osseous fishes were divided into the orders *Plectognathes*, *Lophobranches*, *Malacoptérygiens abdominaux*, *Malacoptérygiens subbrachiens*, *Malacoptérygiens apodes*, and *Acanthoptérygiens*.

The natural groups Plectognaths and Lophobranchs were thus for the first time recognized; as to the rest, the merit consisted chiefly in the criticism exercised in the elimination of doubtful forms and their proper identification, and in approximations of minor groups, rather than in the appreciation of the outlines of classification.

In 1846 Johann Müller, the most able anatomist of the century, who had long been engaged on very elaborate anatomical investigations of different groups of fishes, gave expression to the result of his studies in a remarkable memoir on the classification of fishes. He recognized in the class six distinct sub-classes, viz., (1) *Leptocardii*, (2) *Marsipobranchii*, (3) *Elasmobranchii*, (4) *Ganoidea*, (5) *Teleostei*, and (6) *Dipnoi*. These sub-classes were based upon weighty structural differences, and the combinations indicated by them were far superior to any that had been previously proposed. Perhaps his most valuable results were the recognition and characterization of the sub-class of Ganoidea. The members of this group had previously been either (e. g. by Cuvier and his followers) widely dispersed and their relations not at all appreciated, or (by Agassiz) very unlike forms had been combined with them in one group, on account of partial agreement in characters of very slight value. Müller was the first to recognize a natural group distinguished by definite characters; he also defined, in a much more scientific manner than had been previously done, the sub-classes which had already received names adopted by him. On the whole, his classification marks the most noteworthy epoch in the history of systematic ichthyology.

The great majority of the other natural classifications of fishes proposed since about 1850 have been either slight modifications of Cuvier's or Müller's, or (e. g. Owen's) eclectic ones combining selections from each.

To this generalization, however, there are several marked exceptions, and notably the classifications of Prof. Agassiz and Dr. von Bleeker. The former has been so celebrated that some reference to it may be demanded. In 1833 Prof. Agassiz published his views respecting the ichthyological system, and, exclusively basing his arrangement on the character of the scales, segregated all the existing and fossil fishes into four orders: (1) *Ganoidei*, with enamel-covered scales; (2) *Placoidei*, with shagreen-like scales; (3) *Ctenoidei*, with ordinary scales pectinated at their free margins; and (4) *Cycloidei*, with ordinary scales entire at their free margins. The illustrious and learned author retained this classification till about 1857. It was not, however, received with favor by any other original investigator and was justly objected to on account of (1) the characters themselves being insufficient, (2) the distinctions being very trivial and intergrading, as well as (3) on account of deficiency in diagnostic precision, large numbers of forms being left unprovided for, inasmuch as many fishes are entirely destitute of scales. Very many fishes, also, have two kinds of scales (cycloid and ctenoid) in different parts of the body.

In 1871 Dr. Albert Günther proposed a modification of the system which has been much noticed. The tendency among zoölogists had always been toward a differentiation of the fishes into the teleost and ganoid forms on one hand, and on the other the selachian types, but Dr. Günther reversed this, combining the ganoids and selachians in one sub-class ("fourth sub-class, *Palæichthyes*"), contrasted with that of the Teleosts. The Palæichthyes were subdivided into two "orders"—order 1, *Chondropterygii*, with two "sub-orders" (*Plagiostomata* and *Holocephali*), and order 2, *Ganodei*, with five "sub-orders" (*Amioidei*, *Lepidosteroidei*, *Polypteroidei*, *Chondrostei*, and *Dipnoi*).

Many other modifications have been proposed by various authors, but scarcely require notice here. Only one other system need detain us. In 1871 Prof. Edward D. Cope, after first recognizing three classes by most authors confounded under the old term "Fishes" (*Leptocardii*, *Dermopteri*, and *Pisces*), divided the fishes proper primarily into five sub-classes, viz., (1) *Holocephali* (= *Elasmobranchii holocephali*, Müller), (2) *Selachii* (= *Elasmobranchii selachii*, Müller), (3) *Dipnoi* (Müller), (4) [illegible] *dei crossopterygidæ*, Huxley), and (5) *Actinopteri* (new). The *Holocephali*, *Selachii*, and *Dipnoi* had the same limits

as the homonymous subclasses or orders of Müller. The *Crossopterygia* included those having the "hyomandibular articulated, opercular bones well developed, a single ceratohyal; no pelvic elements; limbs having derivative radii of the primary series on the extremity of the basal pieces, which are in the pectoral metapterygium, mesopterygium, and propterygium." Three orders were recognized, viz., *Haplistia*, *Cladistia*, and *Actinistia*. The *Actinistia* embraced such forms as had "opercular bones well developed or separate and complex suspensorium; a double ceratohyal, no pelvic elements; primary radii of fore limb parallel with basilar elements, and entering the articulation with scapular arch; basilar elements reduced to metapterygium, and very rarely mesopterygium; primary radii of posterior generally reduced to one rudiment." This sub-class was primarily divided into three tribes; *Chondrostei* (Müller) with two orders; *Physostomi* (Müller), with twelve; and *Physoclysti* (Müller), with ten.

Classes.—From this point more lucid ideas may be obtained by considering the primary subdivisions of the group known under the general name of "Fishes." Up to the close of the eighteenth century, under this name all the vertebrated inhabitants of the waters adapted for exclusive progression through the liquid medium were confounded; consequently, the true fishes and cetaceans had not been decidedly separated. In 1756, for the first time, Mathurin Brisson (*Règne animal, divisé en neuf classes*) removed the cetaceans entirely from the fishes, distinguished them as a class, and placed them immediately after the mammals; he therefore was the first naturalist who limited the class Pisces to the typical branchiferous vertebrates. As previously indicated, Linnæus never recognized anything like the true limits of the class, at one time confounding with them the cetaceans, and later, when he excluded them, also excluding typical fishes which he referred to the class of amphibians. Gmelin, however, rectified this error, and thenceforth the fishes were recognized as a homogeneous class until a comparatively recent date. To this statement, however, several exceptions must be noted. E. Geoffroy Saint-Hilaire and Latreille (1825) differentiated the fishes thus understood into *two* classes, viz., (1) *Poissons* (= Fishes proper) and (2) *Ichthyoderes* (= Elasmobranchiates and Marsipobranchiates), the Leptocardians being then unknown. I. Geoffroy Saint-Hilaire, Bonaparte (1856), and Moquin Tandon also recognized *two* classes, but with different limits, viz., *Poissons* (= Fishes, Elasmobranchiates and Marsipobranchiates), and *Myelozoa* (= Leptocardians). Agassiz has distinguished *four* classes, viz., (1) *Myzontes* (= Marsipobranchiates and Leptocardians), (2) *Fishes*, (3) *Ganoids* (2 and 3 = Fishes proper), and (4) *Selachians* (= Elasmobranchiates). Hæckel has likewise adopted *four* classes, but very different from those proposed by Agassiz, viz., (1) *Pisces*, (2) *Dipneusta* (= *Dipnoi*), (3) *Cyclostoma*, and (4) *Leptocardii*. Gegenbaur, Schmidt, Cope, and several other recent naturalists recognize *three* classes, viz., (1) *Pisces*, (2) *Cyclostoma*, *Cyclostomata*, *Dermopteri*, or *Marsipobranchii*, and (3) *Leptocardii*.

It will thus be seen that the present tendency and the weight of authority are decidedly in favor of the recognition of class-value for the differences of structure exhibited by several constituent groups of the old so-called class of "Fishes," and the more thoroughly we enter upon the comprehensive study of the anatomy of all the vertebrates, the more disposed we must be to the recognition of the naturalness of such associations.

In fine, on a review of the various steps in the progress of knowledge gained respecting these animals, it appears that the early Linnæan and post-Linnæan authors rather added to the confusion in which species were already involved than advanced the science; that Cuvier and his disciples did much to clear that confusion away, and introduce sound methods of study; that Müller made a great advance in the rigorous application of anatomical principles to the distinction of the several groups; and that subsequent progress has chiefly resulted from the more or less general recognition of the principle that the consideration of the entire structure must be the paramount guide to a correct appreciation of the true relations of the various types of organization, and that teleological modifications are quite unimportant in comparison with morphological. THEODORE GILL.

Classification.—European writers have followed more or less generally the classification of Cuvier and Valenciennes, or more generally the modifications introduced by Dr. Günther. The necessities of museum administration have been a large factor in the retention of time-honored modes of arrangement, even when these do not fully accord with present knowledge.

In the U. S. the influence of Dr. Theodore Gill has been largely felt in all branches of ichthyology. The system of classification generally adopted is some modification of that proposed by him in the first edition of this cyclopædia. There is no doubt that this arrangement represents a closer fidelity to nature than is the case with any which have preceded it. The following is Gill's list of the classes, orders, and sub-orders as originally proposed by him, the arrangement being that of an inverted descending series:

Class PISCES or FISHES (E. Geoffroy Saint-Hilaire, Latreille, Agassiz (fraction), Cope, Gill).
- Sub-class *Teleostei*,
  - Order *Plectognathi*.
    - Sub-order *Gymnodontes*,
    - " " *Ostracodermi*,
    - " " *Sclerodermi*.
  - Order *Lophobranchii*.
    - Sub-order *Syngnathi*,
    - " " *Solenostomi*.
  - Order *Pediculati*.
  - Order *Hemibranchii*.
  - Order *Teleocephali*.
    - Sub-order *Heterosomata*,
    - " " *Anacanthini*, or *Jugulares*,
    - " " *Acanthopteri*,
    - " " *Percesoces*,
    - " " *Synentognathi*,
    - " " *Haplomi*,
    - " " *Isospondyli*,
    - " " *Eventognathi*,
    - " " *Gymnonoti*.
  - Order *Scyphophori*.
  - Order *Nematognathi*.
  - Order *Apodes*.
    - Sub-order *Ichthyocephali*,
    - " " *Holostomi*,
    - " " *Enchelycephali*,
    - " " *Colocephali*.
  - Order *Opisthomi*.
- Sub-class *Ganoidei*.
  - Super-order *Hyoganoidei*.
    - Order *Cycloganoidei*.
    - Order *Rhomboganoidei*.
  - Super-order *Chondroganoidei*.
    - Order *Chondrostei*.
    - Order *Selachostomi*.
  - Super-order *Brachioganoidei*.
    - Order *Crossopterygia*.
    - Order *Actinistia* (extinct).
  - Super-order *Dipnoi*.
    - Order *Sirenoidei*.
  - (?) Order *Placoganoidei* (extinct).
  - Super-order (?) *Aspidoganoidei* (extinct).
    - Order *Cephalaspidoidea* (extinct).
  - (?) Super-order *Acanthoganoidea* (extinct).
    - Order *Acanthodoidea* (extinct).

Class *Selachians* or *Elasmobranchiates*.
- Super-order *Chimæræ*.
  - Order *Holocephali*.
- Super-order *Plagiostomi*.
  - Order *Raiæ*.
    - Sub-order *Masticura*,
    - " " *Pachyura*.
  - Order *Squali*.
    - Sub-order *Rhinæ*,
    - " " *Galei*.

Class *Marsipobranchii*.
- Order *Hyperoartia*.
- Order *Hyperotreti*.

Class *Leptocardii*.
- Order *Cirrostomi*.

In the more recent systematic works published in the U. S. this series is reversed, the lowest forms being placed first. The order *Teleocephali*, which in Gill's system includes most of the recent fishes, is broken up into several, and a few new orders have been introduced. In view of recent investigations, the following modification of Gill's classification is suggested, the extinct groups being omitted from consideration:

Class I. *Leptocardii* (lancelets).
- Order *Amphioxi*.

Class II. *Marsipobranchii* (lampreys).
Order *Hyperotreti.*
Order *Hyperoartia.*
Class III. *Selachii* (sharks and skates).
Sub-class *Plagiostomi.*
Order *Diplospondyli.*
Order *Proarthri.*
Order *Batoidei.*
Order *Asterospondyli.*
Order *Cyclospondyli.*
Sub-class *Holocephali* (chimæras).
Order *Chimæroidei.*
Class IV. *Pisces* (fishes).
Sub-class *Dipnoi* (lung-fishes).
Order *Sirenoidei.*
Sub-class *Brachioganoidei* (*Polypterus*).
Order *Crossopterygia.*
Sub-class *Chondroganoidei.*
Order *Chonodrostei* (sturgeons).
Order *Selachostomi* (paddle-fishes).
Sub-class *Hyoganoidei.*
Order *Ginglymodi* or *Rhomboganoidei* (gar pikes).
Order *Halecomorphi* or *Cycloganoidei* (bow-fins).
Sub-class *Teleostei* (true fishes).
Series *Ostariophysi.*
Order *Nematognathi.*
Order *Scyphophori.*
Order *Plectospondyli.*
Sub-order *Eventognathi,*
" " *Heterognathi,*
" " *Gymnonoti.*
Series *Evisospondyli.*
Order *Symbranchia.*
Sub-order *Holostomi,*
" " *Ichthyocephali.*
Order *Carencheli.*
Order *Apodes.*
Sub-order *Enchelycephali,*
" " *Colocephali.*
Order *Lyomeri.*
Order *Heteromi.*
Order *Hemibranchii.*
Order *Lophobranchii.*
Sub-order *Solenostomi,*
" " *Syngnathi.*
Order *Isospondyli.*
Order *Opisthomi.*
Sub-order *Truttacea,*
" " *Iniomi.*
Order *Lyopomi.*
Order *Teleocephali.*
Sub-order *Xenomi,*
" " *Haplomi,*
" " *Salmopercæ.*
" " *Synentognathi,*
" " *Percesoces,*
" " *Hypostomides,*
" " *Rheomyzonti,*
" " *Berycoidei,*
" " *Percomorphi,*
" " *Pharyngognathi,*
" " *Holconoti,*
" " *Discocephali,*
" " *Taniosomi,*
" " *Cataphracti,*
" " *Craniomi,*
" " *Haplodoci,*
" " *Xenopterygii,*
" " *Scyphobranchii,*
" " *Anacanthini,*
" " *Heterosomata.*
Order *Pediculati.*
Order *Plectognathi.*
Sub-order *Sclerodermi,*
" " *Ostracodermi,*
" " *Gymnodontes.*

Of these, the sub-orders of *Teleocephali* are necessarily more or less tentative, some of sub-orders even, as the *Percomorphi*, covering a very wide range of forms, but not susceptible of exact definition on account of the almost perfect intergradation between one group and another. The variety of interrelation and intergradation among the true fishes will prevent any possible division of the group into orders from being satisfactory. As these specialized forms are descended from more generalized stocks, the *Teleocephali* from *Isospondyli*, and these from *Ganoidei*, a natural classification would assume the form of a tree with many branches and no lines of division, except where a branch has become extinct.

Authorities.—In addition to the general works whose titles have been subjoined in footnotes to this account, the following articles may be referred to, viz.: *Ichthyology*, by Sir John Richardson, in the *Encyclopædia Britannica*; *Observations on the Systematic Relations of the Fishes*, by Edward D. Cope, in the *Proceedings of the American Association for the Advancement of Science for 1871* (1872), pp. 317–343; and *Arrangements of the Families of Fishes*, by Theodore Gill. Lists of all the fishes of North America have been given by DeKay, Storer, and Gill;* those of British America have been described by Richardson, Fortin, Storer, Perley, and Knight; those of Alaska by Steller and Pallas; those of Maine by Holmes; those of Ohio by Rafinesque and Kirtland; of Massachusetts by Storer and others; those of Connecticut by Linsley; of New York by Mitchill, DeKay, and Ayres; of New Jersey by Baird and Abbott; those of the Great Lakes by Le Sueur, Richardson, and Agassiz; those of the Tennessee by Agassiz. The fishes of the Mexican boundary have been described by Girard, as also those obtained by the surveys of the Pacific railways. The fishes of California were early studied by Dr. W. O. Ayres, Dr. J. G. Cooper, and Dr. W. P. Gibbons. Since then numerous groups and the fauna of different regions have been studied by different writers, notably Cope, Gill, Goode, Bean, Jordan, Gilbert, Garman, Forbes, Eigenmann, Evermann, Meek, and others. The deep-sea fishes have been investigated by Goode and Bean, and by Gilbert; the fishes of the West Indies by Poey, Jordan, Goode, and Bean; those of the Pacific especially by Jordan, Gilbert, Steindachner, Günther, Gill, Bean, Eigenmann, Jenkins, and Evermann. The best general account of the fishes of the U. S. is that in Jordan and Gilbert's *Synopsis of the Fishes of North America.*† This volume will be superseded by the more recent and more extensive *Fishes of North America* by Jordan and Evermann, now in course of publication as *Bulletin 47* of the U. S. National Museum. The best account of the deep-sea fishes of the Atlantic is given in *Oceanic Ichthyology* by Goode and Bean, now (1894) also in course of publication. Numerous articles on American fishes will be found in the *Proceedings of the Academy of Natural Sciences of Philadelphia*; *Proceedings of the Boston Society of Natural History*; *Boston Journal of Natural History*; *Annals of the Lyceum of Natural History, New York*; and especially in the *Reports of the United States Commissioner of Fish and Fisheries*; and in the reports and bulletins of the U. S. Fish Commission, and the *Proceedings of the United States National Museum.*

The fishes of foreign countries have received large attention. The chief recent European authorities are Günther (London), Lütken (Copenhagen), Steindachner (Vienna), Collett (Christiania), Boulenger (London), Vaillant (Paris), Vinciguerra (Rome), Doderlein (Palermo), Giglioli (Florence), Emery (Bologna), Herzenstein (St. Petersburg), and Hilgendorf (Berlin). Day and Alcock have made local studies of the fishes of India; Bleeker (Leyden), the most voluminous writer in ichthyology, most elaborate studies of the fishes of the East Indies; Poey of the fishes of Cuba; and Hector, Hutton, and others, of the fishes of the Australian seas.

The fossil fishes have been chiefly studied by Agassiz, Pander, Egerton, Hugh Miller, Huxley, Hasse, and Kner, and those of the U. S. have been well illustrated and received much attention from Dr. Newberry. See Vertebrates, Fossil.

Revised by David S. Jordan.

Ichthyoph'agi [in Gr. Ἰχθυοφάγοι, fish-eaters]: a name applied by the Greeks to various peoples of the far East who lived on the seacoast (e. g. on the shores of the Persian Gulf), and obtained their subsistence from the sea.

J. R. S. S.

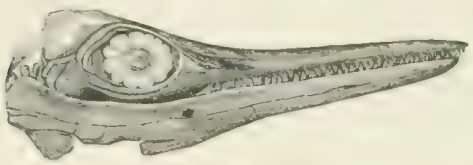
* DeKay (James E.), *Zoology of New York, or the New York Fauna*, part iv., *Fishes* (Albany, 1842. [illegible] described and mostly figured as New York fishes. Storer, [illegible] Humphreys), *A History of the Fishes of Massachusetts* (Cambridge and Boston, 1867; reprinted from: Memoirs of the American Academy of Arts and Sciences, 1853–67, 4to; 133 species figured on [illegible] plates). Gill (Theodore), *Catalogue of the Fishes of the East Coast of North America* (Washington, 1873, 8vo, published by the Smithsonian Institution; 451 species enumerated.

† *Bulletin 16*, U. S. National Museum.

Ichthyop'sida [Mod. Lat., from Gr. *ἰχθύς*, fish + *ὄψις*, appearance + *εἶδος*, form]: a division of vertebrates introduced by Huxley to include the various forms commonly known as fishes and the Batrachia, the chief feature of union being the possession of functional gills, either throughout life or in the larval stages.

Ichthyor'nis [Mod. Lat.; Gr. *ἰχθύς*, fish + *ὄρνις*, bird]: an extinct genus of birds described by Prof. Marsh from the Cretaceous of Kansas. They possessed teeth and biconcave vertebræ, from which fish-like character the name is derived. See ODONTORNITHES.

Ichthyosau'rus [Mod. Lat.; Gr. *ἰχθύς*, fish + *σαῦρος*, lizard]: a genus of extinct gigantic marine reptiles having some fish-like characters, whence the scientific name. In general form these reptiles were elongate, with the head set immediately upon the body, without any constriction at the neck. They had four fin-like paddles, and the tail was flattened, and expanded toward the end into a powerful vertical tail-fin, as in the fishes. There was also a dorsal fin. The skull of the ichthyosaurus is elongated and tapering at



Ichthyosaurus (head).

the snout, which, in the upper jaw, is formed principally by the much-enlarged premaxillaries. The rami of the mandible are also united in an elongated symphysis, as in the modern gavial. The teeth are simple, conical, of nearly equal size, and in an uninterrupted series. Their surface is marked by longitudinal impressions and ridges, varying in the different species. They are inserted loosely in a long and deep continuous furrow, and were retained by slight ridges extending, between the teeth, along the sides and bottom of the furrow, and by the gum and the organized membranes continued into the groove and upon the base of the teeth. The nostrils are small and near the orbits, which are large and evidently inclosed highly developed eyes. There is often found in front of the orbit in fossil skulls a circular series of petrified thin bony plates ranged round a circular aperture. Such a series of sclerotic plates is now found only in the eyes of turtles, lizards, and birds, showing, writes Dr. Buckland, "that the enormous eye of which they formed the front was an optical instrument of varied and prodigious power, enabling the ichthyosaurus to descry its prey at great or little distances, in the obscurity of night or in the depths of the sea." There are in the skull large supratemporal fossæ, and the infratemporal fossæ are closed over by plates of bone. The centra of the vertebræ are short flattened disks and deeply biconcave, resembling those of fishes. The only transverse processes they possess are tubercles developed from the sides of these centra. The neural arches are forked bones, connected only by cartilage, with two flat surfaces, one on each side of the middle line of the upper surfaces of the centra; and in the greater part of the body they are not articulated with one another. The cervical and dorsal series of vertebræ are not separated by any marked characters; and there is no sacrum, but the caudal vertebræ are distinguished by the chevron bones which are attached to their under surfaces. The anterior ribs have a capitular and tubercular articulation. The scapula is narrow. The coracoids are broad, and meet on the median line below. The clavicles are stout, curved, and united with a T-shaped interclavicle. The humerus is short and prismatic, and distally supports two bones representing the radius and ulna. Six or seven bones in the two following series are reckoned as carpals, and the next series are metacarpals. They are followed by not more than three to five complete series of polygonal bones, representing as many digits, which, however, sometimes fork, and there are in addition marginal series of bones upon each side of the paddle. This construction, which is peculiar to the ichthyosauri, is repeated in the hind paddles, but they are much smaller. The pelvis consisted of the ordinary three bones on each side, but was not connected with the vertebral column. The ischium, as well as the pubis, met its fellow on the median line. The body seems to have been covered with a smooth or finely wrinkled skin, and destitute of scales. These animals sometimes attained a length of more than 30 feet, and were predaceous in their habits, as is witnessed by the scales and bones of contemporary fishes sometimes found under the ribs of these fossils. Some of the species appear to have been viviparous. Ichthyosauri may have existed in the Triassic seas, but their remains have not been certainly identified earlier than the Lias, and the latest species occur in the Chalk. The genus *Ichthyosaurus* has not been found in North America, but an allied form, *Baptanodon*, occurs in the Jurassic of Wyoming. It is without teeth, and had six digits in each paddle. One species of *Ichthyosaurus* has been reported from South America. O. C. MARSH.

Ichthyo'sis [from Gr. *ἰχθύς*, fish + Mod. Lat. suffix *-osis*, used to form names of diseases]: a disease of human beings characterized by the presence of scaly growths in or upon the integument. Three distinct diseases have been called by this name: (1) Intra-uterine ichthyosis, in which the *vernix caseosa*, or glutinous secretion of the skin of the fœtus, becomes hardened into a horny armor, crippling the development of the child and leading to its death. (2) True ichthyosis is a hypertrophy of the papillary layer of the skin and of the epidermis. The patient is covered, as to a great part of the body and limbs, with unsightly scales of forms varying in different patients. This disease is thus far quite incurable, but by glycerin and similar emollients considerable improvement may be produced and maintained. It is generally hereditary, but is not always so. Ichthyosis has been known to cover the skin of the knee after recovery from severe destructive disease of the joint. Frequent bathing and anointing are useful, but never curative. (3) The so-called sebaceous ichthyosis depends on excessive functional activity of the sebaceous glands, the secretion of which rapidly hardens into scales. This disease is often caused by some reflex disturbance, and is curable as a rule.

Revised by WILLIAM PEPPER.

Icó, ĕē-kō': a town in the southern part of the state of Ceará, Brazil (see map of South America, ref. 4–H); in a valley at the foot of a portion of the Brazilian plateau called the Serra da Camara. The small river Salgado, an affluent of the Jaguaribe, passes through this valley, but the Salgado and the Jaguaribe dry up during the rainless months (May to October) and water is then obtained by sinking pits in their beds; during this dry season the surrounding country is almost devoid of foliage, resembling a desert; but during the rains it is green and very beautiful, producing excellent crops of rice, cotton, and manioc; the cultivation of these and cattle-raising are the chief industries. The trade is mainly with Aracaty. Icó suffered greatly in the extended drought of 1877–80. Pop. about 5,000.

HERBERT H. SMITH.

Ico'nium (now *Konieh*): an important place in the time of the apostles (Acts xiii. 51); situated in Asia Minor, on the highway between Western Asia Minor and Syria. An oasis in a desert, it was called the Damascus of Lycaonia. From 1099 to 1293 it was the capital of the Seldjouk empire of Roum. Captured by Frederick Barbarossa in 1189, it was recovered by the Seldjouk Turks in 1190. The city is surrounded by walls nearly 3 miles in length, strengthened by 108 strong towers, and formerly defended by a ditch. The suburbs are extensive and populous. It contains the tomb of Hazret Mevlaneh, founder of the Mevlevi dervishes, whose successor outranks all the other dervishes of the Ottoman empire, and has the privilege of conferring investiture upon each new sultan, and girding on him the sword of Osman. Pop. 40,795. Revised by EDWIN A. GROSVENOR.

Icon'oclast [from Mediæv. and Mod. Gr. *εἰκονοκλάστης*; *εἰκών*, image + *κλάειν*, break]: a name given in the eighth century to the destroyers of images, distinguishing them from *iconolaters*, image-worshipers. It should be remarked that in the Church of the first eight centuries, as in the Eastern Church of to-day, an "image" was a colored representation on a plane surface or a mosaic. In the modern Roman Church it may be and generally is a statue. The subject is Christ, the Virgin Mary, an angel, or saint. The excessive and ever-increasing reverence paid to images in the Christian Church had already been reproved by some of its most enlightened members, but the great iconoclastic conflict was begun A. D. 726 by Leo III., the Isaurian, who had ascended the throne of Byzantium in 716. His opponents accused him of listening to Jewish and Mohammedan advisers, especially to the renegade Beser; and it may be that a contemplation of the simpler Mohammedan worship led him to condemn the semi-pagan Christianity of his sub-

jects. His first edict (726) forbade the adoration of images, and ordered that such pictures as were movable should be hung higher, so as no longer to receive kisses and other marks of devotion. Authors disagree as to the chronology of these events, but according to Theophanes and later Byzantine historians, Pope Gregory II., upon Leo's publication of his edict, wrote to him demanding its revocation. In 730 Leo held a synod at Constantinople, at which he commanded the destruction of images in churches, imposing severe penalties on those persons who should persist in worshiping them; he also deposed the aged patriarch Germanus, who disapproved of his measures, and put Anastasius in his place. This second edict excited the iconolaters, among whom were nearly all the clergy, to open revolt. An officer who, by Leo's order, attempted to destroy a miracle-working image of Christ at Constantinople was beaten to death by the populace. The islanders of the Archipelago proclaimed a new emperor, one Cosmas, and sailed against Constantinople; the rebels were discomfited by the Greek fire, and Cosmas was made prisoner and executed. In 731 Gregory II. was succeeded by Gregory III., also an enemy to iconoclasm. This pope and Leo the Isaurian both died in 741. The emperor was succeeded by his son, Constantine V. (Copronymus), who, having defeated the usurper Artavasdes, continued the opposition to images. In 754 he convoked a council at Constantinople, called by the Greeks the seventh general council, but never recognized by the Roman Church. It was composed of 338 Oriental bishops, who prohibited all images, and anathematized those persons who should set up any, either in a church or private house. They also cursed by name the principal champions of image-worship—Germanus (who had not long survived his deposition), George of Cyprus, and the learned John of Damascus. The monks now took refuge in their cloisters or in deserts, whence many of them were dragged to prison, torture, and even death. The patriarch Constantine, successor of Anastasius, being accused of disrespect to the emperor, was publicly degraded and beheaded. Constantine Copronymus died of fever in 775. His son and successor, Leo IV. (Chazarus), though in weak health and of a mild disposition, enforced the laws against iconolatry. After Leo's death (A. D. 780) his wife, Irene, who was devoted to images, became guardian of her young son, Constantine VI., and immediately proclaimed liberty of conscience. She promoted her secretary, Tarasius, a layman, to the patriarchate, made friends with the pope, Adrian, and called a council, first in 786 at Constantinople, but the soldiers, being iconoclasts, effectually prevented its assembling in the city, and so it met in the following year at Nicæa. It was attended by about 308 bishops, who set aside the decrees of the Council of Constantinople (754), anathematized the persons who had composed it, restored the worship of images, solemnly cursed all iconoclasts, and ordered that all books against images should be destroyed. The churches of France, Germany, England, and Spain took a middle course between the destruction and the adoration of images, which they regarded simply as useful memorials of faith and history. A book of controversy was composed and published in the name of Charlemagne, who assembled a council of 300 bishops at Frankfort (794). This assembly, while blaming iconoclasts, pronounced a more severe censure against the Council of Nicæa. In the Eastern Church the decrees of the Nicene Council remained in force until 813, when Leo V., the Armenian, an enemy to images, became emperor, and treated the iconolaters with great severity. Among those who suffered for their doctrines was the historian Theophanes. In 815 Leo V. convened a synod in Constantinople, which condemned the council of 787. Leo was murdered in 820, and was succeeded on the throne by Michael the Stammerer, who restored image-worship and recalled the monks banished by his predecessor. Michael's son, Theophilus, became emperor in 829, and opposed image-worship, which after his death in 842 was again established by his widow, Theodora, who governed the empire for her young son, Michael, afterward called The Drunkard, and instituted a festival, still kept in the Greek Church on the first Sunday in Lent, to celebrate this final triumph over iconoclasm, and this she did notwithstanding an oath she had taken from her dying husband that she would not sanction image-worship.

However much we may condemn the use of images, we must allow that their overthrow by Leo and his successors was a mistake. It was a violent change, but not a reformation; a rooting up, unfollowed by any planting. Pictures and statues, sacred books for those who could read no others, were destroyed, and nothing better was given to replace them. The very fact that they frequently were not regarded simply as emblems, but adored for their own sakes, made the unwisdom of their destruction so much the greater. Ignorant and superstitious persons would probably have cared little to defend mere symbols, but they clung obstinately to mosaics and paintings which were to them as present gods. The images worked miracles of healing, wept tears, and shed blood—in short, lived, so believed their worshipers, as truly as the invisible Christ and his saints in heaven. When Leo's edicts against images were followed by rebellion, the hatred of the iconoclasts was extended to those who adored them. The persecution of iconolaters became particularly violent under Constantine Copronymus, of whose barbarities the Byzantine historians give many terrible examples, but the stories are to be received with some suspicion. The governors of provinces were Constantine's willing agents, the most zealous being Michael Lachanodraco, prefect of Thrace, in which prefecture there was soon left hardly one man bold enough to wear the monkish dress. Andrew and Stephen were the two chief martyrs of this reign. The former, having reproached the emperor for his persecutions, was scourged to death. Stephen, an eloquent preacher against iconoclasm, was killed after a long imprisonment. The patriarch Constantine, though an iconoclast, was accused of conspiracy and of using disrespectful words against the emperor. Having been deposed from the patriarchate and forced to acknowledge a eunuch as his successor, he was banished from Constantinople; but the emperor, not content with this much vengeance, had him brought back to be scourged, exposed to the derision of the populace, and finally beheaded.

The term iconoclast has in modern times been used to designate those Reformers who, through excess of zeal, destroyed statues, painted windows, and other works of art in Roman Catholic churches.

Revised by S. M. Jackson.

Icti'nus: a contemporary of Pericles, and most famous architect of his day. He built, in connection with Callicrates, the Parthenon in the Acropolis of Athens, which was finished in 438 B. C.; also, in 431, the temple of Apollo Epicurius, near Phigalia in Arcadia, and the building at Eleusis in which the mysteries were celebrated, and which was destroyed by Alaric 396 A. D. All these were of the Doric order, and by a strange chance remains of all of them have come down to this day. Revised by J. R. S. Sterrett.

Ictus [Lat. *ictus*, deriv. of *i'cere*, *ictus*, hit, strike]: rhythmical stress, the relatively stronger push of breath upon the thesis of the metrical foot, by which the grouping of syllables characteristic of rhythm is brought to attention. In the quantitative verse of, e. g., the Greek and Latin poetry, rhythm consists in the systematic distribution or division of the *time* of the verse, and here the ictus (Greek *σημασία*) serves to mark this distribution, and is independent of the so-called word-accent of ordinary spoken language. This absence of conflict between ictus and accent in Greek verse of the classical age is commonly accounted for by the assumption that the Greek accent was mainly a matter of pitch, i. e. a musical accent, but it is more likely due in large measure to the fact that poetry was originally adapted solely to rendering in singing voice. In modern poetry which is written to be read the ictus coincides with the word-accent or stress-accent of ordinary speech. Benj. Ide Wheeler.

I'da [Lat. = Gr. *ἡ Ἴδη*], now *Kaz-Dagh*: a mountain in Asia Minor; at the head of the Gulf of Edremid; traverses the ancient Phrygia and Mysia. From it flow the Granicus, the Simois, the Scamander, and other streams whose names are historic. Its highest point, Mt. Gargarus, 5,748 feet, dominated the plains of Troy. (See Gargarus.)—Another Ida (now called Psiloriti), equally famous in song and story, is in the island of Crete. It terminates in three peaks, and rises to the height of 7,674 feet. Still another Ida is that of the "gold-fields of Mt. Ida" in Otago, South Isle, New Zealand, about 70 miles N. of Dunedin. The gold-fields were to the S. W. Revised by M. W. Harrington.

Ida'cius, or **Ida'tius**: ecclesiastic; b. at Lemica, in Galicia, Spain, in the latter part of the fourth century. He was appointed bishop of his native city about 427, but was deposed by the invading Suevi in 461, and died after 469. He wrote a *Chronicum*, arranged according to the succession of emperors, and embracing the period from 379 A. D. (at which point Hieronymus breaks off) to 469. It gives a

brief account of events besides the enumeration of names and dates, and is considered as a valuable repertory of facts. It was first published complete in Paris, 1619, by Sirmond. See *Historia chronicon* illustr. a I. M. Garzon, ed. P. F. X. de Ram (Brussels, 1845). Revised by M. WARREN.

Ida Grove: town; capital of Ida co., Ia. (for location of county, see map of Iowa, ref. 4–D); on the Maple river and the Chi. and N. W. Railway; 80 miles E. by S. of Sioux City. It comprises two parts, the old or north, founded in 1869, and the new or south, founded in 1877, when the railway was constructed through it. The town is in an agricultural and stock-raising region, contains 7 churches, 2 public-schools, and a monthly and 3 weekly periodicals, and has 2 flour-mills and a corn-planter factory. Pop. (1880) 759; (1890) 1,563; (1895) 1,720.

EDITOR OF "IDA COUNTY PIONEER."

Idaho: one of the U. S. of North America (Western group); name of Indian derivation, meaning "gem of the mountains."

Situation and Area.—It is situated almost wholly in the upper Columbia river basin, between 42° and 49° N. lat. and 111 and 117 W. lon.; bounded N. by British Columbia and Montana, E. by Montana and Wyoming, S. by Utah and Nevada, W. by Oregon and Washington; extreme length from N. to S. about 442 miles; mean breadth about 257 miles; area, 84,800 sq. miles (54,272,000 acres).

Seal of Idaho.

Topography.—Idaho is for the most part a mountainous country. The Bitter Root Mountains form at the northeast line of Idaho the divide between it and Montana, and extend over the whole country to the Sierra Nevada with a succession of spurs running nearly due W. The Salmon range follows the course of the Salmon river and its affluents. The summits of this range, rising to a height of from 8,000 to 10,000 feet, are rugged and snow-capped. The town of Florence, in Florence basin, 2,000 feet below the summit of Florence Mountain, is 11,100 feet above the sea. Toward the S. E., along a part of the Snake river, is a somewhat elevated plateau, constituting a broad and tolerably fertile tract of arable soil. S. of the Snake river valley extend the Bear River Mountains, the Goose Creek Mountains, and other ranges. With the exception of Bear river, in the extreme S. E., the entire drainage of the State is into the Columbia river. It has Clark's or North Fork of Columbia and its affluents, the Pend d'Oreille Lake and its tributary streams, the Spokane river, with Cœur d'Alène Lake and its affluents, and, as the principal river of the State, which has a course of about 850 miles within it, the Lewis Fork or Snake river, which with its branches, the Clearwater and the Salmon, with their numerous affluents, drains nearly 70,000 sq. miles of the State. The only other river of any size in the State is Bear river, which drains the southeast corner and is tributary to Great Salt Lake. The principal lakes besides Pend d'Oreille, Cœur d'Alène, Tessentines, Bear, and Henry's Lakes, are the Payette lakes in Idaho County and several lakes in Alturas and Boisé Counties. Between lons. 112° 50′ and 114° 45′ the Snake river forms three remarkable cataracts—Salmon Falls, Shoshone Falls, and American Falls. There are numerous waterfalls of great height. In southeastern Idaho there are a number of sinks or tracts where the roofs of deep caves have broken through, and considerable streams suddenly sink below the surface and become subterranean. The region is volcanic, and noted for its geysers, steam springs, soda springs, and natural hot baths.

The mean elevation of the State is about 4,700 feet. The soil consists largely of shifting sand, and consequently whatever the rainfall the surface is sterile, except where it is furnished with water by irrigation. Large portions of the State have been the scenes of comparatively recent volcanic action, and these regions are considered valueless for purposes of agriculture. The snow falls to great depth in the mountains, and in the spring furnishes abundant water for irrigation and hydraulic mining.

Soil and Productions.—The mountains of the State are for the most part covered with forests up nearly to the snow-line, and the forests are largely evergreen. There are large tracts of red cedar in Kootenai and Shoshone Counties on the foothills and mountain slopes. In the more southern counties there are many deciduous trees, and in some districts vast sage-plains, the white sage being preferred by cattle to any of the grasses. There are 16,000,000 acres of sage lands. These are adapted to agriculture, but require irrigation. In 1890 740,350 acres were supplied with water. The most fertile tracts are in the valley of the Snake river. The best grazing lands are those along the foot-hills of the mountains. It is estimated that 15,000,000 acres are agricultural lands, of which 4,000,000 may be irrigated. The irrigating canals in operation in 1893 cost about $2,000,000. The Snake river and its tributaries furnish an abundant supply of water. The river valleys are very fertile, and, though some of them require irrigation, they yield large crops. Agriculturally, Idaho is, with the exception of these valleys, better adapted to grazing than to the culture of cereals. The ordinary garden vegetables, as well as potatoes, do well in the valleys, and fruit-trees generally yield fruit in great abundance and of fine flavor. There are native grapes of the *Vitis labrusca* or fox-grape species, which ripen in the valleys.

The following table shows the acreage, yield, and value of the principal crops in 1893:

CROPS.	Acreage.	Yield.	Value.
Corn	1,628	31,746 bush.	$22,540
Wheat	78,490	1,514,857 "	908,914
Oats	22,171	733,860 "	300,883
Barley	10,297	308,910 "	163,722
Potatoes	3,812	583,236 "	326,612
Hay	211,561	518,324 tons	2,850,782
Totals	327,959		$4,573,453

In 1893 the farm animals comprised 192,917 horses, value $6,945,012; 1,053 mules, value $42,120; 30,419 milch cows, value $760,475; 417,424 oxen and other cattle, value $6,470,072; 764,262 sheep, value $1,910,655; and 57,015 swine, value $427,613; total value, $16,555,957.

Climate.—W. of the Rocky Mountains there is but a moderate amount of either snow or rainfall, and the climate is much milder than E. of those mountains. The annual range of the thermometer in Northern Idaho, in the river and lake valleys, is between 5° and 93° F., though in exceptional seasons it may surpass either boundary by two or three degrees.

Divisions.—For administrative purposes the State is divided into twenty-one counties, as follows:

COUNTIES AND COUNTY-TOWNS, WITH POPULATION.

COUNTIES.	*Ref.	Pop. 1890	Pop. 1880.	COUNTY-TOWNS.	Pop. 1890.
Ada	9–A	4,674	8,368	Boisé	2,311
Bannock†	10–E	.....	....	Pocatello	.....
Bear Lake	11–F	3,235	6,057	Paris	893
Bingham	9–E		13,575	Blackfoot	.....
Blaine	9–C	1,693	2,629	Hailey	.....
Boisé	8–B	3,214	3,342	Idaho City	.....
Canyon†	9–A	.....	.....	Caldwell	779
Cassia	11–C	1,312	3,143	Albion	179
Custer	8–C		2,176	Challis	356
Elmore	9–B	....	1,870	Mountain Home	233
Fremont†	8–E		.....	St. Anthony	.....
Idaho	7–B	2,031	2,955	Mt. Idaho	190
Kootenai	3–A	518	4,108	Rathdrum	218
Latah	5–A	.....	9,173	Moscow	....
Lemhi	7–D	2,230	1,915	Salmon	...
Lincoln	10–C	.....	4,169	Shoshone	958
Nez Percés	6–A	3,965	2,847	Lewiston	849
Oneida	11–E	6,964	6,819	Malad City	.....
Owyhee	11–B	1,426	2,021	Silver City	433
Shoshone	5–B	469	5,382	Murray	.....
Washington	8–A	879	3,836	Weiser	901
Totals		32,610	84,385		

* Reference for location of counties, see map of Idaho.
† These counties were organized after the 1890 census.

Principal Cities and Towns.—Boisé (capital), 2,311; Montpelier, 1,174; Weiser, 901; Paris, 893; Bellevue, 892; Wallace, 878; Lewiston, 849; Caldwell, 779; Grangeville, 540; Silver City, 433.

IDAHO
DOMINION OF CANADA
Scale of Miles
0 5 10 30 40 80
County Towns
Railroads
WASHINGTON
OREGON
NEVADA
UTAH
WYOMING
MONTANA
Kaniksu
Kootenai
Boundary
Bonner
Shoshone
Latah
Moscow
Nez Perces
Lewis
Clearwater
Idaho
Valley
Adams
Washington
Canyon
Boise
Ada
Boise City
Elmore
Owyhee
Gem
Payette
Blaine
Lincoln
Cassia
Oneida
Power
Bingham
Bannock
Caribou
Bear Lake
Franklin
Fremont
Madison
Teton
Clearwater Mts.
Bitter Root Mts.
Rocky Mts.
Salmon River Mts.
Snake River
Clearwater R.
Kootenai R.
Pend d'Oreille L.
Flathead L.
Coeur d'Alene
Moscow
Lewiston
Boise City
Idaho City
Hailey
Ketchum
Sun Valley
Twin Falls
Pocatello
Idaho Falls
Blackfoot
Soda Springs
Preston
Montpelier
Paris
St. Anthony
Rexburg
Helena
Deer Lodge City
Boulder Valley
Butte City
Bozeman
Virginia City
Dillon
Great Falls
Challis
Salmon
Leesburg
Ft. Lemhi
Lemhi Agency
Nicholia
Beaver
Market Lake
Howe
Arco
Era
Holston
Atlanta
Rocky Bar
Bullion
Broadford
Bellevue
Corral
Dunphian
Soldier
Toponis
Kimama
Omaui
Muldoka
Wapi
Paynes
Clark's
Rock Creek
Albion
Malta
Oakley
Basin
Almo
Kelso
Sublett
St. John
Swan L.
Samaria
Malad City
Clarkston
Cache Valley
Bear L.
Longitude 115 West 114 from 113 Greenwich

Population and Races.—In 1870, 14,999; 1880, 32,610; 1890, 84,385 (white, 82,018; colored, 201; native, 66,929; foreign, 17,456; male, 51,290; female, 33,095; Chinese, 2,007; civilized Indians, 159).

Industries and Business Interests.—Gold and silver ores are found abundantly in Idaho. There are mines of gold and silver at the sources of all the rivers and in every county of the State. In Kootenai County there are extensive leads in the quartz veins and many quartz-mills have been erected. The lead from the argentiferous galena is so pure as to be worth saving for its own sake. There are extensive deposits of coal and iron at various points in the State; quarries of valuable building-stone could be opened at small expense; and the volcanic region of Southeastern Idaho yields sulphur, soda, magnesia, carbonates, and sulphate of lime, very pure salt, and other valuable minerals and alkalies.

The development of mining industries, though begun as early as 1860, did not progress rapidly until the opening of the Union Pacific Railway in 1869. In 1883 the Northern Pacific gave a still further impulse to mining industries. The most rapid development was in the Cœur d'Alêne Mountains, in the extreme northern part of the State. The total production of gold, silver, and lead since 1860 has exceeded $175,000,000. Gold, silver, and lead mines are now worked in Kootenai, Idaho, Custer, Lemhi, Logan, and Alturas Counties, and many other districts known to be rich in mining possibilities only await easier accessibility. On the Salmon river and its branches important placer mines have been developed in Lemhi County. According to the census of 1890 Idaho is third in rank of the lead-producing States. A mining expert of the U. S. Treasury sent to examine the resources of the State in 1891 reported the annual production as—lead, $6,400,000; silver, $7,564,000; gold, $3,204,000. An assay office of the U. S. is established at Boisé City, the capital.

Finance.—The assessed valuation of all taxable property in 1892 was $31,181,945; the amount raised by taxation for State purposes was $235,421; and the tax-rate was $7.55 per $1,000. The bonded debt was $251,000, floating debt $137,225—total, $388,225.

Banking.—In 1892 there were eleven national banks, with $700,000 capital, $380,694 surplus and profits, and $2,050,635 in individual deposits. The State constitution makes no special provisions for savings or other State banks.

Post-offices and Periodicals.—On Jan. 1, 1894, there were 304 post-offices, of which 2 were second-class, 9 third-class, 11 presidential, 293 fourth-class, and 77 money-order offices. There were 5 daily, 2 semi-weekly, 47 weekly, 1 semi-monthly, and 3 monthly periodicals—total, 58.

Means of Communication.—The railway development of the State has been as follows, in miles: 1880, 206; 1890, 946; 1893, 1,073·29. The Northern Pacific and the Great Northern lines extend across the northern part, and the Union Pacific through the southern part.

Churches.—The census of 1890 gave the following statistics of the principal religious bodies:

DENOMINATIONS.	Organizations.	Church buildings and Halls.	Members.	Value of church property.
Church of Jesus Christ of Latter-day Saints	62	68	14,805	$45,560
Roman Catholic	52	54	4,809	70,050
Methodist Episcopal	31	37	941	69,200
Presb. in the U. S. of America	19	17	815	40,950
Baptist	20	20	656	26,100

Schools.—On the organization of the State government, 5,957 acres of unoccupied land were set apart for the support of a State university, and 40,899 acres for the support of public schools. In 1893 sales of university land had already yielded $17,970, and of public school land $570,398. A State university is in operation in Moscow, there are several agricultural experiment stations, and the children of public school age number 27,740.

Charitable, Reformatory, and Penal Institutions.—These comprise a State insane asylum in Blackfoot, and a State penitentiary in Boisé City. The Legislature makes provision for the education of the deaf, dumb, and blind children of the State in Colorado, until they can be cared for in home institutions.

History.—With the exception of the bold explorers Lewis and Clark, who early in the nineteenth century followed up nearly to their sources the two forks of the Columbia, Clark's and Lewis's Forks, which traverse this State, the only white men who had trodden its soil previous to 1850 were trappers and hunters. In 1852 gold was discovered in the extreme northern part, but it attracted few miners or settlers. It formed a portion of the Territory of Oregon up to 1863. Idaho was organized as a Territory Mar. 3, 1863, and admitted as a State in 1890. When first organized it included portions of the previous Territories of Oregon, Washington, Utah, and Nebraska. In 1864 its boundaries were changed and a part set off to Montana.

GOVERNORS OF IDAHO.

Territorial.			
William H. Wallace	1863-64	Edward A. Stevenson	1885-89
Caleb Lyon	1864-66	George L. Shoup	1889-90
David W. Ballard	1866-67	*State.*	
Isaac L. Gibbs	1867-68	George L. Shoup	1890
David W. Ballard	1868-70	Norman B. Willey	1891-92
Gilman Marston	1870-71	William J. McConnell	1893-97
Thomas W. Bennett	1871-75	Frank Steunenberg	1897-
Mason Brayman	1877-78		
John P. Hoyt	1879		
Mason Brayman	1880		
John P. Neil	1880-83		
John N. Irwin	1883		
William N. Bunn	1884-85		

Revised by C. K. Adams.

Idaho Springs: town (founded in 1862); Clear Creek co., Col. (for location of county, see map of Colorado, ref. 3–D); on the Union Pac. Railroad; 14 miles E. of Georgetown, the county-seat; 37 miles W. of Denver. It is beautifully situated in Clear Creek valley in the heart of the Rocky Mountains, derives its name from numerous hot and cold mineral springs of high curative properties, and contains 5 churches, 2 public schools, several valuable mines, 3 large mills, and 2 weekly newspapers. Pop. (1880) 733; (1890) 1,338; (1893) estimated, 1,800–2,000.

Editor of "Mining Gazette."

Idas (in Gr. Ἴδας): in Greek mythology, son of Aphareus and Arene. When Apollo was wooing Marpessa, the daughter of Evenus, Idas kidnaped her. He was pursued and overtaken by Apollo at Messene, where the god and the mortal fought for the maid. So even were the honors that the fight was stopped by Zeus, who allowed Marpessa to choose between the two. She chose Idas, because she feared that Apollo would finally desert her. Idas and his brother Lynceus were first cousins of Castor and Pollux, with whom they made a plundering expedition into Arcadia. By a trick Idas became possessed of all the booty, so that a fight ensued between the cousins. First Idas killed Castor, then Pollux killed Lynceus, then Idas wounded Pollux so badly that Zeus snatched him up to Olympus and killed Idas with a thunderbolt. Idas and Lynceus were Messenian heroes who contended with the Spartan heroes. Castor and Pollux. Originally Idas and Lynceus were light-gods, as their names show, and in this character Idas was a competitor of Apollo. J. R. S. Sterrett.

Idda, or **Atta**: an African town on the left bank of the Niger, lat. 7° 6′ N., in the British Niger territory; a British mission station. Pop. about 8,000. The climate is said to be salubrious.

Iddesleigh, Earl of: See Northcote, Sir Stafford.

Ide'a [Lat. *idea* (Platonic), idea, archetype = Gr. ἰδέα, form, appearance (in the Platonic philosophy), a divine form or idea that entered into and gave reality to all individual things of its sort, deriv. of ἰδεῖν, see: Lat. *videre*, see: Eng. *wit*, know]: one of the most important terms in mental philosophy, used in modern times, especially since Descartes, to designate subjective notions and representations with or without objective validity. Plato discovered, as a result of his "dialectic," that under the constant change which goes on with individual things there is a permanent form or type of the process, which abides—somewhat after the manner of the "persistent force" or "law of nature" described in modern science. These archetypal forms or "ideas" he represented as existing prior to, and independent of, things manifest to the senses. Aristotle held to the doctrine of a pure, self-active form (εἶδος, or ἐντελέχεια), which transcends material existence, but he opposed Plato's doctrine of independent ideas. The doctrine of the existence of ideas as logical conditions of reality, and as conditions of the possibility of all the general conceptions which the mind forms, was held by Spinoza, Malebranche, and Leibnitz in a modified form. Descartes was so strongly impressed with this doctrine that he attempted to prove the existence of God from the idea of a most perfect being. In this he gave his own version of the doctrine of St.

Anselm that he had learned at the college of La Flèche—namely, that there is necessary objectivity to our idea of a whole or totality of being (*id quo majus nihil cogitare potest*). Our ideas of things, for example of an island Atlantis, do not prove their existence; but we have one idea, that of totality, that must be objectively existent—God must be if anything is. This thought of St. Anselm and Descartes is clearly the revival of the Platonic doctrine of idea as a total process or abiding whole in objective existence. The ancient philosophers investigated the question, What is true in and for itself? The moderns propose the problem of certitude, How to proceed from thought to being? Since the time of Locke it has been common usage to designate by the term "idea" all thoughts, notions, conceptions, images, perceptions, and intuitions, whether necessary or arbitrary. According to the sensational school of Locke and Hume, all ideas take their rise in sensation, and immediate sensuous impressions give the most adequate knowledge, while ideas, and especially complex ideas, are fainter and less valid copies of reality. Kant pointed out the objective validity of universal and necessary notions; they were to be regarded as expressing logical conditions of reality in time and space. But ideas proper were with him the product of the reason in its regulative activity. Hegel gave the name of idea (*Idee*) to the highest actuality—the universal form of existence considered as a totality, self-related activity, or thinking reason. This was another return to Plato's insight, or rather to that of Aristotle. Taking "idea" in the modern acceptation as the common term for all representations, it may signify—(1) sensuous ideas = images of sense formed in the lowest stage of thinking; (2) abstract ideas = general concepts formed by abstraction and generalization from experience; (3) concrete ideas = synthetical conceptions or notions formed by tracing out necessary relations and correlations dialectically, for example, the persistence of force; (4) absolute idea = the comprehension of the totality in its self-determination (i. e. of God) (what the Platonists speak of as "knowing by wholes"). Ideas are spoken of as simple or complex, necessary or contingent, absolute or relative, universal or particular, innate or adventitious, clear or obscure, adequate or inadequate, etc. See treatises on logic. W. T. Harris.

Ideal Feelings, or **Emotions**: states of sensibility which accompany the exercise of the knowing or apperceptive function of the mind. They are the special kinds of mental excitement which arise in connection with particular mental processes: thus memory yields regret, remorse, pride; imagination throws us into expectation, hope, fear, love. Such states of sensibility we call *emotions*. They are the special forms of ideal feeling, just as sensations are special forms of sensuous feeling.

Mental Excitement.—The most general predicate which we can make of these states is expressed by the term *excitement*. The word means stimulation, and as physical stimuli bring about a more or less diffused physical reaction or bodily excitement, so presentations, ideas, stimulate higher states of feeling in forms all of which exhibit the diffused property called excitement. If we picture a logical machine, with no feeling whatever, turning out syllogisms, we picture at the same time the absence of that excitement which makes the mind in its logical character different from such a machine. "Coolness" is the popular word—"calmness" is more fitting—to denote the absence of emotional excitement. The general nature of feeling, as dependent upon physical and mental processes, accounts for its extreme variability in different and in the same circumstances. If feeling arises everywhere in consciousness the present state of feeling must result from a great complexity of bodily and mental conditions. The principle of contrast gives the basis of what is known as relativity of emotion.

Emotional Expression.—As forms of excitement emotions represent conditions of intense stimulation, and find their physical basis in processes of pronounced nervous change. As excitement simply, apart from qualitative differences, emotion indicates a diffusive outgoing wave of nervous action consequent upon heightened processes in the centers of the brain. Viewed qualitatively the particular emotions are correlated to nervous discharges in particular directions and portions of the nervous apparatus, issuing in muscular contractions to a large degree differentiated and peculiar. Such muscular indications of emotion are most clearly marked in the face, though the more intense extend to the limbs, and finally take the form of massive and convulsive movements of the trunk. So familiar are we with these forms of emotional expression, and so expert have we become in reading them, both from experience and by heredity, that our responses to them are instinctive. Only the practiced observer is able to analyze the common facial indications which we all readily construe in terms of answering emotion.

A good deal of progress has been made by psychologists in assigning to the different emotions their peculiar correlatives in the muscular system. In general, each main emotion expresses itself, not by the contraction of a single muscle, but of a co-ordinated group of muscles. The smile or weeping of an infant is, at the start, a matter of very extended muscular innervation, and in adult life the entire countenance seems to take on the semblance of thought or laughter, and to support the brow or mouth in its assumption of the leading *rôle*. The general facts of the case, as respects the leading presentative emotions, are readily observed by noting others, or by simulating emotion before a mirror. The hypnotic state, especially the condition called by the Paris school catalepsy (see Hypnotism), affords a striking method of studying emotional expression.

The fundamental emotional expressions are impulsive. The child inherits the necessary vital reactions for its life and growth, and, besides these, certain muscular contractions indicative of pleasure and pain, joy and sorrow—i. e. smiling, weeping, crowing, sobbing, etc. Very early more distinct emotions grow up with corresponding ready formed reactions—fear, wonder, anger, love, jealousy, etc. It is probable, from what we know of mental growth, that the rise of these early emotions waits upon the development of their appropriate nervous basis: which means also that it waits upon the development of certain cortical centers. Such general emotional expressions are either elevating and exciting, or depressing and inhibiting.

The element of diffusion already pointed out in the nervous basis of emotion is a marked characteristic, also, of mental excitement. Strong emotions spread themselves out over the whole content of consciousness, and our thought current becomes grave, gay, elevated, depressed accordingly. Not only so, but we objectify our feeling to an extent. The external world takes on the color of our mood. This is probably due to our lack of control over strong emotion: we are unable either to banish it or to pin it down to its peculiar object. It is also especially true of the more deep-seated organic conditions which give tone to consciousness as a whole. Dyspepsia is the most notorious enemy to good spirits.

It follows, from the foregoing, that relief from emotion may be artificially courted. Indulgence in outbursts of feeling tends to allay their causes; it exhausts the nervous processes involved and induces other emotions. Knocking down a bully satisfies my feeling of vengeance more from the new emotion of justice or honor vindicated than from nervous expenditure; but both satisfactions are real. Relief by nervous expenditure follows, especially, in cases of emotion which excite to action. It is always a relief to have done something in an emotional emergency whether it be successful and wise or not. Again, there is a great class of emotions which sharing tends to relieve. Novelists make much of the smoldering *motif* in the growth of feeling. The immediate effect of sharing a personal emotion is to temper it by the sense of sympathy and social community.

Relief from sharing is, however, temporary unless assisted by other agencies. And the return of feeling is more intense from the sense of social support. Apart from its immediate effects, which are largely nervous, sharing deepens emotion by fixing the ideal causes in the attention, expanding the reasons for feeling fully in consciousness, and giving additional associations to keep it constantly in mind. Mourning garments, cards, etc., undoubtedly keep grief alive. We often have emotions because we feel that it is expected of us. Yet often one of the old associations that has long seemed the dried channel of a forgotten joy or grief empties upon us an overwhelming flood of sweet or bitter memories. Such experiences we call revulsions of feeling, and they sometimes give a new turn to the permanent current of the affective life.

Theories of Emotion.—Three general views are held as to the nature of emotional excitement: *Intellectual* theories hold that all feeling is ideal feeling, taking its rise from the relation of ideas to one another as opposing or re-enforcing. This theory fails confessedly to account for sensuous feeling. *Physiological* theories make all feeling sensuous feeling in

compounds of varying degrees of complexity. Emotion is a higher form of organic pleasure and pain, a biological function. This theory fails to account for higher emotion, or, indeed, for feeling-qualities generally. It involves a doctrine of unity of composition throughout the entire affective life. *Original* theories are opposed to these in holding, in some form, that feeling-qualities are original subjective facts.

Kinds of Emotion.—Upon examination states of ideal sensibility fall into two classes, which may be called respectively emotions of *activity* and emotions of *content*—i. e. first, feelings of the operation of the intellectual function without reference to what it operates upon; and second, feelings excited by the particular object upon which the intellect operates.

All intellectual processes happen in the attention; hence the great class of emotions of activity cluster round the different phases of the attentive life. These emotions again fall into two classes, which we may call feelings of degree of *adjustment* and feelings of *function*, or activity proper.

Emotions of Adjustment.—It is an easy matter to get these feelings experimentally. Attention to successive stimuli—say sounds—following one another in very rapid succession soon grows painful as a feeling of *distraction*. The attention can not adjust and readjust itself in time to bring order into its stimulations. On the contrary, when there is an even-measured flow in the appeals to which the attention is open, we have a class of feelings of *abstraction*. Again, a stimulus may be so slight, vague, dim as to lead to violent concentration upon it, giving feelings of *contraction*; and again, we often have the consciousness of unusual breadth of view, comprehensiveness of range, *expansion*.

Emotions of Function.—Although the line of distinction is inexact, this class of emotions is conveniently separated from the foregoing. They are feelings of the apperceptive process, as far as it is felt in operation; still, however, apart from the nature of the particular object of its operation. The going out of the attention may be felt as *freshness*, *triumph*, *alertness*, etc.; or as *hesitation*, *indecision*, *anxiety*, etc. The former of these classes may be known in general as emotions of *exaltation*, and the latter as emotions of *depression*.

Emotions of Content.—We may distinguish *presentative* from *relational* emotions, and under the presentative order we find, first, a great class which refer exclusively to self, terminate on the ego—for example, pride. These we may call *self*-emotions, after analogy with the more affective kinds of sensation, which have most direct value as reflecting the subjective side of sense experience. Another class under the presentative type depend upon the relation of the object of the emotion to one's self, as fear, etc. These we may call *objective* emotions, after analogy with the knowledge element in sensation. Relational emotions, on the other hand, terminate upon objects which have certain complexities in themselves apart from their connection with the individual. The presentative emotions carry belief in the sensational or memory coefficient; the relational, in the logical coefficient. Further, under the objective emotions, we may distinguish the *expressive* from the *sympathetic*. The former indicate a reaction in consciousness outward as an expression of personal feeling; and the latter indicate a similar reaction, which is now sufficiently described by the term "sympathy." Again, feelings of relation fall into so-called *logical* and *conceptual* feelings. The divisions thus indicated may be presented to the eye in the following table:

Emotions of content	Presentative	Self		
		Objective	Expressive	
			Sympathetic	
	Relational	Logical		
		Conceptual		

Self-emotions.—Such emotions attend either an exalted estimate of one's own person or possessions, or, on the other hand, a depreciatory estimate. The former we may call emotions of *pride*, and the latter emotions of *humility*. In different individuals these emotions have habitual stimulation in very varying circumstances. One vain-glorious mortal dwells always upon his past exploits; another, on the mighty deeds he is going to perform. One humble spirit bears always in mind the weakness of his earlier or present endeavors; another lives in constant dread that an occasion will arise in which his real shortcomings will become evident. Moreover, besides the common object, of them all, self, viewed in a narrow sense, these emotions attach very broadly to anything in which one's interest is wrapped up, or for which he is in any way responsible. Without discussing the question as to whether the extent of these feelings justifies our extending the notion of self to include all the objective personal interests of the man, it is still true that his self-feelings overflow, as Hume maintained, and attach themselves to all objects with which he is closely and habitually associated. A man grows proud of his college, of his house, even of the valor of his enemies; ashamed of his associates, of the shabby dress of his grocer, of the venality of his political adversaries.

Objective Emotions.—The *objective* emotions are so called to indicate that they arise in the presence of objects; as feelings they are subjective states, but they arise as differentiated qualitative states; and this differentiation seems to depend in some way upon the relation of self to the objects which excite them respectively. But the idea of self is not necessarily present. Children show fear, anger, etc., before they have the notion of self. The object of the emotion does sustain a relation in adult conception to self, and the emotion which is purely instinctive at first thus becomes reasonable. The phrase *expressive* emotion is also used to distinguish them. They are an expression of the reaction or behavior of consciousness when given objects are presented. They represent the reactive, outgoing side of consciousness, as the affective emotions or feelings of self represent the receptive or reflective side. Looked at from this point of view, emotions rest upon impulses, and exhibit the two great directions which appear in impulse—i. e. toward or from an object as fitted to satisfy, or the contrary. Careful distinction in terminology—more careful and exact, no doubt, than the facts warrant—gives over the active, impelling factor in a state of high emotion to impulse, and reserves for emotion only the mental excitement, agitation, felt disturbance of consciousness. This, at any rate, serves to cover both aspects of the case, and gives us a terminology which may be consistently maintained.

Having in view, therefore, the direction of the impulses which the expressive emotions accompany, we may distinguish emotions of *attraction* from emotions of *repulsion*. Under the general head of attraction we may include all tendencies toward an object or individual, or satisfaction in its presence, from the slight feeling of approval to the boisterous expression of social enjoyment, or to the quieter but stronger movings of affection and love. And the progress of this emotion in degree and closeness of attachment is an interesting and typical chapter in the natural history of feeling. The repelling impulses also supply us with a group of emotions of enormous range and importance.

The second division of presentative emotions has been called *sympathetic*. The word SYMPATHY (*q. v.*) in ordinary usage signifies the emotion which is called out by the intelligence of such good or bad fortune to others as sustains no immediate connection with our own.

Representative Emotions.—Presentative pass over into representative emotions when the object is itself representative—i. e. a memory, imagination, reproduction of any kind. It is sufficient to say here that the emotion aroused by a reproduction is the same as that of the original presentation in kind. They are prevailingly, however, of much lower intensity. The time element which they involve also gives them a new coloring: the joys of memory are, in a vague way, different from the joys of the present or of the future.

Emotions of Relation.—The higher reaches of apperception in conception, judgment, and thought give rise also to characteristic emotional states. The fundamental act of attention as relating function gives most general coloring to this class of feelings, and from it they also derive their name, *relational* feelings. Three very distinct kinds of emotional experience may be distinguished: intellectual or *logical* feelings, moral or feelings of *right and wrong*, and *æsthetic* or feelings of the beautiful. The latter two may be further classed as *conceptual* feelings. They have to do with so-called ideals of the mind. See IDEALS and SENTIMENT. For authorities, see PSYCHOLOGY).

J. MARK BALDWIN.

Idealism [: Fr. *idéalisme*; Germ. *Idealismus*, from Lat. *idea'lis*, ideal, existing in idea, belonging to the world of mind or spirit, deriv. of *idea*. See IDEA]: a philosophical doctrine defined (*a*) as holding that in external perception the objects immediately known are ideas, or (*b*) as holding that the external world is a mere phenomenon manifesting a supersensuous essence which is (1) spirit, reason, or think-

ing intelligence and will, or (2) force, law, or some unconscious principle of evolution. According to the former definition, nearly all philosophers, excepting those belonging to the Scottish school, would fall in the class of idealists, thus numbering such different systems as those of Locke, Hume, Kant, Plato, Aristotle, Descartes, etc., all in one school. According to the latter definition, the theistic or spiritualistic thinkers would be classed in one division of the idealistic school, while the pantheistic thinkers (including even the modern "positivists") would belong to the other division; and opposed to these would be the nominalistic branch of materialists and the self-styled "common-sense" thinkers. It has been contended, in fact, that all philosophy must be impliedly idealistic in that it undertakes to explain immediate things—or at least the knowledge of them—and thereby presupposes a unity or ground for them upon which they depend. All dependent things are in a certain sense ideal or potential, and underlying the external multiplicity of such things there is a unity. Were there no interdependence or correlation among things, it is held that there could be no philosophy. Although Parmenides, Anaxagoras, and especially Pythagoras, are to be regarded as idealists, yet Plato is the idealist *par excellence*, and the father of that school of thinkers. His "ideas" or archetypal forms—παραδείγματα—are immaterial and eternal essences which are shadowed forth or manifested by finite realities. Finite things are "copies" of ideas, and by reason of their inadequateness as copies they are in a state of perpetual flux or transition from one phase to another, each imperfection giving place to a more correct copy, which, again, is defective in some other respect. Thus the process of finite things arises from their mutual imperfection, and from the consequent struggle to attain adequateness. Substantially identical with this is the doctrine of Aristotle, who opposes the doctrine of "ideas" as separate archetypes, and lays stress on an intelligent First Cause as the supreme principle of explanation. The Neo-Platonists were Aristotelian in the scientific form of their systems, but they betray a strong Oriental influence upon their modes of thinking. Oriental idealism is unable to reconcile the infinite with the finite, holding the former to be the unconditioned and indeterminate, consequently as impersonal and empty or devoid of all attributes. The Neo-Platonists endeavor to seize a first principle higher than intelligence or than consciousness; they seek, after the manner of Oriental idealism, an impersonal absolute unity. The idealism of Plotinus and Proclus, and especially that of Iamblichus and Synesius, strives to reach a primordial essence as the secret ineffable One above all causation, and yet the final goal of all things. Their doctrine is substantially identical with the Sánkhya doctrine in HINDU PHILOSOPHY (*q. v.*). The visible world of time and space is a creation of the soul in its "lapse" or descent from the divine world of ideas or eternal verities. Valentinian Gnosticism undertook to furnish a Neo-Platonic basis for Christianity, adding, however, a more explicit principle of mediation or means of return from the "lapse" to the highest principle. Alexander of Aphrodisias, and more especially the Arabian commentators of Aristotle, set up a pantheistic idealism, which, indeed, is the outcome of Oriental monotheism as contrasted with the Christian Trinitarianism. The ideal principle to which all individual existences in the world are subordinated, and before which they perish, is a world-soul conscious in individuals not endowed with immortality, and not possessing, of itself, personality. This is the interpretation given to Aristotle's doctrine of the soul by his commentator, Alexander of Aphrodisias. Christian philosophy, as such, is essentially idealistic, inasmuch as it has to provide a speculative basis for the doctrine of a personal Creator and for an immortal creature. Thomas Aquinas says that God "eternally knows all things as present, and through this knowledge these things themselves are caused"; but with the disputes of Nominalism and Realism arose the distinction which separates later philosophy into idealism and materialism. The "realism" of Anselm, Albertus Magnus, and Aquinas is idealism in the proper sense of the term, holding to the origin of the world from the thought of God, through his eternal ideas which make possible our cognition of things by means of general ideas, these being the subjective correlates to the eternal ideas manifested in individual things. Realism thus holds the universe to exist *ante rem* in the mind of God, *in rem* in the phenomena of the world, and *post rem* in the human mind recognizing it by the act of cognition. Nominalism, as developed by Roscellinus and Occam, looked upon general terms as arbitrary creations (*flatus vocis*) without objective reality corresponding to them. Each individual thing exists in its isolated independence, and there is no species or genus or class in nature, but only individual beings. Hence sensuous certitude is the nearest approach to truth, and abstract or general ideas are the furthest removed from it; but when the mind perceives the existence of essential relations in nature, such as it names *force*, *law*, *life*, etc., indicating dependence and interdependence among the things in the world, it finds itself obliged to recognize, perforce, the objective validity of its complex or general ideas expressing "substances, modes, and relations." Powers and forces give rise to individuals, and cause them to vanish again. While the particular individuals begin and cease, the power or force persists, and is *manifested* in the evanescence of things as much as in their origination, and thus proves itself to possess greater reality than the particular things which Nominalism supposes to be the only reality. The existence of processes which are generic in their nature and correspond to our general ideas comes to consciousness in modern natural science as the doctrine of the "persistence of force." In the first stage of idealism, accordingly, all individuality is looked upon as transitory, and an abstract unity of force is regarded as the ultimate reality which swallows up all special existences, spiritual or material. From this pantheistic idealism to spiritual idealism the transition lies in the perception that all force or essential relation is necessarily, in the last analysis, a phase of self-determination, and hence of personal being. This insight is the key to the idealism of Aristotle, Leibnitz, Aquinas, Eckhart, Hegel, and of most thinkers who have founded systems that explain human institutions. Idealism, according to Sir William Hamilton, deduces the object from the subject, while materialism deduces the subject from the object. This would exclude the numerous forms of idealism wherein both subject and object are deduced from a spiritual principle. Among distinguished modern philosophers, called idealists in accordance with one or the other of the above definitions, are to be named Berkeley and Malebranche as theological idealists; Descartes, as problematical idealist; Hume, as skeptical idealist: Kant, as transcendental idealist; Fichte, as subjective idealist; Schelling, as objective idealist; Hegel, as absolute idealist; Schopenhauer, as pessimistic or nihilistic idealist; Jacobi and Schleiermacher, as sentimental idealists; Spinoza, as substantial idealist. These and similar designations are liable to convey a false impression unless supplemented by reference to the full systems of those thinkers. See Krauth's *Berkeley* (Philadelphia, 1874). See also the several articles on the philosophers above named, and those on PHILOSOPHY and on SCHOLASTICISM. W. T. HARRIS.

Idealism, in Fine Art: See REALISM IN FINE ART.

Ideals [Fr. *idéal*, subst.; from Lat. adjec. *idea'lis*; deriv. of *i'dea* = Gr. ἰδέα, form, pattern, model; deriv. of ἰδεῖν, to see]: standards of perfection considered as the best possible goal of attainment. From the side of the mind we can best describe our consciousness of the free constructions of imagination and conception as a sense of enlargement of range, emancipation, constructive capacity; which is covered in popular language by the phrase getting or having ideals. If my imagination builds up for me something more pure and satisfying in any particular, as form, color, use, I say that result approaches more nearly to my ideal in that direction. If, again, I set myself to draw up a system of philosophy, I express my satisfaction at each turn of its development by saying it tends toward my ideal of a system; and I reverence a character more because, as I think, it more nearly embodies my ideal of a man. So in all mental construction whatever, besides the feeling of the extent of actual construction, there is a feeling of further possible construction—construction beyond what I have done, yet in the line of what I have done. IMAGINATION (*q. v.*) is the process by which ideals are produced.

What constitutes the fitness of the material of imagination? This asks what ideals are. What is art from the spectator's point of view? Evidently ideals are something felt in connection with present images; something, that is, in virtue of which peculiar feelings arise over and above the simple feelings of apprehension. In other words, conceptions of the kind produced under the lead of the constructive imagination have a peculiar quality, which leads us to pronounce them true, beautiful, or good. From the essential nature of conception we are able to reach, in a

general way, the lines within which this quality must be sought. Conception proceeds by abstraction, which is the mental tendency to pursue identities through the mazes of new experience. The gratification of this pursuit of identities arises as a feeling of pleasure whenever two elements of experience before disparate fall together in a unity or common meaning. Without such a process of identifying, with its accompanying gratification, no conception whatever can take place. One element of IDEAL FEELING (*q. v.*), therefore, must arise from abstraction, and this element may be best characterized as the feeling of "unity in a whole." But an equally important, because opposite, aspect of conception is generalization, the function whereby a concept gets application over a wider area of experience by a modification of its content. In abstraction I preserve my concept and neglect all experience which does not illustrate it; in generalization I accept my experience and modify my concept to include it. It is a mental tendency away from identity to variety, and its gratification brings another element to conceptual feeling, i. e. the feeling of "harmony of parts." The intension or depth of a concept begets a phase of feeling in response to the peculiar value of it in experience, while its extension excites only a feeling of its present accidental application. Man in intension excites in me the sympathetic and social feelings; it indicates humanity, with the living thrill of interest the word suggests; but man in extension simply means men, anybody, everybody, commonplace and uninteresting. The emotion of intension let us call the feeling for "meaning," a third essential ingredient in ideal emotion. By meaning we mean interesting quality, recognizing in the word all the springs of interest, intellectual, emotional, and volitional. Our ideals are the things of most absorbing interest to us. Further, conceptions are objective in their reference; they arise in the knowing function. Their objectivity means both that there are objective relations presented, but that these relations hold for others no less than for myself. Both these aspects may be covered by the phrase feeling of "universality," a fourth ingredient in conceptual feeling. Ideals therefore are the forms which we feel our conceptions would take if we were able to realize in them a satisfying degree of unity, harmony, significance, and universality. It follows from this that we do not have any mental picture of our ideal man, or our ideal deed; but only a groping, as it were, of emotion, out beyond the thought of the best man or the best deed that we know. For references, see PSYCHOLOGY.

J. MARK BALDWIN.

Ideas, Association, or Connection, of: See ASSOCIATION OF IDEAS.

Ideler, ee'de-ler, CHRISTIAN LUDWIG: scientist; b. at Gross-Brese, in Brandenburg, Prussia, Sept. 21, 1766. He was appointed Professor of Astronomy and Chronology at the University of Berlin in 1821. His principal works are *Handbuch der mathematischen und technischen Chronologie* (1831) and *Die Zeitrechung der Chinesen* (1839); but his earlier writings, *Historische Untersuchungen über die astronomische Beobachtungen der Alten* (1806), *Handbuch der Französischen Sprache und Litteratur* (1852), etc., were also well received. D. in Berlin, Aug. 10, 1846.

Identity [through Fr., Germ., and Mediæv. Lat., from Lat. *idem*, same]: a philosophical term used to indicate unity with persistence and continuity. By it is not meant abstract unity, but unity in plurality, in multiplicity, succession, diversity, or change. Hence it is predicable of substance, and of the quantity of force, matter, and other essential relations in nature. It is more especially predicable of life and of personality. Personal identity is attested through consciousness and memory. In consciousness there is the antithesis of subject and object, and the self is certain of the identity of itself as subject with itself as object. Identity may be regarded as existing in various degrees: 1. As the identity of the inorganic substances in nature—of the mineral, for example. Here there is supposed to be an identity in material or substance—an identity of composition, but scarcely any identity that might be called individual identity, although in the crystal this begins to be suggested. 2. In the plant, according to Aristotle, dwells the *nourishing* soul, so that there is identity of life, and even of propagation of species—identity of individual and identity of genus. There is a preservation of identity under diverse conditions and transmutations. 3. In the animal there is a still more remarkable preservation of identity, inasmuch as to the *vegetative* soul is added the *feeling* soul, and the individual animal feels his identity even in his extremities. 4. Man *thinks* his identity, and consciousness is the result. In his entire history man may be regarded as coming into identity with himself—i. e. as realizing, by education, in himself, his faculties and possibilities as mind, and as making these actual in the world in the shape of institutions and social organizations. Man's identity is personal identity, and essentially different from the identity of the plant, which grows and repeats its species in new individuals; or from the animal, which also *feels*, but can not generalize. In man the species, or the generic process, enters entire in each individual as consciousness, the universal and particular being identical with the individual—constituting subject, object, and union of the two. The doctrine of identity, as taught by Schelling (see SCHELLING), holds the absolute to be the identity of the ideal and real, or of the subjective and objective—matter and mind being the two poles of one infinite substance. The Principle of Identity in logic states in another form what the Principle of Contradiction lays down as the fundamental law of thought—namely, that a thing can not *be* and *not be* at the same time. See IMMORTALITY, LOGIC, and PERSON and PERSONALITY. W. T. HARRIS.

Ideo-motor Action: muscular movement which is prompted by an idea or memory in consciousness. Imitation is an example. It is contrasted with "sensori-motor action," which is a movement brought about in response to a sensation.

J. M. B.

Ides: See CALENDAR.

Idiocy: See INSANITY.

Idiosyn'crasy [from Gr. *ἰδιοσυγκρασία*, peculiar or own temperament; *ἴδιος*, own, private + *σύγκρασις*, a mixing together, temperament, deriv. of *συγκεραννύναι*, mix together, temper; *συν-*, together + *κεραννύναι*, mix]: a marked individual trait of any function of body or of mind which is possessed by only one or by very few persons. Idiosyncrasies frequently affect the senses. Thus certain persons are profoundly affected by certain odors, sounds, etc. So, too, unusual effects, either in the way of excessive or decreased action, may follow the administration of certain drugs. Certain bodily idiosyncrasies appear to be compatible with perfect health. Others arise from diseased conditions, and cease upon the cure of the disease. Mental idiosyncrasies may not amount to marks of insanity, and yet it is very difficult to draw a line between the two.

Revised by WILLIAM PEPPER.

Idioticon: See DICTIONARY.

I'docrase [from Gr. *εἶδος*, form, shape + *κρᾶσις*, mixture, from its resemblances to other minerals]: a mineral crystallizing in the dimetric system, and essentially a silicate of alumina and lime, with a smaller proportion of iron, and in some cases also containing magnesia, etc.; hardness, 6·5; specific gravity, 3·4. It occurs chiefly in lavas, but is also met with in gneiss, serpentine, and granular limestone.

Idolatry [M. Eng. *idolatrie*, from O. Fr. *idolatrie*, from Mediæv. Lat. *idolatri'a*, with contraction < Lat. *idololatri'a* = Gr. *εἰδωλολατρεία*: *εἴδωλον*, image, idol (deriv. of *εἶδος*, form) + *λατρεύειν*, work for hire, serve (deriv. of *λάτρις*, hired servant or laborer)]: the worship of idols, as distinguished from *iconolatry*, or the worship of images. In the former the things themselves are worshiped, whereas in the latter the images are used merely to direct the mind in worship to the Deity or saints represented. The ignorant find it difficult to distinguish between the two, and end by believing that there are sanctity and miraculous or magical virtue in the image itself. As used by theologians the term idolatry includes fetishism, or the worship of animals, trees, rivers, hills, stones, etc.; the worship of the powers of nature, the sun, moon, the stars, etc., hero and ancestor worship, as well as the worship of abstractions, such as justice, etc.

Idolatry appears to be of great antiquity. The Turanian races (i. e. the Finnic, Turkish, Tartar, and Ural-Altaic, Dravidian, and cognate tribes, including perhaps the Basque and Etruscan) worshiped the spirits of their ancestors, and represented these by little images, as did the Romans, who derived the custom from the Etrurians. As soon as the belief was established that the departed were immortal, it would occur to the survivors that their spirits might benefit them, and that this might be made sure by worship. The beginning of this *cultus* was before all history, since Boucher de Perthes found that the earliest races buried their dead in urns with offerings. The more civilized branch of humanity divided into the Indo-European and Semitic. The former appear to

have been inspired with a deeply poetical and pantheistic spirit, from which came the tendency to deify not only the principal forces in nature, but all their subdivisions, so that eventually there was a god or goddess for every separate river or kind of plant—all represented more or less by images, which were worshiped, but all members of this family have records of a primitive time when idols were unknown. Thus idols are unmentioned in the Vedic hymns, in the Homeric poems—"where an image [of a divinity] is mentioned (as in *Il.*, vi. 301), it is evident it was of the rudest description, and but little indebted to human art" (J. S. Blackie)—in the cultus of ancient Greece and Rome. The Semitic races limited their ideas, expressed in gods, to the first principles of reproductiveness and death, especially the former, whence resulted a sex-worship and obscene rites. But they found in Moses and Mohammed reformers who vigorously repressed all nature-worship and its resultant idolatry to such an extent as very strictly to forbid the making of graven images, Mohammed, with great practical shrewdness, going so far as to forbid the making of any image whatever. It is a curious fact that the literal worship of images in themselves appears to be in proportion to their monstrosity and ugliness. The Greeks made beautiful statues of their gods, but seem to have merely admired them, while they adored the ugly ones. In the Roman Catholic Church the Virgins of Raphael and of the great artists generally serve merely for *iconolatry*, but where *idolatry* is developed the object of veneration is commonly some barbarously adorned rural image or one absolutely hideous—e. g. the jet-black Virgin of Altötting. The tendency of humanity to invest material objects with magical virtues is universal. A savage who has by chance always killed his enemies or his game with a certain weapon soon believes that it possesses a peculiar virtue, and this belief readily extends to ornaments and amulets, which are supposed to bring luck. From amulets—pebbles or beads—the faith readily extends to human images, whether of ancestors or representing powers of nature. Idolaters of every country endeavor to please their divinity by sacrifices, and many punish it when their prayers are not answered. It was well on in the nineteenth century when the inhabitants of Segni, in Italy, having prayed in vain to St. Bruno for rain, took his image down, punished it with stripes, and stuck it head downward into the mud of a river. A great shower happening to fall immediately after, the people came in procession, took the image up, washed it, and reinstated it in its shrine. It is needless to say that the Roman Catholic Church does not sanction such idolatry, though it encourages iconolatry. A curious form of idolatry is the totem-worship by which a certain sacred animal is regarded as originating and protecting families and tribes of a common descent. This was to be found, e. g., among the Teutonic Wolfinge—whose names survive in Rudolf, Wolfgang, etc.—as also among North American Indians. Sir John Lubbock briefly explains this as follows: "In endeavoring to account for the worship of animals we must remember that names are very frequently taken from them. The children and followers of a man called the Bear or the Lion would make that a tribal name. Hence the animal itself would be first respected, then worshiped." Herbert Spencer regards this as the origin of fetichism, or the lowest forms of all idolatry. "He whose family tradition is that his ancestor was the crab will conceive the crab as having a disguised inner power like his own. Hence . . . multitudinous things around will acquire imaginary personalities." Idols representing forms half human, half brutal, also originate, in all probability, from this source. There is more than one royal or noble family in Europe and the East which has a tradition that it sprang from the amours of a woman with an animal, the animal having been simply a man named after one. According to Max Müller, races so rude as to have simply one word for every one idea, can not represent active powers, natural or supernatural, in any but a personal and more or less human form. This would also account for the origin of much rude idolatry. Iconolatry becomes idolatry when the image is believed to wink, bow, or display signs of life, owing to the actual presence in it of the spirit which it represents, or when it is believed to possess healing or magical power. The most extensively disseminated idols are those of Buddha and of the Chinese queen of heaven, which bears a striking resemblance to Isis. C. G. Leland.

Idom'eneus (in Gr. Ἰδομενεύς): in Greek mythology, son of Deucalion and grandson of Minos, King of Crete. He was distinguished for his great beauty and nobility of character. Having been one of the suitors of Helen, he was forced to join the expedition against Troy, where his prowess made him one of the first of the heroes. On his way back from Troy, being overtaken by a storm, he prayed to Poseidon for deliverance, vowing to him whatever should first meet him on his return home. He kept his vow, and offered up in sacrifice his own son. (See Jephthah.) For this crime a plague was sent upon Crete, Idomeneus was driven from the island, and settled first in Southern Italy, where he built a temple to Athene. Subsequently he settled in Colophon, in Asia Minor, where he died after having built a temple to Apollo. His grave was shown on the neighboring Mt. Cercaphus, as well as at Cnossus, in Crete, where, according to another myth, he died. J. R. S. Sterrett.

Idumæ'a [= Lat. = Gr. Ἰδουμαία, from Heb. *Edōm*, Edom, liter., red]: territory of Western Asia, bounded N. by Judæa, W. by the Mediterranean. At one time it comprised parts of Judæa as far N. as Hebron, and in Arabia the peninsula of Petræa. It was inhabited by the descendants of Esau, and was annexed to Judæa by David, and later by the Maccabbees. The relations between the Jews and the Idumæans (Edomites) were always hostile and full of hatred, even after the Jews had received an Idumæan dynasty in the son of Herod the Great, in whose time the Idumæans were, however, Jews in religion.

Idun (Icel. *Iðunn*): in Scandinavian mythology, is the wife of Brage (*q. v.*). Her name is derived from the root *ið*, and expresses a constant activity and renovation. She keeps in a box the apples which the gods have only to taste of to become young again when they feel old age approaching. It is in this manner that they will be kept in perfect youth until Ragnarok. According to a myth told in the *Younger Edda*, the giant Thjasse once compelled Loke to bring Idun and her apples from Asgard to Jotunheim. Loke enticed her into a forest by telling her that not far from Asgard he had found apples growing which he thought were of a much better quality than her own. There the giant Thjasse, clad in an eagle's plumage, flew toward them and catching up Idun carried her and her apples away to Jotunheim. The gods being thus deprived of their rejuvenating apples soon turned wrinkled and gray. They learned that Idun had last been seen with Loke, and so they threatened him with torture and death if he did not bring Idun and her apples back to Asgard. Loke borrowed Freyja's falcon plumage, flew in it to Jotunheim, and, finding that Thjasse was out at sea fishing, he lost no time in transforming Idun into a nut and flying off with her in his claws. When the gods saw Loke approach, and Thjasse pursuing him, with his outspread eagle wings, they placed on the walls of Asgard bundles of chips, which they set fire to the instant Loke had flown over them, and as Thjasse could not stop his flight his plumage caught fire, and he thus fell into the power of the gods, who slew him within the portals of Asgard. In physical nature Idun is spring, and Thjasse winter. See *Scandinavian Mythology*; see also Anderson's *Norse Mythology*. Rasmus B. Anderson.

Ie'si, or **Jesi**: town; on the left bank of the Esino, in the province of Ancona, Italy (see map of Italy, ref. 4–E). It is said to be of Pelasgian origin, and through the Umbrians and Gauls it passed to the Romans, who called it Æsis. Later it fell into the hands of the Franks. It was in the power of the holy see (1447–55), was a vice-prefecture under Napoleon, and in 1860 was incorporated with the kingdom of Italy. The city-walls are flanked by towers, and the place is well supplied with good water. Among public buildings are an ancient cathedral, dedicated to St. Septimius, a town-hall containing some fine pictures, and there are a seminary, a lyceum, a communal college, and a technical school. The town has important manufactures of paper, silk stockings, cloths, and soap, and carries on a large trade in wine, oil, grain, and cheese. It was the birthplace of Frederick II., under whose rule it was most prosperous. Pop. 12,118.

If'fland, August Wilhelm: actor and playwright; b. at Hanover, Germany, Apr. 19, 1759; took to the stage at Gotha in 1777; acted in Manheim in 1779, and became in 1796 director of the National theater of Berlin, where he died Sept. 22, 1814. His dramas, of which he wrote a great number, and which in their time were performed in all the theaters of Germany and Scandinavia, are narrow, sentimental, and affected pictures of the trivialities of everyday life; but they are not altogether without psychological interest and theatrical effect. As an actor he showed unusual talent.

Iglau, ee'glow: town; near the Bohemian frontier on the Iglawa, in province of Moravia, Austria; 50 miles W. N. W. of Brünn (see map of Austria-Hungary, ref. 4-E). It consists of an old but well-built town with the suburbs Frauen, Pirnitzer, and Spital, and has many interesting public buildings, including the churches of St. Jacob, St. Ignatius, St. John (founded in 799), and the Protestant church built in 1875. It has an Obergymnasium, a Landesoberrealschule, a Minoriten convent, 2 hospitals, and 3 poor-houses; carries on the manufacture of tobacco, beer, leather, pottery, and glass; has a large trade in grain, flax, wool, and cloth. Pop. (1890) 23,716.

Iglesias, ee-glā'see-as, Miguel: general and statesman; b. at Cajamarca, Peru, Aug. 18, 1822. He studied law, but devoted himself chiefly to the care of his estates. From 1861 to 1876 he was several times deputy; was senator in 1879; and after the first successes of the Chilians and the flight of President Prado, supported Pierola, who in Dec., 1879, made him his Minister of War. When the Chilians attacked Lima, Iglesias took personal command of one of the Peruvian divisions, defending the Morro Solar, Jan. 23, until compelled to surrender. Soon after he escaped and joined Caceres; but becoming convinced that the only hope for Peru lay in entire submission, he called the northern representatives together at Cajamarca, assumed the presidency, and on Oct. 20, 1883, signed a treaty of peace with the Chilians, who then evacuated the country. The treaty, which conceded everything to Chile, was ratified Mar. 8, 1884. Caceres refused to recognize Iglesias, took up arms against him, and finally captured Lima Dec. 1, 1885. Iglesias then agreed with Caceres to resign the government into the hands of an executive ministry until an election could be held; this resulted (June, 1886) in favor of Caceres, and soon after Iglesias left Peru.

Herbert H. Smith.

Ignacio, eeg-naa'see-ō, Joaquim José: Brazilian naval officer; b. at Lisbon, Portugal, July 30, 1808. When a child he went to Brazil, where he entered the navy in 1822, distinguishing himself in the war for independence, in the civil wars in Rio Grande do Sul and Pernambuco, and on the Rio de la Plata. In 1861 he was Minister of Marine. During the war with Paraguay he commanded the Brazilian flotilla, 1867 and 1868, and the most memorable exploits of the conflict are connected with his name; his brilliant passage of the Paraguay at Humaitá (Feb. 19, 1868) was particularly notable. For these services he was successively created Marquis and Viscount of Inhauma, and promoted to full admiral. Returning to Rio de Janeiro on sick-leave he died there Mar. 8, 1869. Herbert H. Smith.

Ignatieff, eeg-naa'tee-ef, Nicholas Paulovitch: general and diplomatist; b. at St. Petersburg, Jan. 29, 1832; was educated among the imperial pages, and entered the guard in 1849. Having been appointed military *attaché* at the Russian embassy in London, he attracted the emperor's attention by a report on Great Britain's military position in India, and was in 1858 sent on a special mission to Khiva and Bokhara. He was afterward (1860) appointed ambassador to Peking, where he negotiated a treaty very favorable to Russian interests, and to Constantinople (1864), where he exercised a decisive influence on the course of affairs, and promoted friendly relations between the two powers for several years, but when difficulties arose in 1876 he opposed the policy of the Porte and afterward became a strong supporter of the war policy. He was appointed Minister of the Interior soon after the accession of Alexander III., but was dismissed in 1882, though he remained a member of the council of the empire. He has since been conspicuous as a leader of the Pan-Slavic party in Russia.

Revised by F. M. Colby.

Igna'tius de Loyola: See Loyola, Ignatius de.

Ignatius's Bean, or **Bean of St. Ignatius**: the bean-like seed of *Strychnos ignatii*, a rather large shrub with curious vine-like branches growing in the Philippines, and belonging to the family *Loganiaceæ*. The seed is an inch long, half an inch thick, and has the properties of nux vomica, but more actively, for it contains a much larger percentage of strychnia. The commercial supply is irregular. The seed was named by the Jesuits in honor of Ignatius de Loyola, their founder.

Revised by Charles E. Bessey.

Ignatius, Saint: bishop and martyr. It is not known whether he was of Syrian or of Greek descent, nor whose disciple he was. Eusebius (*Hist.*, iii., 22) makes him the second Bishop of Antioch, Evodius having been the first. The *Apostolic Constitutions* (vii., 46) make Evodius and Ignatius bishops together—Evodius appointed by Peter, and Ignatius by Paul. Baronius and Natalis Alexander think they were bishops together—Evodius of the Jews, Ignatius of the Gentiles. That he was a martyr, having been condemned at Antioch, and taken to Rome to be thrown to the lions, is hardly to be doubted. The date of his martyrdom is, however, a mooted question. The earliest date is that recently given by Dressel on the authority of a new codex of the *Martyrium*, first edited by him in 1857 (2d ed. 1863), which begins: "In the fifth year of the reign of the Emperor Trajan," i. e. 102 a. d. The old *Martyrium*, which has the appearance of having been tampered with, names Dec. 20, 107. But as it is now generally admitted that Trajan did not go to the East till 114, wintering at Antioch 114-15, critical opinion is now gravitating toward 115. Perhaps we may say Dec. 20, 115. Bearing the name of Ignatius there are fifteen *Epistles*, eight of which (three in a Latin and five in a Greek recension) are now generally considered spurious. The remaining seven (*Ephesians*, *Magnesians*, *Trallians*, *Romans*, written at Smyrna; *Philadelphians*, *Smyrnæans*, *Polycarp*, written at Troas) are in two Greek recensions: (1) the longer, first published by Pacæus in 1557; (2) the shorter, first published by Archbishop Usher in 1644. Three of the seven (*Ephesians*, *Romans*, *Polycarp*) were published, with a translation, in a still shorter Syriac recension, by Cureton in 1845. Since then the Ignatian controversy has been renewed with great sharpness. The several opinions are as follows: (1) Killen thinks them all spurious, but imagines that the Syriac three were the first to be forged, in the time of Origen (185-254), soon after which they were translated into Greek, expanded, and others added, before the time of Eusebius, who had the seven. (2) Baur and Hilgenfeld think them all spurious, but are of the opinion that the seven shorter Greek epistles were the first to be forged, after 150. The Syriac three, it is contended, read like extracts. (3) Cureton, Bunsen, Ritschl, and Lipsius advocate the genuineness of the Syriac three. (4) A strong array of the ablest critics, both Protestant and Roman Catholic, such as Gieseler, Uhlhorn, Möhler, Hefele, and especially Lightfoot, may still be reckoned on the side of the shorter Greek recension. The longer Greek differ from the shorter in the greater emphasis which is put—(1) upon episcopacy; (2) the divinity of Christ. English translation of the Epistles in vol. i. of *The Ante-Nicene Fathers* (New York); for the text the best edition is by Lightfoot (London, 1885; 2d ed. 1889).

Ig'nis Fat'uus [= Mod. Lat.; liter., fool's fire; Lat. *ignis*, fire + *fa'tuus*, foolish]: a luminous meteor, appearing during summer and autumn nights on marshy land, near stagnant water, in graveyards, and other places where decomposition is going on. It is an unsteady bluish light, usually seen a few inches above the surface of the ground, sometimes stationary, but commonly moving with great rapidity. It appears brightest at a distance, and recedes from the observer as he tries to approach it; thus travelers have frequently lost their lives through being deluded by it into dangerous bogs. From its resemblance to a lighted wisp of straw or torch borne quickly along, it has received a number of names, such as Will-o'-the-Wisp, Jack (or Peg) o'-Lantern, Friar's Lantern, Kit-with-the-Canstick (i. e. candlestick), and has given rise to many popular legends. It was formerly attributed by country people to evil spirits, who found pleasure in luring human beings to destruction, but was sometimes supposed to be souls escaped from purgatory, all in flames, with the hope of inducing men to pray for their deliverance. When appearing in churchyards, the ignis fatuus is still in some places called "corpse-candle," and regarded as a presage of speedy death, generally to the person by whom it is seen. The English gypsies, to whom, owing to their out-of-door life, the ignis fatuus is a familiar spectacle, call it *mullos momelis*, or ghost-light. A light of this species, called in Buckinghamshire "the Wat," is said to haunt prisons, and when seen by a prisoner before his trial is considered an unfavorable omen. The cause of the ignis fatuus is not fully decided.

Ignoramus: See Grand Jury.

Ignoran'tia Facti: See Ignorantia Juris.

Ignorantia Ju'ris [Lat.]: ignorance of law; words forming a part of the Latin legal maxim *I*[illegible]

excusat (that is, ignorance of law does not excuse), which is properly applied only in cases where the defendant seeks to excuse either the commission of a crime or to shield himself from civil liability for a violation of another's right.

It is evident that public policy demands that no one shall be allowed to excuse the commission of a crime by pleading that he did not know that the law forbade the doing of the act in question. It is equally evident that if one has in fact violated the right of another, the fact that he was ignorant of the existence of that right would not justify the court in throwing the loss upon the injured party. In such a case justice demands that the party who has been wronged should recover compensation for the injury done. If, then, one is charged with having committed a crime, when knowledge of the law is not of the essence of the criminal act, or if one is charged with having violated a contractual or quasi-contractual right of the plaintiff, or with having committed a tort, the fact that the defendant was not conscious of doing any wrongful act is entirely immaterial, and his ignorance of law therefore affords no excuse.

The result thus reached is often justified by the statement that every one is presumed to know the law, and as this presumption, to use a contradictory expression, is a conclusive presumption, the fact of ignorance of law can never be proved. The statement of the rule that ignorance of law does not excuse, in the form of the presumption that every one is presumed to know the law, has been productive of much confusion and injustice, without any compensating advantage. Whenever a presumption reaches the irrebutable stage it ceases to be a presumption and becomes a rule of law. To say, therefore, that every one is conclusively presumed to know the law is to say that no one can in any circumstances show his ignorance of law. It would seem that there is no public policy demanding the adoption of such a rule. While many of the decisions can only be supported on the theory of the existence of such a rule, the courts have in other cases refused to recognize its existence. When it is said that ignorance of law does not excuse, the statement presupposes a case where a person is charged with a delinquency, which he seeks not to disprove, but to excuse, for the reason that the act was done in ignorance of law. The maxim *Ignorantia juris haud excusat* should not therefore be invoked where the party alleging his ignorance of law is seeking not to justify a wrong but to establish a right. If, however, it can be correctly said that for any and all purposes every one is conclusively presumed to know the law, then ignorance of law can never be shown, even though the party alleging his ignorance of law is confessedly not a wrongdoer, but a claimant simply.

If there is a presumption that every one is presumed to know the law, one would expect to find it applied in criminal law. Such in fact is not the case. When ignorance of law can not be shown by one charged with the commission of a crime, proof of his ignorance is excluded, not because of the conclusive presumption that he knows the law, but for the reason that as a knowledge of the law is not essential to the commission of the crime his ignorance of the law is immaterial.

Whenever knowledge of the law is material as bearing on the question of whether a crime has in fact been committed, the defendant is allowed to plead his ignorance of law, not for the purpose of excusing the commission of the crime, but in order to show that no crime has been committed. Thus while one who is charged with murder can not show that he did not know that there was a law forbidding the killing of a human being, one charged with larceny can show that because of his ignorance of law he supposed the property which he took to be his own. The distinction between the two cases is that the crime of murder consists in the willful and malicious killing of a human being, and when that act has been done the fact that the party doing it did not know that the law forbade it does not show that the killing was not done willfully and with malicious aforethought, and therefore does not excuse the doing of the act. Whereas the crime of larceny consists not simply in taking the property of another with the intention of appropriating it, but in taking it knowing it to be the property of another. If, therefore, the accused because of his ignorance of law supposed the property to be his own, one of the elements in the crime of larceny is wanting, and the effect of proof of ignorance of law on his part is not to excuse the commission of a crime, but to show that no crime was committed. *Rex* vs. *Hall*, 3 C. and P. 409; *Commonwealth* vs. *Stebbins*, 8 Gray 492.

Notwithstanding the fact that ignorance of law can be shown when it establishes the fact that a crime has not been committed, it is held in England, and generally in the U. S., that a plaintiff suing for money paid under mistake of law to a person not entitled thereto can not show that the money was paid in ignorance of law and should therefore be repaid. Prior to 1802 the law was otherwise, and money paid under mistake, whether of fact or of law, could be recovered if the plaintiff proved that it was against conscience for the defendant to retain the money. In that year, however, it was held in *Bilbie* vs. *Lumley* (2 East, 469) that every one was presumed to know the law, and that money paid under mistake of law could not be recovered; and this decision has been followed in England and generally in the U. S.

In the case just cited Lord Ellenborough held that unless every man was taken to be cognizant of the law there was no telling to what extent the excuse of ignorance of law would not be carried. Notwithstanding Lord Ellenborough's apprehension of the results that might follow from allowing a man to prove his ignorance of law, the maxim that every one is presumed to know the law is not of universal application in courts of law. The existence of such a maxim was denied by Justice Maule, in *Martindale* vs. *Falkner*, 2 C. B. 706, 719. "There is no presumption," said he, "in this country that every person knows the law. It would be contrary to common sense and reason if it were so."

In *Queen* vs. *Mayor of Tewksbury* (Law Reports, 3 Queen's Bench, 629) this statement of Justice Maule was cited with approval, and the court refused to apply the maxim. In that case a candidate for office, who in fact received a minority of the votes actually cast, contested the election, and sought to establish his claim to the office by showing that notwithstanding he in fact received a minority vote he was entitled to the office for the reason that the electors who voted for the candidate receiving the majority of the votes cast knew that he was ineligible. Had this been the fact he would have been entitled to the office. To establish this fact he invoked the aid of the maxim that every one is presumed to know the law, and contended that as he had shown that the voters knew the facts rendering his opponent ineligible it must be presumed that they knew the law, and therefore knowingly voted for an ineligible candidate. The court refused to apply the maxim. "It does not seem to me," said Lord Blackburn, "consistent with justice or common sense to say that because these voters were aware of certain circumstances they were necessarily aware of the disqualification arising from that circumstance, and that therefore their votes were to be considered as mere nullities."

Not only have courts of law refused to apply this presumption in all cases, but courts of equity have refused to apply rigidly the rule that no one can obtain relief who bases his application therefor on the ground of mistake of law. While one might not be justified in saying that the maxim receives no recognition in equity to-day, its scope has certainly been very much limited, if it can be said to have any existence.

In the following cases relief will be granted in equity: Where money is paid under mistake of law to an officer of the court of equity in his official capacity (*ex parte* James, Law Reports, 9 Chancery Appeals 609; *ex parte* Simmonds, Law Reports, 6 Queen's Bench Division 308); where the party who has paid money under mistake of law wishes relief by way of set-off in equity (*Livesey* vs. *Livesey*, 3 Rus. 287; *Dibbs* vs. *Goren*, 11 Beav. 483; *Hemphill* vs. *Moody*, 64 Ala. 468); where the parties are mistaken as to the legal effect of the language used in a contract or conveyance (*Earl of Beauchamp* vs. *Winn*, Law Reports, 6 House of Lords Cases 223; *Griswold* vs. *Hazard*, 141 U. S. 260; *Pitcher* vs. *Hennessey*, 48 N. Y. 415; *Stockbridge Iron Company* vs. *Hudson*, 107 Mass. 290; *Stafford* vs. *Fetters*, 55 Ia. 484); where the parties are mistaken as to the construction of an act of the Legislature relating to a private right (*Cooper* vs. *Phipps*, Law Reports, 2 House of Lords Cases 149); where the mistake of law made by the plaintiff is due to a misrepresentation by the defendant (*Cooper* vs. *Phipps*, Law Reports 2 House of Lords Cases 149); *Snell* vs. *Insurance Company*, 98 U. S. 85; *Martin* vs. *Railroad Company*, 36 N. J. Eq. 109); where the defendant knew that the plaintiff was acting under a mistake of law (*Kerr on Fraud and Mistake*, 2d ed. 470).

The existence of the distinction as to mistake of law and mistake of fact renders it important to consider when a

question is to be regarded as one of law and not of fact. The theory of law is that while facts are in their nature transient, existing at one time and not at another, there is always a principle of law applicable to any given state of facts regardless of the form that the facts may assume. To determine therefore whether any given question is one of law or of fact, one should ascertain what knowledge is requisite to a correct solution thereof. If a lawyer or a judge can, solely because of his knowledge of law, give an opinion as to the result that should be reached, then the question is a question of law and not of fact. If, however, one's knowledge of law does not enable him to answer the question involved, then the question may be one of law and fact or fact alone, but is not simply a question of law.

It is often said that questions of law are for the court to decide, while questions of fact are to be decided by a jury, and therefore the conclusion is reached that if in any given case the question at issue is to be decided by the court and not by a jury, then the question involved is necessarily one of law and not of fact.

This statement as to the character of the questions to be decided by the court and jury respectively must not be taken literally. The statement is made to indicate the peculiar province of the jury in our system of law. While it is true that questions of law are for the court and not for the jury, it is not true that all questions of fact are for the jury and not for the court.

It is often not only the right but the duty of the court to pass upon questions of fact. If, for example, the admissibility of evidence depends upon facts about which there is a dispute, it is the duty of the court to decide the question so raised before admitting or excluding the evidence. Again, it is the duty of the court to require the jury to act as reasonable men in their findings of fact. It does this either by directing a non-suit or a verdict in the first instance, or by setting aside a verdict which it thinks the jury acted unreasonably in rendering.

So if a contract is in writing, it is for the court to declare what the contract means. This is true for historical reasons, but words written can not involve a question of law if they would only involve a question of fact had they been spoken instead of written.

Mistake as to foreign law is treated as if it were a mistake of fact and not of law. And this is true whether the mistake is made by a citizen of the jurisdiction where the suit is brought as to the law of another jurisdiction (*Haven* vs. *Foster*, 9 Pickering 112) or is made by a resident of a foreign jurisdiction in a foreign jurisdiction as to the law of the jurisdiction where the action is brought (*Bank of Chillicothe* vs. *Dodge*, 8 Barbour 233). The several States are regarded as foreign to each other for the purpose of this rule.

WILLIAM A. KEENER.

Ignorantines: an order better known as BROTHERS OF THE CHRISTIAN SCHOOLS (*q. v.*).

Igor, The Tale of the Troop of: more commonly known as *The Song of Igor*; a famous Russian epic describing a disastrous battle in the twelfth century. It was first published in 1800, and the manuscript was destroyed at the burning of Moscow in 1812, though a copy of it has been found. The poem achieved great popularity, and has been often studied and discussed; modern critics have proved that the text can not be older than the fifteenth century, while many think that the tale was composed by the publisher in imitation of Ossian. The best text is that of Tikhonravov (Moscow, 1868). For discussion and commentary, see *Vzgliad na Slovo o Polku Igorevе* (*A View of the Tale of the Troop of Igor*), by Vsevolod Miller (Moscow, 1877); *Zamechanie* (*Remarks*) *n. S. o P. I.*, by Prince Viazemsky (St. Petersburg, 1875); articles by Orest Miller and Veselovski in the *Journal of the Ministry of Public Instruction* (1877), and Barsov in the *Vestnik Evropy* (*Messenger of Europe*, Nos. 10 and 11, 1878). See also the partial translation and commentary in Rambaud, *La Russie épique* (1876).

A. C. COOLIDGE.

Iguala, ĕe-gwaa'lăă: a town of the state of Guerrero, Mexico; on a small plain surrounded by hills, about 3,000 feet above the sea (see map of Mexico, ref. 8–G). It is very picturesque, and of considerable importance as the center of the Guerrero cotton industry. Historically it is noted as the place whence was issued the famous "plan of Iguala." (See ITURBIDE.) Pop. 7,000. H. H. S.

Igualada, ĕe-gwăă-laa'dăă: town; in the province of Barcelona, Spain; on the Noya, at the foot of Montserrat, about 30 miles N. W. of Barcelona (see map of Spain, ref. 14–K). It is an old and gloomy town, with a bright and handsome suburb, a brisk trade in wine, oil, and fruits, and extensive manufactures of weapons, cotton and woolen goods, paper, and cement. Pop. 10,201.

Iguana, ĕe-gwaa'na [Span., from Haitian name]: the generic as well as popular name of several lizards inhabiting Central and South America and the West Indies. These animals are of large size, often 4 or 5 feet in length to the end of the tail, which is long, slender, compressed, and covered with small, equal, imbricated, and carinated scales. The body is also scaly, and provided with a prominent median fold of integument under the throat, forming a conspicuous dewlap, which is serrated in front, with large scales. Another fold along the back is similarly raised into a deeply and acutely serrated crest, highest on the dorsal region and extending upon the tail. There is a single row of femoral pores. The tongue is short, contractile, and notched at the tip. There is a double row of small teeth upon the pterygoid bones of the palate, and larger teeth upon the usual maxillary bones. These teeth have the crown compressed, acute,

The common iguana (*I. tuberculata*).

and with a serrated margin. The external surface of the crown is coated with enamel and traversed by a median longitudinal ridge. The bases of the teeth are elongated, subcylindrical, and soldered to excavations on the inner surface of the outer wall of a shallow, oblique, alveolar groove, thus exhibiting the pleurodont type of dentition. The vertebræ, besides the ordinary articulation by the zygapophyses or oblique processes from the arches, are further united by a process (zygosphene) from the front part of each arch, which fits into a cavity (zygantrum) upon the posterior face of the preceding arch; and in this respect they resemble the vertebræ of serpents. There are five well-developed toes on each foot, all provided with claws. Iguanas are active animals, living mostly upon trees, and are herbivorous. Their flesh is considered a delicacy. The best-known species is *Iguana tuberculata*, so named from the tubercular scales upon the sides of the neck. O. C. MARSH.

Igua'nodon [Mod. Lat. *igua'na*, iguana + Gr. *ὀδούς, ὀδόντος*, tooth]: a genus of extinct reptiles belonging to the order Dinosauria, and found in the Wealden and Cretaceous of Europe. These reptiles were first discovered by Dr. Mantell in the Wealden of Tilgate Forest, and the remains first found consisted of teeth. The name of the animal was intended to express the resemblance of these teeth to those of the iguana. As in that animal, the base of the tooth is elongated, the crown expanded and notched on the margin; at first it is acuminated and compressed, its sloping sides serrated, and one surface, external in the upper jaw, internal in the lower, is traversed by a median longitudinal ridge and covered with a layer of enamel. On each side of this ridge are one or two lower ridges, separated from each other and from the serrated margin by wide smooth grooves. The marginal serrations are seen under a low magnifying power to be transversely notched. These teeth were set in sockets giving a firm support for mastication, by which they seem to have been worn until nearly the whole crown was gone. In the earlier stages of use a sharp, irregular edge was maintained by the layer of enamel; later, the ossified

pulp, harder than the dentine, formed a transverse ridge, fitting the teeth for its work as a molar for grinding and bruising the coarse vegetables that formed the food of these animals. The vertebræ of the neck were moderately convex in front, concave behind, becoming concave on both faces in the dorsals, resembling those of some mammals, while other points of structure allied these animals with the birds. The ribs were bifurcate. The shoulder-girdle resembled that of lizards, and the fore legs were comparatively small. The pelvis had the ilium extending far in front of the acetabulum, and furnishing only a widely arched roof to that cavity. The ischium was much elongated, had an obturator process as in birds, and probably united with its fellow in a median ventral symphysis. The pubis had its anterior branch large and spatulate, and the posterior part short and rod-like. The unusually large bones of the hind limbs were hollow and fitted for terrestrial locomotion. The femur had a strong inner trochanter, and its distal end was bird-like in the development of a strong ridge, which played between the tibia and fibula. The metatarsals were elongated, and so fitted together as to hardly if at all move on one another. The inner and outer digits were wanting, leaving only three well-developed toes, of which the middle was the largest and strongest. Large three-toed tracks in the Wealden are such as might have been made by these animals. *Iguanodon mantelli* (so named by Prof. Owen for its discoverer) was 30 feet in length, with a bulky body. A large number of skeletons have since been found in Belgium. This genus has not yet been identified from America, but *Camptosaurus* from the Jurassic of Wyoming is a near ally. O. C. Marsh.

Iguapé, ē-gwä-pā': a small town and seaport in the southern part of the state of São Paulo, Brazil; on a navigable river of the same name, 15 miles from the sea (see map of South America, ref. 7-G). It is the center of trade for the Iguapé valley, exporting rice, cabinet-woods, cattle, and a little coffee, mainly to Paranaguá and Santos. Pop. 4,000.

Ihlang'-Ihlang' [Malayan, flower of flowers]: the rich and powerful perfume of *Unona odoratissima*, a noble forest tree of the Philippines and other Malay islands. The volatile oil of the flowers of the tree is largely employed in making the rich handkerchief perfume of this name. This oil is distilled in the East, and is worth about $250 a pound.

Ihre, ee're, Johan: philologist; b. at Lund, Sweden, in 1707; educated at the University of Upsala; spent some years in foreign travel, and after holding several minor offices became Professor of Belles-lettres at Upsala, where he acquired fame as a lecturer and as an author. He attracted attention by a brilliant defense of his theological opinions at a public debate occasioned by the attacks of his opponents. He wrote a number of works on the Swedish language, of which the most important was the *Glossarium Suiogothicum* (1769), containing the derivation and etymology of all Swedish words, and comprising a philosophical treatise on the kinship of languages. The Government paid him $10,000 for this publication. His treatises on Ulphilas's version of the Gospels and on the Edda were also valuable contributions to philology. His vast learning and critical ability placed him in the first rank of scholars in the eighteenth century.

Ijssel: same as Yssel (*q. v.*).

Ikao, ē'e-kaa'ō: a watering-place in Kozuke, Japan, much frequented by foreign visitors; situated about 88 miles N. of Tokio (see map of Japan, ref. 5-E). Most of this journey is covered by railway to Takasaki (68 miles). The village is situated at an elevation of about 2,600 feet above sea-level, on the northeastern slope of Mt. Haruna, and rises in picturesque terraces, the main street being a succession of steep flights of stone steps. From nearly every house a magnificent view is obtained of the broad valley below, and the lofty mountain ranges to the E. and N. The place is famous for its mineral hot waters, which issue from the ground at a temperature of 115° F. The water, containing small quantities of iron and sulphate of soda, is said to be good for women's complaints and derangements of the stomach. At first used externally, it has of late been taken internally, but with little more effect than hot water. Ikao is a favorite summer resort on account of the fine air and the cool nights.

Ilarion the Metropolitan: the earliest Russian original writer of the Middle Ages known to us. He lived in the eleventh century, and in 1050 became Metropolitan Bishop of Kiev. His works, which were theological, were written in the old lavonic language.

Île-de-France, eel de-frāñs [Fr., Isle of France]: an old province of France, with Paris for its capital; now divided into the departments of Seine, Oise, Aisne, Seine-et-Marne, and Seine-et-Oise. It became a dukedom in the ninth century, and in 987 Hugh Capet, Duke of the Île-de-France and the founder of the Capetian dynasty, came to the French throne.

Il'eum [Mod. Lat., from Lat. *ī'leum*, better *ī'lium*, usually in plur. *ilia*, groin, flank]: the lowest portion of the small intestine, extending from the jejunum to the head of the colon. In man it is about 12 feet long, thus including some three-fifths of the length of the small intestine. It is 1¼ inches in caliber, is thinner and narrower than the jejunum, has less marked *valvulæ conniventes*, and is ordinarily the only part of the intestine which has Peyer's patches (agminated glands) upon its inner surface.

Il'eus [Mod. Lat., from Lat. *ī'leos* = Gr. *εἰλεός*, severe kind of colic or intestinal disease]: a very painful disease of the intestine, produced by mechanical obstruction, as by twisting, intussusception, or knotting of the entrail. Intense pain, persistent vomiting (sometimes stercoraceous), constipation, hiccough, etc., are characteristic symptoms. Intussusception, or the passage of a part of the intestine into the cavity of another part, is one of the most common conditions, as when the lower part of the small intestine is slipped down into the large intestine. The disease is very often fatal. Spontaneous reduction of the displacement may occur; the intussuscepted part may slough away and an inflammatory process occur, resulting in recovery; dilatation of the bowels by injecting large quantities of water, or by the bellows may effect a cure. As a last resort coeliotomy may be tried with possible success.

Revised by William Pepper.

Ilex: See Holly and Holm Oak.

Ili, ee'lee, or **Kulja**: a town of the Chinese empire; on the river Ili (see map of China, ref. 2-B). It has long been a place of banishment for disgraced Chinese officials. It was inclosed by a stone wall, and contained barracks, forts, granaries, many mosques and Chinese temples, etc., but was completely destroyed in 1868 by the insurgent Dungans, who massacred all the inhabitants and razed the buildings to the ground. Pop. 4,000.

Ili, ee'lee: a river and a region of Central Asia. The river is the principal feeder of Lake Balkash; rises about lat. 43° N., lon. 84° E., in Chinese territory; flows W. past Kulja, then passes into the Russian province of Semiryetshensk, and after passing the Russian fort of Iliisk turns N. W. and spreads into an enormous arid delta. Its length is 1,000 miles; one-third to one-half navigable for small craft. The lower part has less water than that above Iliisk, because of the evaporation, and the delta is filled only in seasons of floods. A small stream in Transbaikal, Siberia, is also called Ili. It was also formerly the name of a Chinese viceroyalty of Zungaria, occupying in part what is now the Chinese province of Ili, in part the Russian province Semiryetshensk—being in part what is sometimes called East Turkestan. The name Ili is also applied to a group of Turcoman tribes numbering about 150,000 in all. Mark W. Harrington.

Ilïa' Mu'romets (of Murom): the Russian typical hero and strong man, the favorite of the ancient Russian *Bylinas*, or popular epic songs, who defends widows and orphans and fights Tartars and robbers, but is often out of favor with the ungrateful king whom he serves. See O. Miller, *Ilïa Muromets i Bogatyrstvo Kievskoe* (*Ilia Muromets and the Heroism of Kiev*, St. Petersburg, 1860); also Rambaud, *La Russie épique* (1876); and I. F. Hapgood, *Epic Songs of Russia* (New York, 1886). A. C. C.

Ilijats, or **Iliyats**: nomadic tribes of Persia, of various origin, mostly orthodox or Sunnite Mussulmans. Nominally each tribe is confined to its own grazing-ground, for which a tribute from their flocks is exacted by the government, but frequently their favorite occupation is robbery.

Ilini'za, Illiniza, or **Ilinisa**: a mountain of Ecuador, in the Western Cordillera; 20 miles S. S. W. of Quito. It is capped by two peaks, the southernmost, as determined trigonometrically by Reiss and Stübel, being 17,406 feet high. Whymper failed in an attempt to reach the summit. Iliniza is presumably an extinct or quiescent volcano; but there is no record of an eruption. The upper portion is covered with perpetual snow, and usually cloud-capped.

Il'ion, or **Il'ium**: See Troy.

LAKE
MICHIGAN
CHICAGO
MAP OF
ILLINOIS
Drawn and Engraved expressly for
JOHNSON'S CYCLOPÆDIA

Ilion: village; Herkimer co., N. Y. (for location of county, see map of New York, ref. 4–H); on the Mohawk river, the Erie Canal, and the N. Y. Cent. and H. R. and the West Shore railways; 11½ miles E. S. E. of Utica, 83 miles N. W. of Albany. It is in an agricultural region; has street-railway connection with Frankfort and Mohawk and with Herkimer on the opposite side of the river; contains an academy, free public library (completed 1893, cost $30,000), five churches, a monthly and two weekly periodicals, has electric lights and water-works, and manufactures firearms, type-writers, sewing-machines, bicycles, knit goods, carriages, and agricultural implements. Pop. (1880) 3,711; (1890) 4,057.
EDITOR OF "CITIZEN."

Ilis'sus (in Gr. Ἰλισσός): a small stream of Attica that rises in two arms on Hymettus and flows close under the eastern and southern walls of Athens toward the Bay of Phalerum. In ancient times it was celebrated for its beautiful scenery, and though it must always have been a mere brook, its waters have now greatly decreased and are lost in the fields S. of Athens. In the summer it is wholly dry.

Illampu, ēēl-yaam'poo, or **Sorata**, sō-raa'-taā: a mountain of Bolivia, in the Eastern Cordillera, overlooking Lake Titicaca; 50 miles N. N. W. of La Paz. It is 21,484 feet in height, and is believed to be the highest mountain of the Bolivian Andes, though this honor is also claimed for ILLIMANI (*q. v.*); it is probably exceeded by the Cerro de Huascan in Peru and by Aconcagua in Chili. Illampu is a magnificent mass, with three principal peaks. Seen from Lake Titicaca it is the grandest mountain in America. It has never been scaled.
HERBERT H. SMITH.

Il Lasca: See GRAZZINI.

Ille-et-Vilaine, eel'ā-vēē'lān': maritime department of Northwestern France, a part of the old province of Brittany, bordering on the English Channel. Area, 2,597 sq. miles. It has iron, lead, and zinc mines and slate quarries. The ground is mostly low, occupied along the sea by dunes and marshes, but much of the soil is fertile, producing, besides good crops of grain, large quantities of hemp and flax, which are manufactured into thread, cordage, and woven goods. Many horses and cattle are raised, and cheese, glass, sea-salt, and paper are manufactured. The oyster-fisheries are considerable. Rennes is the chief town and St.-Malo the chief port. Pop. (1896) 622,039.

Illegitimacy: See BASTARD.

Illimani, ēēl-yēē-maa'nēē': a mountain of Bolivia, in the Eastern Cordillera; forming the southeast extremity of the Sorata or La Paz group; 25 miles E. S. E. of the city of La Paz and 75 miles S. E. of Illampu; lat. 16° 33′ 10″ S. and lon. 67° 46′ 7″ W. It has three peaks; the highest has never been scaled, but in 1877 M. Wiener and two companions reached one of the other summits which was found by aneroid to be 20,116 feet above the sea; Wiener calculated that the highest point was 20,692 feet. Vegetation ceases at about 11,400 feet, and the limit of perpetual snow is about 14,900 feet.
HERBERT H. SMITH.

Illinois, il-li-noi', or -nois': one of the U. S. of North America (North Central group); in the upper Mississippi valley; name derived from the Illini tribe of Indians.

Situation and Area.—It lies between the parallels of 36° 59′ and 42° 30′ N. lat., and the meridian of 19° 30′ and 14° 40′ of lon. W. from Washington, and is bounded on the N. by Wisconsin, on the E. by Lake Michigan, the States of Indiana and Kentucky, S. E. by the Ohio river, flowing between it and the State of Kentucky, and W. and S. W. by the Mississippi, which separates it from Iowa and Missouri. Its territory and jurisdiction extends to the middle of Lake Michigan, and of the channels of the Mississippi and Wabash rivers, but to the northern bank of the Ohio only. Its area is 56,650 sq. miles, or 36,256,000 acres; its extreme length N. to S. is 385 miles, and E. to W. 218.

Topography.—The physical conformation of the State presents the appearance of an inclined plane with a moderate descent in the general direction of the streams toward the S. and S. W. The greatest elevation above the sea-level is found in Jo Daviess County—820 feet, and the point of lowest depression at Cairo, 300 feet; while the altitude at Chicago is 583 feet. A spur from the Ozark Mountains, projected across the southern part of the State, rises in Jackson County to over 500 feet. A peculiar feature of the country in the middle and northern portion of the State, which excited the delighted surprise of early explorers, was the vast extent of prairies or natural meadows, from which the State has also been named the "Prairie State."

Rivers.—Illinois is one of the best-watered, as it is one of the most level, States of the Union. It is drained by the Mis-

Seal of Illinois.

sissippi, which washes its entire western border, and its chief eastern tributary, the Ohio, with the Wabash on the E., and the Illinois, its largest stream, wholly within the State, nearly 500 miles in length, with its affluents, the Kankakee, Des Plaines, Mackinaw, Sangamon, Vermilion, and Fox rivers; the Kaskaskia, rising in Champaign County, drains the region between the Illinois and the Wabash, and Rock river the northern portion of the State, The Big Vermilion, Embarras, and Little Wabash are tributaries of the Wabash, and the Saline and Cash of the Ohio. The whole number of streams in the State is over 280.

Geology.—The first recorded evidence of the discovery of coal in the U. S. was that of Father Hennepin in Illinois (near Ottawa) in 1679. The area of coal in the State embraces 37,000 sq. miles, one-fifth of the whole bituminous coal area of the U. S. It is divided into six principal workable seams, ranging from 2 and 3 feet in thickness to 7, which are found at a depth varying from a few feet to 800. The most valuable and productive mines are in the vicinity of Springfield, Belleville, Braidwood, La Salle, Peoria, and in Jackson County. Just above as well as beneath these veins of coal thick beds of superior fire-clay are found in many localities, the manufactures from which and from potters' clay are increasing in value and importance. In Pope and Hardin Counties is found kaolin clay, from which is manufactured the finest kind of porcelain. Lead ore is still mined in the vicinity of Galena, whose name is derived from it, and is found in Pope and Hardin Counties. There are veins also of copper ore in the northern part of the State on the Peckatonica river, and zinc is mined to some extent in the same locality. In various portions of the State there are valuable and extensive quarries of limestone of both the Upper and Lower Silurian formation. The most extensive of these are in the vicinity of Joliet. Heavy beds of sandstone are also found and extensively worked on the Ohio, the Illinois, and Rock rivers. Iron, only found in the southern portion of the State, has not been discovered in workable veins.

Soil and Productions.—The proportion of woodland to prairie in the northern portion of the State is 7 per cent., in the central about 15, and in the southern about 24 per cent. The subsoil is usually a yellow clay, varied in some northern counties by gravel. The surface soil is mainly formed of drift deposits from 10 to 200 feet in depth, overlaid with rich black loam from 10 to 50 inches thick. The river bluffs are more or less covered with a siliceous deposit called loess; while the soil of the river bottoms is alluvial and practically inexhaustible. The prairie differs from the forest soil in the same locality. Resulting from the peculiarities of the soil, the midland counties are best adapted to the culture of corn, those S. of Springfield to wheat, and others again to fruit.

The native flora of the State is as numerous as its soil is prolific; from the deciduous cypress and cane of the S. to the juniper and tamarack of the N. Six species are found peculiar to the northern part of the State, 16 to the southern,

and 61 common to the whole, in all 83 varieties, of which the oak has 12, the hickory 6, the ash 5, the maple 3, and walnut 2. In addition to these there are the tulip, cucumber, beech, sassafras, catalpa, elm, poplar, hackberry, cottonwood, sycamore, pecan, cypress, and redbud. Of wild fruits the State produces the plum, cherry, mulberry, crab and thorn apple, haw, papaw, persimmon, and grape, besides blackberries, raspberries, strawberries, and blueberries.

When first explored, the buffalo, wapiti, deer, bear, panther, wild-cat, and wolf roamed here unchecked. Beaver, otter, mink, and muskrat were found along the streams. But few of these are now found in any considerable number. Foxes are still hunted, and the wolf appears occasionally; also the turkey and the prairie hen, although very scarce. Wild ducks and geese still visit the ponds and rivers, and quails are to be seen; the rabbit is numerous, and the raccoon and opossum are still hunted.

The following table shows the acreage, yield, and value of the principal crops in 1893:

CROPS.	Acreage.	Yield.	Value.
Corn	6,247,100	160,550,470 bu.	$49,770,646
Wheat	1,348,462	15,507,313 "	7,908,730
Oats	3,082,433	83,842,178 "	22,637,388
Rye	126,597	1,759,608 "	721,476
Barley	30,978	718,690 "	287,476
Buckwheat	6,555	76,038 "	43,342
Tobacco	3,870	2,109,150 lb.	147,641
Potatoes	160,461	8,504,433 bu.	6,293,280
Hay	2,705,681	3,273,874 tons	29,006,524
Totals	13,712,137		$116,816,503

The farm animals in 1894 comprised 1,308,771 horses, value $56,799,353; 104,720 mules, value $5,367,573; 1,039,121 milch cows, value $26,102,720; 1,553,383 cattle, value $28,984,266; 1,032,976 sheep, value $2,450,632; and 3,422,454 swine, value $23,988,664: total value $143,693,208.

Climate.—Stretching as Illinois does over five and a half degrees of latitude, there is of course considerable variety in its climate. In the northern portion the annual range of the thermometer is very great, the summer heat being at times intense and the cold of winter very severe. At Chicago, and in the north of the State generally, the prevalent winds throughout the year are those from the S. W. and S., though in the spring and summer N. and W. winds are moderately frequent. The wind blows almost constantly in some direction, only 44 out of 1,100 observations noting a calm condition of the atmosphere. At Cairo, in the southern extremity of the State, the most prevalent wind was that from the S., though closely followed by that from the N. E., while those from the N. and the S. E. were less frequent. About one-eleventh of the observations represented the absence of wind. At Rock Island the S. W. wind was the prevalent one, though N. W. and N. E. winds were also common. The annual range of the thermometer in Peoria in 1859 and 1860 was 117° F. (the maximum being 104° in July and the minimum—13° in December); in Riley, McHenry County, near the north line of the State, 123° F. In 40° N. lat. the mean temperature of the year is about 54°; of the summer 77°, and of the winter 33° 30′. At Beloit on the north line of the State the mean annual temperature is 47° 30′; at Cairo 58° 30′. About 245 days of the year are clear and 120 cloudy or rainy. The climate is generally healthful, the paludal fevers which prevailed in the early settlement of the State having mostly disappeared or become greatly mitigated with more thorough cultivation and drainage. In the low and swampy bottom-lands, especially in the southern part of the State, bilious and intermittent fevers and diseases of the bowels are prevalent.

The following table, compiled from a series of observations extending through various years, shows the mean and annual temperatures at the points named, viz.:

PLACES.	Latitude.	Alt., feet.	Spring.	Summer.	Fall.	Winter.	Mean.
Chicago	41° 45°	600	43° 55°	66° 76°	48° 32°	24° 78°	45° 85°
Peoria	40° 43	512	50° 63	74° 45	52° 94	27° 40	51° 36
Springfield	39° 48	550	48° 37	74° 02	48° 94	27° 62	49° 74
Manchester	39° 31	683	51° 16	73° 90	53° 34	28° 86	51° 82
Highland	38° 44	630	56° 55	77° 69	56° 60	34° 13	56° 24

The general average for the State is 50·65°, or 48° in the northern half and 56° in the southern.

Divisions.—For administrative purposes Illinois is divided into 102 counties, as given in the table in the next column, with county-towns and population:

COUNTIES.	* Ref.	Pop. 1880.	Pop. 1890.	COUNTY-TOWNS.	Pop. 1890.
Adams	6-B	59,135	61,888	Quincy	31,494
Alexander	12-E	14,808	16,563	Cairo	10,324
Bond	8-D	14,866	14,550	Greenville	1,868
Boone	1-E	11,508	12,203	Belvidere	3,867
Brown	6-C	13,041	11,951	Mount Sterling	1,655
Bureau	3-D	33,172	35,014	Princeton	3,396
Calhoun	8-C	7,467	7,652	Hardin	311
Carroll	2 D	16,976	18,320	Mount Carroll	1,836
Cass	6-C	14,493	15,963	Virginia	1,602
Champaign	6-F	40,863	42,159	Urbana	3,511
Christian	7-E	28,227	30,531	Taylorville	2,829
Clark	7-G	21,894	21,899	Marshall	1,900
Clay	9 F	16,192	16,772	Louisville	637
Clinton	9-D	18,714	17,411	Carlyle	1,784
Coles	7-F	27,042	30,093	Charleston	4,135
Cook	2-G	607,524	1,191,922	Chicago	1,099,850
Crawford	8-G	16,197	17,283	Robinson	1,387
Cumberland	8-F	13,759	15,443	Toledo	676
De Kalb	2-E	26,768	27,066	Sycamore	2,987
De Witt	6-E	17,010	17,011	Clinton	2,598
Douglas	6-F	15,853	17,669	Tuscola	1,897
Du Page	2-G	19,161	22,551	Wheaton	1,622
Edgar	7 G	25,499	26,787	Paris	4,996
Edwards	9 G	8,597	9,444	Albion	937
Effingham	8-F	18,920	19,358	Effingham	3,260
Fayette	8-E	23,241	23,367	Vandalia	2,144
Ford	5-F	15,099	17,035	Paxton	2,187
Franklin	10 E	16,129	17,138	Benton	939
Fulton	5-C	41,240	43,110	Lewistown	2,166
Gallatin	11-F	12,861	14,935	Shawneetown	
Greene	7-C	23,010	23,791	Carrollton	2,258
Grundy	3-F	16,732	21,024	Morris	3,653
Hamilton	10-F	16,712	17,800	McLeansboro	1,355
Hancock	5-B	35,337	31,907	Carthage	1,654
Hardin	11-F	6,024	7,234	Elizabethtown	652
Henderson	4-B	10,722	9,876	Oquawka	
Henry	3-C	36,597	33,338	Cambridge	940
Iroquois	4-G	35,451	35,167	Watseka	2,017
Jackson	10-E	22,505	27,809	Murphysboro	3,880
Jasper	8-F	14,515	18,188	Newton	1,428
Jefferson	9-E	20,686	22,590	Mount Vernon	3,233
Jersey	8-C	15,542	14,810	Jerseyville	3,207
Jo Daviess	1-C	27,528	25,101	Galena	5,635
Johnson	11-E	13,078	15,013	Vienna	828
Kane	2-F	44,939	65,061	Geneva	1,692
Kankakee	4-G	25,047	28,732	Kankakee	9,025
Kendall	3-F	13,083	12,106	Yorkville	375
Knox	4-C	38,344	38,752	Galesburg	15,264
Lake	1-G	21,296	24,235	Waukegan	4,915
La Salle	3-E	70,403	80,798	Ottawa	9,985
Lawrence	9-G	13,663	14,693	Lawrenceville	865
Lee	2-E	27,491	26,187	Dixon	5,161
Livingston	4-F	38,450	38,455	Pontiac	2,784
Logan	6-E	25,037	25,489	Lincoln	6,725
McDonough	5-C	27,970	27,467	Macomb	4,052
McHenry	1-F	24,908	26,114	Woodstock	1,683
McLean	5-E	60,100	63,036	Bloomington	20,484
Macon	6-E	30,665	38,083	Decatur	16,841
Macoupin	8-D	37,692	40,380	Carlinville	3,293
Madison	8-D	50,126	51,535	Edwardsville	3,561
Marion	9-E	23,686	24,341	Salem	1,473
Marshall	4-E	15,055	13,653	Lacon	1,649
Mason	5-D	16,242	16,067	Havana	2,525
Massac	12 F	10,443	11,313	Metropolis City	3,573
Menard	6-D	13,024	13,120	Petersburg	2,342
Mercer	4-B	19,502	18,545	Aledo	1,601
Monroe	9-C	13,682	12,948	Waterloo	1,860
Montgomery	8-E	28,078	30,003	Hillsboro	
Morgan	7-C	31,514	32,636	Jacksonville	12,935
Moultrie	7-F	13,699	14,481	Sullivan	1,468
Ogle	2-E	29,937	28,710	Oregon	1,566
Peoria	4-D	55,355	70,378	Peoria	41,024
Perry	10-E	16,007	17,529	Pinckneyville	1,298
Piatt	6-F	15,583	17,062	Monticello	1,643
Pike	7-B	33,751	31,000	Pittsfield	2,295
Pope	11-F	13,256	14,016	Golconda	1,174
Pulaski	12-E	9,507	11,355	Mound City	
Putnam	4-E	5,554	4,730	Hennepin	574
Randolph	10-D	25,690	25,049	Chester	2,708
Richland	9-G	15,545	15,019	Olney	3,831
Rock Island	3-C	38,302	41,917	Rock Island	13,634
St. Clair	9-D	61,806	66,571	Belleville	15,361
Saline	11-F	15,940	19,342	Harrisburg	1,723
Sangamon	6-D	52,894	61,195	Springfield	24,963
Schuyler	6-C	16,249	16,013	Rushville	2,031
Scott	7-C	10,741	10,304	Winchester	1,542
Shelby	7-E	30,270	31,191	Shelbyville	3,162
Stark	4-D	11,207	9,982	Toulon	945
Stephenson	1-D	31,963	31,338	Freeport	10,189
Tazewell	5-D	29,666	29,556	Pekin	6,347
Union	11-E	18,102	21,549	Jonesboro	
Vermilion	6-G	41,588	49,905	Danville	11,491
Wabash	9-G	9,945	11,866	Mount Carmel	3,376
Warren	4-C	22,933	21,281	Monmouth	5,936
Washington	10-E	21,112	19,262	Nashville	2,084
Wayne	9-F	21,291	23,806	Fairfield	1,881
White	10-F	23,087	25,005	Carmi	2,785
Whiteside	2-D	30,885	30,854	Morrison	2,088
Will	3-G	53,422	62,007	Joliet	23,264
Williamson	10-E	19,324	22,226	Marion	1,338
Winnebago	1-E	30,505	39,938	Rockford	23,584
Woodford	4-E	21,520	21,429	Metamora	758
Totals		3,077,871	3,826,351		

* Reference for location of counties, see map of Illinois.

Principal Cities and Towns.—Chicago, 1,099,850; Peoria, 41,024; Quincy, 31,494; Springfield, 24,963; Rockford, 23,584; Joliet, 23,264; Bloomington, 20,484; Aurora, 19,688; Elgin, 17,823; Decatur, 16,841; Belleville, 15,361; Galesburg, 15,264; East St. Louis, 15,169; Rock Island, 13,634; Jacksonville, 12,935; Moline, 12,000; Danville, 11,491; Streator, 11,414; Cairo, 10,324; Alton, 10,294; and Freeport, 10,189.

Population and Races.—In 1860, 1,711,951; 1870, 2,539,891; 1880, 3,077,871; 1890, 3,826,351 (white, 3,768,472; colored, 57,028; native, 2,984,004; foreign, 842,347; males, 1,972,308; females, 1,854,043; Chinese, 740; Japanese, 14; and civilized Indians, 97).

Finance.—The State has no outstanding bonded debt, excepting $19,500 in bonds which have ceased to draw interest but have not been presented for payment. The assessed valuation of taxable property in 1892 comprised personal property, $143,967,054; lands, $316,659,655; lots, $284,288,202; railway property, local assessments, $2,737,803; railway property assessed by the State board of equalization, $77,108,390; and capital stock of corporations, $6,549,202; aggregated, $831,310,306. The State receipts from all sources were $10,586,743, the expenditures $10,682,659, and the balance in the treasury $4,349,551.

Banking.—In 1892 there were 212 national banks, with combined capital of $40,031,000, surplus and profits of $23,594,925, and individual deposits of $126,419,958; and 110 State banks of all kinds, with capital of $17,512,500, surplus and profits of $7,901,198, and individual deposits of $80,099,290.

Commerce and Trade.—In the calendar year 1893 the imports of foreign merchandise at the port of Chicago aggregated in value $17,722,406, and the exports amounted to $4,577,828.

Post-offices and Periodicals.—On Jan. 1, 1894, there were 2,566 post-offices in the State, of which 80 were first-class, 44 second-class, 191 third-class, 243 presidential, 2,323 fourth-class, 1,120 money-order offices, 37 money-order stations, and 36 postal-note offices. There were 133 daily, 20 semi-weekly, 1,067 weekly, 7 bi-weekly, 40 semi-monthly, 267 monthly, 5 bi-monthly, and 21 quarterly periodicals; total, 1,560.

Libraries.—In 1892 there were 218 libraries of 1,000 volumes and over, which had 1,704,885 bound volumes and 178,166 unbound pamphlets. They were classified as follows: General, 88; school, 52; college, 34; college society, 8; law, 5; theological, 10; medical, 2; public institution, 6; Y. M. C. A., 2; scientific, 7; historical, 3; and society, 1. The will of John Crerar, who bequeathed $2,500,000 for a public library in Chicago from which all sensational and skeptical works should be excluded, was sustained by the State Supreme Court in 1893.

Means of Communication.—The State railroad and warehouse commission reported in 1893 a total railway mileage of 14,677·88. The combined capital of all railway corporations was $1,977,399,590; total income, $114,426,308; net income (54 corporations), $36,616,701; net deficit (27 corporations), $2,276,751. There was an increase in capital in the year of $30,735,820.

Churches.—The census of 1890 gave the following statistics of the principal religious bodies:

DENOMINATIONS.	Organizations	Churches and halls.	Members.	Value of church property.
Roman Catholic	688	693	473,324	$9,946,819
Methodist Episcopal	1,903	1,912	165,191	7,046,785
Baptist	966	1,008	95,237	3,495,010
Lutheran, Synodical Conference	250	223	69,033	1,456,630
Disciples of Christ	641	640	60,867	1,145,275
Presb. in the U. S. of America	472	497	54,744	4,045,350
Ger. Evan. Syn. of N. A.	164	164	37,138	813,450
Congregational	302	315	35,830	2,975,812
Lutheran, Gen. Council	141	142	26,429	800,650
Protestant Episcopal	186	199	19,099	2,117,275
United Brethren	320	302	15,429	260,075
Cumberland Presbyterians	198	196	14,177	313,985
Evangelical Association	134	132	10,934	438,500

Schools.—Illinois has maintained a system of free schools since 1855. The permanent school fund amounts to $10,985,553, producing an annual income of $635,000, which sum is only a fraction of the amount annually expended for the support of the schools. In 1892 the total net expenditures on account of the public schools by districts was $12,968,860, and the total expenditure for public schools, State educational institutions, and State institutions of an educational character was $14,264,466. There were 1,221,832 children of school age (6 to 21 years) in the State, of whom 809,452 were enrolled in the public schools, and 574,738 were in average daily attendance. The number of school districts was 11,578; of school buildings, 12,372; of high schools, 233; of teachers, 22,346. The public-school property comprised, buildings and sites, $29,924,373; libraries, $253,768; apparatus, $501,727, total, $30,679,868, including the value of State educational institutions, $32,580,362. Of private schools, 955 were reported, which had 90,444 pupils and 2,867 teachers. As a part of its educational system the State has established and maintains three institutions of a higher grade, known as the State Normal University, in Normal (1857), and the Southern Normal University, in Carbondale (1870), for the training of teachers; and the University of Illinois, in Urbana (1867), a semi-industrial institution, whose primary object is, without excluding other scientific and classical studies, to teach such branches of learning as are related to agriculture and the mechanic arts. The proportion of the land grant from Congress going to the establishment of this institution was 480,000 acres, which with the amount already disposed of (319,178) will raise the endowment fund to $600,000. The normal schools and the university have commodious and costly buildings. Cook County maintains a widely noted normal school in Englewood. There are 28 colleges and universities of liberal arts; 6 colleges for women; 37 endowed academies and seminaries; 14 schools of theology, 4 of law, 4 of medicine, 3 of dentistry; and 14 commercial and business colleges.

Charitable, Reformatory, and Penal Institutions.—The charitable institutions are the Deaf and Dumb Institution, cost $495,521; Blind Institution, cost $200,264; Central Insane Hospital, cost $927,332—all in Jacksonville; Southern Insane Hospital in Anna, cost $723,602; Northern Insane Hospital in Elgin, cost $649,413; Eastern Insane Hospital in Kankakee, cost $1,336,287; Soldiers' Orphans' Home in Normal, cost $173,844; Asylum for Feeble-minded Children in Lincoln, cost $210,679; Soldiers' and Sailors' Home in Quincy, cost $291,513; and the Eye and Ear Infirmary in Chicago, cost $100,386. The reformatory and penal institutions comprise a penitentiary in Joliet, cost $1,075,000, and one in Chester, cost originally $504,000; an asylum for insane criminals in Chester; and a State reformatory for juvenile offenders in Pontiac, cost $287,679.

History.—Before the names of Vermont, Ohio, Kentucky, or Tennessee had been heard of, and while the first settlers of New England and Virginia were struggling for a foothold among the aborigines on the Atlantic coast, the "Illinois Country" occupied a place on the maps of North America. It was first seen by the French explorers Joliet (1673), La Salle (1679), Tonty (1679–90), and their missionary companions Marquette, Allouez, Gravier, Pinet, Saint-Cosmé, and Marest; and its first permanent settlements were made by their French followers, voyagers, and traders at Cahokia and Kaskaskia in 1700, so that the latter place, which was the capital of the territory for seventy-eight years and of the State two years, is older than New Orleans, Pittsburg, or St. Louis, is half a century older than Cincinnati, and was known 130 years before Chicago, as a town, had an existence. The French retained control of the country until 1763, when by reason of the conquest of Canada by Great Britain that power became its owner under treaty stipulations. The English, however, in consequence of the hostility of the Indian confederacy under the chieftain Pontiac, were not able to fly their flag from old Fort Chartre, the capital at that time, until Oct. 10, 1765. The white population at this time was 1,600. The French and the native owners of the soil generally maintained the most friendly relations. They lived and hunted together and intermarried, but the connection was not beneficial to either race, and although the government of the towns, civil and ecclesiastic, was of the most liberal kind, promoting the comfort, ease, and enjoyment of the people, it was not such as to encourage liberty, intelligence, or sobriety, and no memorials of any value to progress or education followed as a result of the French occupation.

The British remained in possession of the country, removing the capital to Kaskaskia in 1772, until July 4, 1778, when it was captured in an expedition from Virginia, commanded by George Rogers Clark, and was attached to Virginia as the county of Illinois. All State claims having been ceded to the general government in 1785, Congress provided for and in 1787 established the government of the Northwest Territory, of which Illinois formed the most conspicu-

ous part. It remained in a territorial condition under the Northwest or Indiana territories until 1809, when it was formed into a territorial government by itself, resuming its old name of Illinois. At this time it was divided into two counties, and could boast of a population of only 12,000. The first settlers, as in all the States, were exposed to attacks from the Indians, but suffered no great losses, except at the remote post of Fort Dearborn, where an unexpected attack on the retiring garrison, commanded by Capt. Nathan Heald, Aug. 17, 1812, resulted in considerable loss and the surrender of the place.

The State was admitted into the Union Dec. 3, 1818, with an alleged population of 40,000, but actually of only 34,620, smaller than any other State when admitted. The Black Hawk war of 1832, in which 8,000 volunteers and 1,500 regular soldiers were called out to expel from the State 500 Sac and Fox Indians with their women and children, at a cost of 1,000 lives and $2,000,000, while successful, reflected but little credit upon either the policy, bravery, or humanity of the people of that day. One good result which followed, however, was that of opening up the splendid country in the northern half of the State, and in the extension of prosperous and enterprising settlements in every direction. The construction of the Illinois and Michigan Canal, for which Congress granted to the State the alternate sections of the public lands on each side of the proposed route 5 miles in width, which was begun July 4, 1836, but owing to the "hard times" was not completed until 1848, gave another and most important impetus to the growth and prosperity of the State. The failure of the preposterous internal improvement system projected by the Legislature in 1836 involved the State in a debt of over $13,000,000, which required more than forty years of taxation to liquidate. But in 1856 Congress again responded to the demands of the Illinois representatives in the cession of 2,595,000 acres of land to the State to aid in the building of the Illinois Central Railroad, an improvement which did more to benefit the State than any other in its history.

The State has had three constitutions—the first one being succeeded by that of 1848, and the one now in force having been adopted and ratified in 1870. The State officers are elected for four years, as they have been under each instrument. Provision is made for county, circuit, appellate, and supreme courts—the judges of county courts having terms of four, of the circuit courts of six, and of the supreme courts of nine years—the latter being elected in three separate grand divisions, at different periods. The appellate court judges are selected from the circuit judges by the supreme court. The General Assembly is elected biennially, holding one session of about five months (but unlimited as to time), unless specially convened by the Governor, and members receive $5 a day and mileage for their services. The right of suffrage is extended to all male citizens, native or naturalized, above the age of twenty-one years. By subsequent provisions, women are permitted to vote for school officers. A peculiar constitutional provision is that of minority representation, by which, in electing members of the Legislature—three in each district—the elector can cast one vote for each, one and a half for two, or three for one candidate.

Illinois sent Abraham Lincoln to preside over the nation from 1861 to 1865, and gave Ulysses S. Grant his first commission in the civil war. Under Gov. Richard Yates the State furnished a greater number of volunteers in proportion to population than any other, the number being 255,057, or, reduced to a three years' standard of service, 214,133. These were included in 156 infantry, 17 cavalry, and 2 artillery regiments, whose losses were 5,874 killed in battle, 4,020 died of wounds, 22,786 died of disease, and 2,154 from other causes; total casualties, 34,834. See *Illinois, Historical and Statistical* (2 vols., 1889), by John Moses.

GOVERNORS OF ILLINOIS.

Territorial.	
Ninian Edwards	1809–18
State.	
Shadrach Bond	1818–22
Edward Coles	1822–26
Ninian Edwards	1826–30
John Reynolds	1830–34
Joseph Duncan	1834–38
Thomas Carlin	1838–42
Thomas Ford	1842–46
Augustus C. French	1846–53
Joel A. Matteson	1853–57
William H. Bissell	1857–61
Richard Yates	1861–65
Richard J. Oglesby	1865–69
John M. Palmer	1869–73
Richard J. Oglesby	1873
John L. Beveridge	1873–77
Shelby M. Cullom	1877–83
John M. Hamilton	1883–85
Richard J. Oglesby	1885–89
Joseph W. Fifer	1889–93
John P. Altgeld	1893–97
John R. Tanner	1897–

JOHN MOSES.

Illinois and Michigan Canal: a line of communication uniting Lake Michigan with the navigable waters of the Illinois river, thus ultimately connecting the Gulf of St. Lawrence with the Gulf of Mexico. The summit-level of the canal lies about 580 feet above tide water. The eastern terminus of the canal is at the south branch of the Chicago river, and 5 miles from the entrance of the main stream into the lake. The line is direct to the valley of the Des Plaines at Summit, about 8 miles distant; thence it pursues that valley to the mouth of the Kankakee river, 42 miles, passing through Lockport and Joliet, and receiving four feeders—Calumet, Des Plaines, Du Page, and Kankakee; between the junction of the Kankakee and Des Plaines the combined rivers take the name of Illinois, and within this valley the canal pursues its course to its western terminus, La Salle, at the head of steamboat navigation on the Illinois river, passing through the towns of Morris and Ottawa, and receiving the Fox river feeder at the last-named place, the entire length of the canal proper being 96 miles. The difference of level between Lake Michigan and the Illinois river at La Salle is 145 feet, distributed through 17 locks, varying in lift from 3½ to 12½ feet each. The 17 locks are 110×18 feet, designed for boats carrying 100 to 150 tons.

There are 5 feeders of the aggregate length of 25 miles, all navigable, and 40 feet wide and 4 feet deep; 4 aqueducts; and 7 dams—two of the last of stone at Joliet, for crossing the river. There are extensive basins at Lockport, Joliet, Du Page, Ottawa, and La Salle; three of these furnishing ample water-power for manufacturing purposes. The elevation of the summit-level made a further water-supply necessary, and therefore at Bridgeport there were erected two steam-engines to two wheels of 38 feet diameter, with buckets of 10 feet length or width, each wheel working in a stone cell or chamber, independently of the other, and each capable of delivering 15,000 cubic feet per minute upon the summit-level. The cost of these two machines was about $55,000, and they were continued in use every year, except the year 1855, from 1848 to 1870, inclusive. These pumps became useful to the city of Chicago at an early day for sanitary purposes. The drainage and sewage of the city were discharged into the Chicago river for a distance of 5 or 6 miles, their only outlet being to the lake through the same river. With the wind in a certain direction, the water of the river could not find its way into the lake; it was forced back toward the interior, and if long continued the effect upon the atmosphere was very deleterious. The pumping-engines at Bridgeport were brought into use, withdrawing the foul water from the river, emptying it into the summit-level of the canal, and as a consequence substituting the pure water from the lake for refilling the river. To obviate the expense of this pumping, the canal was deepened in 1865–71 at an expenditure of about $3,000,000, so as to carry the drainage of the south side of Chicago through the canal to the Des Plaines river. This still proved insufficient, and pumping was resumed, and in 1893 the excavation of a larger channel for the drainage was begun.

History.—The near approach of Lake Michigan and the Illinois river to each other was known to the early fur-traders and Indian missionaries of Canada. Soon after the formation of the State of Illinois from the Northwest Territory—say, in the year 1822—Congress granted the right of way through the public lands "for the route of a canal connecting the Illinois river with the southern bend of Lake Michigan," and in the year 1827 a further grant of 286,000 acres of land. In 1854 an additional grant of 32,895 acres was made to aid the State in the construction of a canal. In 1825 a board of commissioners made estimates of five several plans, varying in amount from $639,000 to $716,000, the length of the canal being about 100 miles. In 1830 engineers under the orders of the War Department investigated the question of a supply of water. In 1833 other surveys and estimates were made by the State, and the engineers reported the cost of a canal 40 feet wide and 4 feet deep at $4,043,000.

In 1836 a board of commissioners was again organized, with authority to construct the canal; surveys were made for a canal 60 feet wide at surface, 36 feet at bottom, and 6 feet deep. The estimate for the work and its appendages was $8,654,000. The work was begun in June, 1836, and was prosecuted until Mar., 1841; then was suspended until June, 1845, when, the Governor of Illinois having been authorized to negotiate a loan of $1,600,000 for the purpose of completing the canal, work was resumed and the canal was opened for purposes of navigation in Apr., 1848, at which time the

entire cost of the canal and its subsidiary works was $6,170,226. The original intention was to make a through cut from Lake Michigan to the main eastern branch of the Illinois river (the Des Plaines), but on account of difficulties and expenses it was decided to raise the summit-level one lock in height instead, and to rely for the supply of water upon the tributaries of the Illinois.

The canal reverted to the State of Illinois in 1871, the registered canal bonds, principal and interest, and the loan of $1,600,000, principal and interest, having been paid by the trustees under the terms of the contract with the State. In 1882 the State offered to cede the canal to the U. S., provided the latter would agree to enlarge it and complete works for through navigation to the Mississippi river. In 1887 this offer was repeated, but examinations showed that another route was more economical, and the U. S. began constructing a canal on that route in 1890.

In connection with the Illinois and Michigan Canal, two locks and dams have been built on the Illinois river, one at Henry, about 28 miles below La Salle, the terminus of the canal, the other at Copperas creek, about 60 miles below Henry. These improvements furnish slack-water navigation the year round, and are practically an extension of the canal. The cost of the first lock and dam at Henry was $400,000, built by the State by direct appropriation from the treasury. The cost of the second was $410,831.30, of which $62,359.80 was spent on the foundation by the U. S. Government, the balance being paid by the State, mostly from the revenues of the canal. The U. S. Government has built another lock and dam at La Grange, and is building one at Kampsville landing, intended to make navigation to the mouth of the river practicable at all times of the year. Since May, 1871, the canal has been managed by a board of three commissioners appointed by the Governor of the State.

Revised by J. J. R. Croes.

Illinois Indians: See Algonquian Indians.

Illinois River: the largest stream in Illinois. It is formed by the junction of the Des Plaines and Kankakee rivers, and, nearly bisecting the State, flows S. W., traversing Peoria Lake, and reaches the Mississippi river 20 miles above the mouth of the Missouri. It is navigable 245 miles by steamers, and, with the canal from Chicago to La Salle, affords an all-water route from the Mississippi to Lake Michigan.

Illinois, University of: an institution at Urbana, the county-seat of Champaign co., Illinois. The university was established under the laws of Congress of 1862 and 1866, and under acts of the Legislature of Illinois Jan. 25, Feb. 28, and Mar. 8, 1867. Its charter name was Illinois Industrial University; it was opened to students Mar. 2, 1868; the technical courses were early developed and were steadily kept to the front. In 1871 the institution was organized into four colleges: agriculture, engineering, science, and literature. The name was changed by the State Legislature in 1885 to its present name, without any change in organization. The Governor, superintendent of public instruction, president of the State board of agriculture, and nine trustees, elected like the other State officers, constitute the board. The campus contains 40 acres, and an adjoining farm of 160 acres which is devoted to the work of the agricultural experiment station founded in 1887. There is also a stock farm of 410 acres. The five main buildings cost $320,000. The value of scientific apparatus is over $60,000, and of grounds and buildings over $400,000; and the permanent productive funds exceed $450,000. The library contains over 20,500 volumes. The number of students enrolled in 1893 was 702. An honorary scholarship, good for four years, is awarded to each county in the State. The faculty in 1893 numbered 48, besides 7 non-resident lecturers. T. J. Burrill.

Illuminated Manuscripts [from Lat. *illumina're*, to light up, to adorn, to decorate, used in mediæval Latin of the decoration of manuscripts]: manuscripts which are ornamented by means of variety of form and color in the writing itself, and especially in the large initial and other capital letters; or by borders or fantastic scroll-work on the margins; or by patterns covering large parts of the page and either partly connected with the writing or wholly separate from it; or by pictures of figures or groups combined with the large letters, either actually within the loops of the P, D, G, O, or the like, or within a frame which incloses the letter also; or by pictures wholly apart from the writing, as modern wood-cuts are inserted in a book; or, finally, by combinations of these different processes. The beautiful Persian and other manuscripts of the Levantine nations, from the fourteenth to the eighteenth century, often have the opening pages nearly filled with elaborate ornament wholly without lettering, and other pages where only two or three brief texts in highly ornate Arabic characters are combined with the patterns. These books are generally copies of the Koran. The paintings are in the most brilliant and varied colors and gold. Chinese and Japanese books exist, some of great antiquity, in which the chirography is extremely beautiful in large and elaborate characters, but usually in simple black ink, which, however, is frequently relieved by a background of delicate painting and gilding in flowers, clouds, or patterns. These books sometimes contain large pictures, generally of the full size of the page, highly finished in water-color. Scrolls also are in use both in Japan and China. The illuminated books of Europe were usually scrolls down to the fifth century, but have been generally stitched books since that time. The art of illuminating books, derived from Greece, where it was early practiced, was never lost in Europe until sometime after the introduction of printing. No Greek manuscripts remain nor any Roman earlier than of the fifth or sixth century A. D., but some of the earliest and many Byzantine books of all times down to the tenth century at least contain pictures which are apparently rather closely copied from earlier ones. Illumination was the art which was more freely and successively practiced in Europe throughout the earlier Middle Ages than any other; and after architecture took the highest place in the eleventh century illumination continued to be the most successful decorative art next to those immediately connected with building. The books most frequently made beautiful in this way were church-service books of different kinds. Bibles and psalters; books of other than theological subject were less common, though not absolutely rare. The best epoch is perhaps the thirteenth century, when the pictures were no longer ill-drawn and were beautiful in effect, while the writing and the rich borders and ornaments were at their most perfect point of good taste and refinement, and all combined together to make the pages really extraordinary in beauty of general design. At a later time the pictures were less in harmony with the rest of the book, and the letters and borders were less refined. The use of large initial letters painted richly by hand was continued long after printed books became general. A space, perhaps an inch square, often larger, was left at the beginning of a chapter, and the first letter of the first word was printed in the middle of it, small and not noticeable, as a guide to the illuminator. The outline wood-cuts of early printed books were often painted by hand with great richness, and in these decorations the last works of illumination in Europe are preserved.

Russell Sturgis.

Illumina'ti [Lat., liter., illuminated or enlightened ones; perf. partic. of *illumina're*, for **in-lumina're*, light up; *in-* on + *lumina're*, light, deriv. of *lu'men*, for **luc'men*, light. See Light]: originally, a name (or its equivalent) assumed by, or given to, various religious societies or sects. In different ages and in different countries there have been many who believed, both in Asia and Europe, that by abstraction and devotion to God a divine light was shed on the soul. Among the best known are the Alombrados in Spain in the sixteenth century, suppressed by the Inquisition. But the name was adopted by the disciples of Jacob Böhme, Swedenborg, and many others of the seventeenth and eighteenth centuries; and a mystical and magical order, called the Illumines of Avignon, was founded in 1760 by Pernety and Grabianca. Toward the end of the eighteenth century, when the most radical theories as to government, religion, and morals were inspiring all Europe, two ideas became prevalent—the one of a skeptical philosophy, which taught men that they were free to do as they pleased; and the other of occult philosophy, by which they learned that they might become whatever they would. At this time Adam Weishaupt, born at Ingolstadt, Feb. 6, 1748, a professor of canon law in Ingolstadt, inspired partly by hatred of the Jesuits, with whom he had some personal quarrel, and instructed by certain passages in the works of Bode, a professor in Frankfort, conceived the idea of a secret society which should unite all mankind in brotherly union, introduce justice, abolish all abuses resulting from priestcraft and aristocracy, extend education, surround kings with wise counselors, and in short reform society. This union founded, it is said, May 1, 1776, received at first from its members the name of Perfecti-

bilists, and then Illuminati. It does not appear that Weishaupt inclined to magic or Rosicrucianism; in fact, his quarrel with the Rose-Croix Freemasons indicates the contrary. But his disciples were strongly imbued with these fancies. Beginning with his students, Weishaupt made rapid progress. Within three years he had lodges in Germany, Holland, and Italy, and thousands of *adepti*. The grades of initiation were those of novice, minerval, illuminatus minor and major, Scotch knight, epope or priest, regent or prince illuminatus, magus, and king. As in all mysteries of old, Weishaupt led his pupils through different grades of free thought up to complete "emancipation." A noted writer, Baron Adolph Franz Friedrich Ludwig von Knigge, joined the order, and through his influence it rapidly increased. He was the author of its elaborate constitution, which established the grades just mentioned. Weishaupt, who was a weak man, could not refrain from expressing to his neophytes his advanced opinions, and, moved by fear or jealousy, quarreled with Knigge (1784). This resulted in complete exposure, and works appeared revealing all the secrets of the order. On Jan. 22, 1785, an edict was issued for its suppression in Bavaria. Weishaupt was dismissed from the university and prosecuted, and a price set on his head. He found a refuge in Gotha and died there Nov. 18, 1830, aged eighty-three. He had used German Masonry to forward his views, having been in advance of it as regards political radicalism; French Freemasonry in its turn borrowed largely from Illuminéeism, the latter being introduced into the seven Masonic lodges of Paris by Bode, who became chief of the order after Weishaupt lost his influence. It is said that Illuminati still exist; if so, probably they are to be found in the ranks of the communists. The name Illuminati belongs rightly to the Quietists and Mystics (*qq. v.*), who have existed in one form or the other under this name since the earliest age of Christianity, but at present the word is popularly understood as applicable only to Weishaupt's order. For works on this subject, see Weishaupt, *Apologie der Illuminaten* (Frankfort and Leipzig, 1786); *Einleitung zu meiner Apologie* (1787); the Abbé A. Barruel, *Apologie des Misvergnügens und Uebels*, etc. (1787; 2d ed. 1789); A. Barruel, *Memoirs* (Eng. trans., 4 vols., London, 1797); Prof. John Robison, *Proofs of a Conspiracy*, etc. (Edinburgh, 1797); *Proofs of the Existence of Illuminism* (an abstract of the works of Barruel and Robison, by Seth Payson, Charleston, 1802). These works, however, are so prejudiced as to be of little real value to any save the most impartial reader. Also, Larousse, *Dictionnaire Universelle*, article *Illuminées*, and an article on the same subject by Charles G. Leland in the *Princeton-Nassau Monthly* (1842).

Revised by S. M. Jackson.

Illumination: See Illuminated Manuscripts.

Illusion [Lat. *illu'sio*, from *illu'dere*, *illu'sum*, to play upon by artifice; *in-* + *ludere*, to play]: mental deception of any kind. As a psychological state, illusion has two great features—first it involves *memory*, or a degree of representation. In saying we are deceived we mean that we take one thing for another; that is, what is really there is identified with something that we remember or imagine. The second factor needed is *belief* in the mental image which is thus mistaken—belief that is strong in proportion to the belief which we have in the real object recalled. Thus, if I attribute living reality to my friend whom I recall, the same kind of living reality is attributed to the person whom in my illusion I mistake for my friend. If, on the other hand, an image arises in my consciousness which recalls my fancied picture of Adam Bede, this former image is given only the fictitious reality which attaches to my mental image of Adam Bede.

From these two facts we are led to say that the ground of an illusion must be the same as the ground of our belief in the original image which the illusion simulates. The question, therefore, of psychological interest is not why do I interpret the new experience in terms of an old one, but what right have I to give the interpretation I do to the old? If I believe the new, it must be because it has the same marks which have led me to attach reality to the old.

Among the *grounds of illusion*, therefore, we have: (1) *Similarity between a new mental state and an old one.* This is the most general and evident reason for our mistaking a counterfeit image for a reality; and this similarity may be further explained as due to the presence of points of identity in the two experiences. For example, a picture recalls a friend; supppose *a b c* be points in the picture and *x b c* points in the remembered image of the friend. The resemblance consists in the identical points *b* and *c* in the two; and the friend's image comes up because it has already been started when the points *b* and *c* come up in connection with the picture. When we remember, however, that perception itself is a matter of interpretation of sensations, we get a briefer statement of this general source of illusion—an illusion becomes an illustration of mental and nervous assimilation. The elements of new stimulation do not necessarily cause their appropriate perception at all, but are assimilated to other psychophysical processes already present, and only serve to justify and intrench them in mind and body.

(2) Another reason that we attribute reality falsely is that *images of memory and imagination sometimes become as independent of our control as realities are.* We all know what it is to be haunted by a fixed or Insistent Idea (*q. v.*). Such an idea carries the mental life with it. Imagination reverts to it, thought endeavors to explain it, feeling responds to it. It becomes more firmly rooted and gathers round it all the characteristics of reality. It has this importance because it behaves just in the way that real things behave; that is, real things can not be banished by the will or affected in any way by it; so just in as far as a present mental state refuses to yield to voluntary modification, just so far it has a mark of external reality.

(3) Certain conditions of the nervous system predispose us to illusion. There are two principles of nervous action which account for this influence. Whenever any process takes place in the brain (center) we are conscious of it only at the circumference, or at the extremity of the nerve that connects this portion of the brain with the external surface of the body. For example, if any shock occurs to the center for sight in the brain we "see stars"—that is, we have sensation in the eye. After a person's arm is cut off he still feels anything down to the nerve of the stump as though it were in his absent hand. This is called the principle of nervous projection. Again, if any portion of the brain be excited by any internal organic cause, there arises in consciousness the same state as that which accompanies the same brain change when it is stimulated from without. If, therefore, from any cause, such as disease, anxiety, strong emotion, expectation, etc., a brain center is excited, mental images arise from these organic causes, and by the principle of projection they are located at the surface of the body. When we remember that all objects are at first located at the surface of the body, and that distance is an acquired judgment, what difference is there between an image aroused by such an organic stimulus and a real object?

(4) *Consistency of Escort.*—The principle of identity gives rise to illusion, since the fact that a thing fits into an appropriate escort and carries a network of familiar relationships with it, suffices frequently to make it seem identical with some well-accepted reality. Here, again, a great deal is due to the emotions and to certain particular emotions. Whenever an image is presented to us in such a way that it excites our strong interest, affection, sense of duty, or expectation, it has a direct claim upon our belief; and there is a more or less unconscious "paring down" or modifying of our former beliefs to make room for the new fact. Most illusions of sense-perception arise in this way. If we call the established fund of belief already in our conscious lives the "escort" to the new image, we may say that such an image gets a consistent escort, and thus seems to be real because of previous emotional experience in connection with it. The limit in all these cases is the extent of possible consistency of the illusory image with an escort already believed in.

Kinds of Illusory States.—Illusions proper are images which have some elements of reality, which take advantage of the points of resemblance already spoken of to substitute themselves for the new facts which they resemble. The tree in the forest is taken for an Indian, the flight of a bird in the leaves becomes the stealthy tread of the savage, and the sudden throbbing of our hearts adds distinctness and emphasis to the expectation we have of his attack upon us. Some ordinary fact is molded over into the shape of our fears. If there were no tree we would not see the Indian; if there were no sound we would not hear his footfall, and so on.

In *hallucinations*, on the contrary, the counterfeit image has no such support from fact. It deceives us by its own force and because of an attitude of receptivity toward it. Consequently, hallucinations indicate the border line beyond which health passes into disease, either in some special brain

seat or in the central organism as a whole. So the images of delirium and madness, and the occasional visions which we see when in unusual conditions of nervous excitement, are due to fatigue, fever, etc.

Range of Illusion.—It is now evident that all the processes of the mind which report fact—which construct higher products out of lower material—are open to deception. Psychology recognizes the following clear types of illusion, all falling short of the delusions of INSANITY (*q. v.*): i. e. illusions of perception, movement, recognition, time, self-consciousness, and of the logical processes.

LITERATURE.—See the "systematic treatises" mentioned in the article PSYCHOLOGY, and the pathological works cited in INSANITY. J. MARK BALDWIN.

Illustration: a picture, ornamental border, or headpiece, or the like, forming part of a book or periodical and acting as an elucidation of the text or simply as a decoration. The term is also applied to the art of preparing such pictures or drawings for books and periodicals. In these two kindred senses illustration has been an important part of book-making since printing was first used in Europe. Of the books printed before 1500 A. D., called incunabula, a number were illustrated with wood-cuts, and from that time on until the last quarter of the nineteenth century wood-engraving was the chief means of book-illustration. (See WOOD-ENGRAVING.) Prints from steel or other metal engravings have also been used, but much more rarely, except as insets, because the sheet of paper has to be printed directly from the metal plate and separately from the type; whereas wood-engravings can be printed with the letter-press. Since about 1870 photographic process-engraving has been very largely used for book-illustration, and the different arts included in this are still in their infancy. See PHOTO-ENGRAVING.

The method of illustration called *Grangerism* consists in the insertion in one copy of a book of a number of prints, maps, or pages from other books, or hand-made drawings, the subjects of which may have to do with the subject of the book chosen for illustration. Thus a Bible has been enlarged to fifty large volumes by the insertion of a great number of pictures of different sorts. The practice is hardly to be commended, because the inserted pictures will certainly be of different characters and on different scales of design: thus a copy of Rogers's *Italy*, with minute and delicate engravings after Turner, is injured as a beautiful and artistic book by the insertion of landscapes more boldly and broadly engraved, however meritorious in themselves. The passion for this kind of illustration has often led to the ruin of very valuable books by the taking of plates or wood-cuts from them to ornament the book selected for illustration. This practice is generally disapproved by lovers of books and of art.

BIBLIOGRAPHY.—See under ENGRAVING, PHOTO-ENGRAVING, and WOOD-ENGRAVING; also the notices of those artists who have done illustration: thus Reid's *Descriptive Catalogue of the Works of George Cruikshank* describes about 500 books and pamphlets. There are few treatises on illustration or illustrated books; Henry Cohen's *Guide de l'Amateur des Livres à Vignettes*, etc. (4th ed. Paris, 1880), describes books of one class; J. Brivois's *Bibliographie des Ouvrages Illustrés*, Joseph Pennell's *Pen Drawing and Pen Draughtsmen*, and C. G. Harper's *English Pen Artists of To-day* describe many nineteenth-century books.

RUSSELL STURGIS.

Illyrians: See ITALIC LANGUAGES.

Illyr'icum, or **Illyria**: a name which now has no geographical or political signification, but which at different epochs has denoted important provinces of different empires. It was in ancient times inhabited by a fierce, warlike, and savage tribe, allied to the Thracians and addicted to robbery and piracy. The eastern portion of the country, corresponding nearly to the modern Albania, was conquered in 359 B. C. by Philip of Macedon, and annexed to Macedonia. The western portion, comprising the modern Dalmatia, Croatia, Herzegovina, and parts of Bosnia, remained independent till the middle of the eighteenth century before the Christian era, when it was conquered by the Romans and made a Roman province. At the division of the Roman empire both Illyris Græca and Illyris Romana fell to the Eastern empire, but the Slavic tribes which had settled in Illyris Romana soon made themselves independent. During the Middle Ages Illyricum was divided between the Venetians, the Hungarians, and the Turks, and the name fell out of use until Napoleon in 1809 organized the Illyrian provinces, consisting of Carinthia, Carniola, Dalmatia, Istria, and parts of Croatia, and incorporated them with France. In 1816 these provinces were formed into a kingdom and annexed to Austria. The kingdom was dissolved in 1849 and for administrative purposes divided into provinces, but the territories are still Austrian possessions.

Revised by J. R. S. STERRETT.

Ilmen': a lake of Western Russia, in the government of Novgorod. It is 30 miles long by 24 broad, and is well stocked with fish, but is unfit for navigation on account of its storms and shallowness. The Volchof connects it with the Lake of Ladoga.

Il'menite: titaniferous iron. See TITANIUM.

Ilme'nium [named from the *Ilmen* range of mountains in Siberia, where the ore is found]: a supposed element announced by Hermann; regarded by Rose and by Mariqnac as impure niobium (columbium).

Iloïlo, ĕe-lō-ee'lō, or **Yloïlo**: a port of the island of Panay (see map of East Indies, ref. 3–G), Philippine Archipelago; on the southeast coast, on the strait separating Panay from Negros. Not counting Manila, it is one of the four ports opened to general commerce in 1885, and is the most important of the four. The port is a very safe one, but not accessible to large vessels. M. W. H.

Ilopango, ĕe-lō-paan'gō: a small lake of Central America, in the republic of San Salvador; bordering on the departments of La Paz, San Salvador, and Cuscatlan; situated in the center of a very fertile, well-populated, and well-cultivated plain, and celebrated for its beauty. In 1880 a volcanic eruption occurred within the lake, elevating its level and raising a cone 35 feet high, which subsequently attained a height of 200 feet.

Il Tedesco: See ELSHEIMER, ADAM.

I'lus (in Gr. Ἴλος): in Greek mythology, son of Tros, grandson of Scamander, great-grandson of Dardanus, brother of Ganymede, father of Laomedon, grandfather of Priam. In an athletic contest instituted by the King of Phrygia he won the prize of fifty youths, fifty maidens, and a spotted cow, and was instructed by an oracle to follow the cow and found a city where she should lie down. The cow lay down on the hill of the Phrygian Ate, and here Ilus founded a city, which he named Ilium, after himself. Not satisfied with this he prayed for a further sign of divine favor, and in response Zeus sent him the celebrated Palladium of Troy, for which he built a temple. His wife was Eurydice, the daughter of Adrastus. J. R. S. STERRETT.

Image-worship, or **Iconol'atry** [*iconolatry* is from Gr. εἰκών, image + λατρεία, worship. See IDOLATRY]: the worship of images, as distinguished from idolatry, or the worship of idols. According to ancient legends, images of Christ are as old as Christianity; St. Luke, it is said, left portraits both of his divine Master and of the Virgin; our Lord himself gave to St. Veronica a handkerchief upon which his face was miraculously impressed; the woman who was healed by touching his garment (Mark v. 25) set up his statue at Cæsarea Philippi. Some Greek controversialists, whose assertion is supported by Baronius, affirm that a council of Antioch in apostolic times sanctioned the worship of images; but most authorities, both Roman Catholic and Protestant, agree that they were little, if at all, used during the first three centuries after Christ; and the correctness of this opinion is borne out by the silence of heathens on the subject. They were frequently reproached by the early Christians with adoring lifeless gods, yet we read of no instance in which they recriminated; nor during the last persecution, when Christian churches were plundered, were any images seized in them. The Council of Elvira, about A. D. 300, decreed that pictures were not to be in a church, lest they should become objects of worship. In the same century Epiphanius, Bishop of Cyprus, having found before the door of a certain church in Palestine a veil or curtain whereon was a picture of Christ, tore it down, and sent a plain one to be used in its stead. St. Augustine disapproved of images, which evidently were worshiped in his time. "I have known," he says, "many adorers of tombs and pictures" . . . whom "the Catholic Church condemns and daily studies to correct as froward children." The pictures of living persons were frequently put in churches. That of Paulinus, Bishop of Nola, was during his lifetime placed in the church built by Severus. Paulinus caused the basilica of St. Felix to be adorned with

paintings of Bible stories, that the peasants who assembled there might have their minds occupied with sacred subjects. In the SIXTH century Serenus, Bishop of Marseilles, seeing that his people gave undue honor to images, caused those in his diocese to be defaced or broken. For this deed which offended many persons, he was censured by Gregory the Great, who, however, praised his zeal against the worship of things made by hands. From this time image-worship greatly increased, and in the eighth century disputes respecting it caused that great controversy (see ICONOCLAST) which raged for a time in the Greek Church. The decrees of the Council of Nicæa (A. D. 787) were rejected by nearly all Western nations, who, while adorning their churches with images, refused to worship them, and this decision was confirmed by the Councils of Frankfort (794), of Paris (825), and of Aix-la-Chapelle (829). But iconolatry spread by degrees through the whole of Europe. Miracles were attributed to a particular picture or statue, around which flocked crowds of worshipers bringing rich offerings to the church wherein it was placed. This preference for some special image—a remnant, doubtless, of the old pagans' tutelary idolatry—was discouraged by many wise ecclesiastics and condemned by the Council of Mayence (1549), which decreed that such objects of peculiar devotion should be removed from churches. The doctrine, still held by enlightened Roman Catholics, that images are mere reminders of Christ and the saints, was set forth by the Councils of Poissy (1561) and of Trent (1563, sess. 25); the latter insisted that such representations are to receive due veneration, not on account of any divinity or virtue in themselves, but because honor is thus reflected on those whom they represent.

Both pictures and statues are used in the Roman Catholic Church. The Greek Church forbids statues, but this prohibition is comparatively modern, for one of the Virgin was placed by the Emperor Johannes Zemisces (A. D. 970) in the metropolitan church, and was honored as the palladium of the state; and in the eleventh century Alexis Comnenus, needing money, caused many gold and silver images to be taken from the churches and made into coin, which act Leo, Bishop of Chalcedon, denounced as sacrilege. At the Reformation, images were condemned by Zwingli and Calvin, but Luther regarded them as unimportant ornaments, useful for instructing the people; and his followers still admit them into their places of worship. They are forbidden by the Church of England, though some of the more advanced Ritualists defend their use.

Even after image-worship was sanctioned by the popes, it was forbidden to delineate God the Father. This may be attributed partly to the influence of Gnostic theories, partly to a fear lest the idea of Jupiter should be recalled. Paulinus describes a painting where the Father is represented by a voice:

> Pleno coruscat Trinitas mysterio:
> Stat Christus agno; vox Patris cœlo tonat;
> Et per columbam Spiritus Sanctus fluit.

At a later period God the Father was represented by a hand extended from clouds, generally in the attitude of blessing. After the twelfth century he was depicted as a venerable man, frequently wearing royal or papal attire. Christ was at first represented as a lamb or a lion; afterward as a man, generally of great beauty. In the twelfth century artists began to depict him as a human being, sometimes very young, but more commonly of mature age. A dove has always been emblematical of the Holy Ghost. The cross is not merely a symbol of Christ's death, but in itself is an object of veneration by many. It is personified, as it were, and the details of its history are given. It has been made the subject of many poems, especially by Rabanus Maurus, Bishop of Mentz. Saints and martyrs are represented with certain appropriate emblems, for details of which see Didron's *Iconographie Chrétienne*; Mrs. Jameson's *Sacred and Legendary Art*, etc.

Revised by S. M. JACKSON.

Imaginary Quantities: in algebra, those quantities which arise when we have to express the square root of a negative quantity. Since the product of two negative quantities is always positive, as well as that of two positive quantities, it follows that, so long as we restrict ourselves to these two classes of quantities, a negative square is impossible. But, in stating a problem, the result will frequently come out as the square root of a negative quantity. The ordinary interpretation of such a case is that the problem involves some condition which is impossible of fulfillment. For example, if we are required to find by algebra the points in which a given straight line intersects a given circle, it may happen that the straight line and circle are so given that they do not intersect at all. Then the algebraic solution will give the square root of a negative quantity. Such problems were formerly called impossible ones, and it was thought that no valid conclusion could be reached by considering them. In modern mathematics, however, the consideration of the quantities to which they give rise is necessary to the completeness of algebra; we shall therefore explain how mathematical ideas are expanded so as to include them.

Let $-a$ be any negative quantity. Its square root will be represented as $\sqrt{-a}$. But whatever a may be, we can write $-a$ in the form $a \times -1$. Hence we shall have $\sqrt{-a} = \sqrt{a} \times \sqrt{-1}$. Here a being supposed positive, $\sqrt{a}$ is an ordinary real quantity, and the imaginary element is represented by the other factor. Now, if we *imagine* a quantity whose square is -1, and represent it by the symbol i, we can perform all the algebraic operations we please, and extract roots of negative as well as of positive quantities. This fictitious quantity i is called the *imaginary unit*. Its square being -1, its cube will be $-i$, its fourth power will be the negative of its square, that is, $+1$, etc. Hence, although it is imaginary in itself, all its even powers are real quantities. Where they enter they can be interpreted in the usual way; the difficulty is to interpret i itself. To show how this may be done, let us illustrate the general principle of extending the meanings of mathematical operations to cases in which they originally were not applied.

As first understood in arithmetic, to *multiply* a quantity means to add it to itself a certain number of times; that is, to find its product by a whole number. As thus defined, there can be no meaning to multiplying by a fraction. But as soon as we come to fractions, we extend the meaning of the word multiplication to fractions, by defining multiplication by a fraction as meaning to take that fractional part of the quantity. Thus to multiply a quantity by three-fourths means to take three-fourths of it.

When we come to algebra we find multiplication by negative quantities. As defined in arithmetic, multiplication by a negative quantity has no meaning. But in algebra we introduce the additional conception of changing the direction or sign of a quantity, and we say that when a quantity is multiplied by a negative multiplier it must be conceived as changed from a subtractive to an additive quantity, or *vice versa*, or to be counted in a contrary direction to which it actually lies. For example, if we consider the quantity as the distance measured from a point, O, toward the right, on the straight line BA, then when we multiply it by a positive multiplier the product is counted toward the right; if we multiply it by a negative multiplier, it means that we simply measure off the distance from O toward the left, on the same line. Multiplying by -1 will only change the direction of the line multiplied from right to left without altering its length; if $OA = a$, then $-a = OB$.

$$\underset{B}{-a} \qquad \underset{O}{} \qquad \underset{A}{+a}$$

So far, an imaginary quantity has no meaning whatever. But this principle of multiplying suggests a method of assigning it a meaning. Since the square of the imaginary unit i is -1, it follows that the operation of multiplying a line twice by this unit must be such as to turn the line in the opposite direction without changing its length. This condition is fulfilled by making it turn the line through a right angle. If, then, we call the motion of the line through 90° *multiplying by* i, we see that everything will be quite consistent; four multiplications will restore the line to its original position, just as $i^4 = (-1)^2 = +1$.

This representation of the imaginary unit seems to have been introduced by several mathematicians about the beginning of the nineteenth century, and is now universally adopted.

The sum of real and imaginary quantities is combined according to a rule for the addition of vectors, which we shall proceed to explain. By a *vector* is meant a line which is considered to have direction as well as length. Having the two elements of direction and length, a given vector, if moved about, is supposed not to change its direction; should it do so it is transformed into a new and different vector. Now, as in elementary mathematics we may add two lines by placing them end to end and forming a new line with their sum, which sum is the distance from the beginning of

the first line to the end of the last, so we may add several vectors, as OA, OB, OC (Fig. 1), by placing them end to end without changing their direction, as in Fig. 2. Their sum is then conceived to be the vector OC, from the beginning

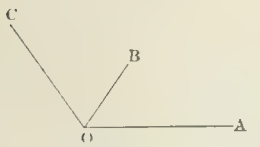


FIG. 1.

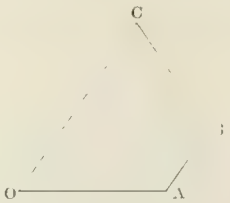


FIG. 2.

of the first to the end of the last one when thus put together. So with imaginary quantities; a real quantity is considered to be represented by a vector drawn horizontally from a given point, O, while any number of imaginary units is, in accordance with the system just explained, conceived as represented by a perpendicular line equal to the number of imaginary quantities. The sum of real and imaginary units is therefore represented by drawing one line, OB, Fig. 3, horizontally, to represent the real units, and the other one, BM, vertically, to represent the imaginary ones. Then, in accordance with the convention, the sum of these lines or vectors is the line OM, from the beginning of the first to the end of the second. If $OB = a$ and $BM = bi$, the length BM being equal to b units, then we have OM, considered as a vector, equal to $a + bi$. But if we leave out the element of direction, and consider only the length, we have, by the property of right triangles,

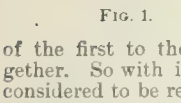


FIG. 3.

$$\text{Length, } OM = \sqrt{a^2 + b^2}.$$

This quantity, $\sqrt{a^2 + b^2}$, is called the *absolute value*, or *modulus*, of the expression $a + bi$. It must not, however, be supposed that all problems into which imaginary quantities enter can be interpreted in this way; such is the case only when we make this special use of the imaginary quantities. In pure algebra the imaginary unit need be nothing more than what we have already defined it, namely, a quantity whose square is -1, to which we are not required to give any meaning, any more than we are to simple x, when we use it in an equation. The great advantage of using it is that all equations in algebra thus become susceptible of a solution. Without it we should have to say, for example, that some quadratic equations had two roots, while others had none at all; that some cubic equations would have one root only, and some would have three, etc. But when we allow ourselves to use the imaginary unit, then every quadratic equation whatever, even if its coefficients be imaginary, will have two roots, every cubic equation three roots, etc. Thus for algebraists these quantities are just as real as any others, and they have the great advantage of making algebra into a complete science.

S. NEWCOMB.

Imagination [viâ O. Fr., from Lat. *imagina'tio*, deriv. of *imagina'ri*, imagine, liter., make an image for one's self, deriv. of *ima'go*, *ima'ginis*, image, whence Eng. *image*]: the general representative function of mind, the power of representing by images, thus including memory and association, as well as the constructive working up of images. The material of the imagination is supplied entirely by the earlier function of presentation. The imagination never creates. It serves only to give form to ideas revived. The data of sense perception and self-consciousness supply all its content. And, further, its material is always capable of being represented in the form of memory pictures.

Power of Imaging.—The power of recalling mental pictures varies greatly with individuals and at different periods of life. Images of sight are most distinct and lasting and become our type of memory pictures in general; they arise also and become fixed very early in child life. Persons who have this power to a marked degree are known as having good imaginations, though simple revival of images is the most rudimentary form of imagination. It may be a bane to the mental life rather than an advantage, as in the case of insistent and fixed ideas. The images of childhood are strongest in our memory. The attention at that period is not burdened with details, and trivial things are of great interest and importance: such images are also recalled so often in after years that repetition gives them great vividness and numberless associations. Many old people are constantly led back in conversation to their childhood, even when memory of middle life is failing. Galton has found the further remarkable fact that a small proportion of persons have a peculiar mental scheme or diagram in consciousness in which they arrange numbers, colors, etc., when imaging them. "Number forms" and other such peculiarities seem to be innate and hereditary. Cases have long been known of individuals who attach particular colors to particular sounds, such as green, blue, etc., to certain letters of the alphabet. Grüber has recently reported "disparate associations" of this kind between sight and taste, sight and smell, sound and taste, etc. He even finds in one subject certain tastes accompanying degrees of muscular exertion, and colors attaching to temperature sensations.

Passive Imagination.—By passive imagination is meant the spontaneous uncontrolled play of images in consciousness, from whatever cause they spring, and in whatever arrangement they take form. It finds its simplest type in the incoherent forms of dream consciousness. Here there is no mental supervision of the flow of ideas, no true appreciation of their relative value for the mental life, no exercise of will in selecting or combining them. The physical and intellectual causes of their production are free to work their own effects, and the result is the storming of consciousness, in its helpless state, with all the missiles of sense. The *physical basis* here presents its most complex and intricate activity, as is seen in the boundless combinations presented. From the nature of the brain, the nerve elements which represent unessential or accidental mental modifications are very readily excited. The corresponding mental states are outside the chain of ideas, and seem quite detached and irrelevant; but in their physical basis they are reasonable effects. And this result is indefinitely added to by the interplay of different cerebral trains. The entire brain vibrates with its single members, and surcharged parts are thus excited by connections perhaps so delicate and fine that there are no elements in consciousness corresponding to them. Thus images far removed in thought from one another and never consciously connected are thrown together in imagination. This state of complete confusion in consciousness rarely extends over its whole area, however; for while we are conscious at all there is a greater or less degree of mental supervision. Even in dreams there is a glamour of logical or æsthetic consistency thrown over the most inconsistent elements. We think we are making convincing arguments or reciting delicious stanzas, when, awaking, we find it the most meaningless jargon. And in states of light dreaming, when the picture as a whole is coherent, new excitations of the senses are accommodated to it.

As has been said, dreams are the most evident type of the free play of this physical causation. When we are asleep, the active, distinguishing, correlating, and arranging function of mind is at rest; some of the senses are freely open to excitation from without, and the mechanical element of our personality is predominant. Moreover, the withdrawal of the blood-supply from the brain, which is the usual accompaniment of a reduced consciousness, tends to alter the relative potential of its parts. It facilitates the discharge of isolated regions, or exposes elements whose ordinary activity is covered by larger or more recent connections. As would be expected, very young children dream little. In our waking states, also, we often indulge in the state of uncontrolled representation, which passive imagination presents. When we relax all mental exertion, and fall into reverie or day-dreams, this spontaneous flow of images is realized. Yet the play of representations is never in our waking states so detached and incoherent as in dreams. We can usually detect, even in our states of completest intellectual abandon, the successive connections in trains of ideas, governed by the principles of regular association.

The mental side of passive imagination is of more importance and of greater obscurity than its physical basis. And yet its phenomena are in the main of the same nature. The most striking characteristic of imagination is the strange and wanton nature of its combinations. Detached parts of former images are combined in unexpected and ridiculous forms. Monsters before unknown are put together from earlier creatures of thought. Situations are devised which involve persons and places impossible to be reached or associated in real life. But all that we know of the case leads us to the opinion that, even in its most extravagant forms,

the material of imagination still obeys the principles of association.

Imagination, in its passive form, takes on two general modes: we first find a breaking up of the complexes of experience into their elements, small or great, and second, we find that these elements take on new shapes.

The former process, called *dissociation*, is often due to the breaking up of physical connections in the brain. The fact of forgetfulness or fading of memory is largely to be explained by the separation and dissolution of brain circuits. The command of a language, for example, may be lost from injury to the brain leading to the loss of verbal memories or to the impairment of the movements of pronunciation. But single words or letters, parts of former groups, may remain clearly before us. By the dropping away of certain elements of a complex whole the others become more vivid and the result is a more or less complete analysis. And the same is true of the mental side of our memory: mental groups are acted upon variously by the attention, and attain different degrees of permanence in memory; so parts or elements of these groups may also be affected. Of a long argument I may remember, without effort, only a single step. Of a face only the nose, perhaps, or the chin, is clear in memory. The whole of a word or sentence is often brought up in memory from the persistence of a single letter or combination which before attracted the attention. Consequently, in the progressive fading which all representation undergoes, parts of groups, or elements of single images, fall away, while other parts or elements stand out alone. This, as before, constitutes a more or less complete analysis of former complexes. In associations by resemblance points common to the two resembling presentations get similar emphasis.

Fancy.—The combining function of passive imagination is called *fancy*. Fancy is the familiar decking out of commonplace experience with images brought from distant and unexpected regions. Incongruous elements are placed in juxtaposition, grotesque forms grow up from most familiar elements, the most extravagant antitheses, and even contradictions, are allowed indulgence in this delightful license of thought. It brings freshness into the midst of tedious processes, and, in its subtle refinements, appeals directly to the emotional and æsthetic nature. The passive automatic play of fancy is to be emphasized in contrast with the more purposive construction of active imagination, which remains to be considered.

We may notice also the *enlarging* and *diminishing* functions of fancy. It brings about unexpected and grotesque alterations in the size of things. Pygmies and giants are ordinary acquaintances of our fancy. Things which we fear or dread are apt to be very large, and things which we ridicule or despise very small. It is probable that this, as many other aspects of the imagination, is due largely to the emotional coloring of the time. The ordinary correctives of reality and thought being wanting, the presentative life is at the mercy of the emotional. The idea which calls the emotion forth accommodates itself to the emotion, by way of justification for it.

Constructive or Active Imagination.—In analyzing the process of construction by the imagination we proceed upon the account already given of the passive play of images. That is, the dissociation of the elements of former ideal complexes is assumed, and their readiness to be recombined under the guidance of an idea or "plan." We may distinguish four factors or moments in the process of construction: *Natural impulse* or *appetence*, *intention*, *selective attention*, and *feeling of fitness*. By natural IMPULSE (*q. v.*) is meant the trend or prevailing direction of a man's habit, desire, and preference. This supplies the motive power in all his constructive work. Further, the narrowing down of one's impulsive tendencies to a particular kind of endeavor, as in art, invention, etc., serves to define his *intention*. Professions are chosen, associations formed, pleasures indulged in, all of which both satisfy this permanent desire and strengthen it. The scientific man has a constant impulse or "intention" toward the objects of his science. It has become to him the chosen channel for the expenditure of his intellectual energy. The artist likewise finds his whole life devoted to the pursuit of the forms which gratify his æsthetic nature. His consciousness is filled with images of the beautiful, and his intention is so spontaneous that it leads right on to volition.

In *selective attention*, however, we reach the influence which controls the constructions of imagination. Presupposing the native preferences and tendencies which have been spoken of, the will, in attention, builds up images, which meet its purpose, into forms of novelty and beauty. The attention is given to reproductions with this construction in view. The scientist or artist views his ideas as so much material, to be directly used for the purpose of his science or art, and each image in turn is scrutinized, alone and with its escort, to discover the possibilities of combination which lie inherent in it. Images which do not present promise of usefulness in the construction are withdrawn from attention and fade away; others which fit into the growing temple of imagination are changed, divided, refined, combined, and cast into forms more complete or beautiful.

The psychological value of this phase of the imagination consists in the prolonged and concentrated mental reaction which it involves: what Newton called "patient thought." Surface analogies are seen by the common mind, and need no effort of construction; but the hidden properties, the relations which spread wide out through nature and art—these are discovered only when the veils that conceal them are pierced by the power of constructive thought. Every scientific hypothesis is such a piece of construction. Only the properties of the matter in hand are taken which, by the selective attention, can be arranged in a logical framework, to be tested by further appeal to fact. Causes are imagined to be working alone, although never so found, and their effects constructed. "So Newton saw the planet falling into the sun, a thing that did not take place, but which would take place if the tangential force were suppressed" (Rabier, *Psychologie*, p. 233). Such imagination is the mark of GENIUS (*q. v.*).

The attention has a twofold part in imagination. First, it is *exclusive*, that is, it excludes representations which have no meaning for the task in hand. This is not a positive banishment from consciousness, since that is impossible. The effort to banish an idea only makes it more vivid, while the attention is held fixed upon it. But it consists in the neglect of this particular idea, as unsuited to the purpose of present pursuit. Thus withdrawn from attention an image sinks into subconsciousness and is practically banished. Second, it is *selective*: an image is held clear before consciousness and thus found available in the growing result.

It must have become evident that this selection of images by the attention proceeds upon some principle. There must be some criterion of choice, something either in the images themselves or in the end which they are to subserve, which renders some available and others useless. The perception of this fitness requires an end or purpose held in conscious thought which is to be realized by construction. That is, the will is exerted only for the accomplishment of something which is presented as an idea, i. e. is an *ideal*. This end or ideal aim may be the vaguest and most general notion, having only the characteristics of the general class to which it belongs. An artist desires to make something beautiful, or something expressive; an inventor, something useful. They begin, with this vague thought, to select their images. And as the construction proceeds, it is as new to them as to others, and satisfies them, if it meet the general requirement of their first thought. Later in the growing process the end becomes more definite, as the possibilities of the creation become evident. The artist then projects lines of possible combination, to be filled in by actual representations.

The further element is a feeling of adaptation to this end. It seems to consist in a sense of the adaptation of means to end. Only by it is the exclusive and selective attention guided in its choice of elements. As a feeling, it extends throughout our entire mental and active life. We pass involuntary judgment on the fitness of an instrument for its use, of the material for a garment, of an officer for his office. This feeling, in its variations in individuals, is in large part the basis of artistic talent. The general proportions of things, the relative value of details, the harmony of discordant meanings, the reduction of varied elements to a fundamental motive—these and many other problems of the artist call this feeling prominently into play. He says: "I know not why, but I *feel* that it must be so." Some men are almost destitute of such a sense. They show its lack in the absence of personal and room adornment, in incongruous and peculiar actions—actions inappropriate to the circumstances. This lack may be summed up concisely as either the want of constructive imagination, or the want of the sense of fitness in selecting its material.

Scientific Imagination.—The scientific imagination is the imagination occupied with the discovery of truth. The

imagination is the prophetic forerunner of almost all great scientific discoveries. In science the mental factors seen to underlie all imaginative construction are called into play in a highly exaggerated way. The associative material presented covers, generally, the whole area of the data of the scientific branch in hand: familiarity with the principles and laws already discovered is assumed, and, in general, a condition of mental saturation with the subject. Native taste, preference, and personal interest are also here highly significant. There is as distinctly a scientific genius as there is an artistic genius. Great discoverers in science have a facility in discovering deep-seated analogies and relations, an appetence for positive truth, a tendency to accept only the confirmed deliverances of nature herself. They generally are men of great emotional soberness and intellectual enthusiasm, if the antithesis be allowed. Further than this, their imaginative process is largely under control. This is no doubt the great essential, the preponderating force of the exclusive and selective attention. Not only do great scientists see deeply, but they are able, from an exquisite sense of relative values in nature, and of relative fitness in fact, to dissect, arrange, and classify, until from a few great general resemblances the construction of a law is possible. And it is only by this act of relating attention, or apperception, that the actual law is finally constructed. A minor scientist may collect data and draw from them generic resemblances, but, with all his study and effort, he does not construct. The trained, refined, and nature-given constructive force of attention alone does this, and thus becomes in the highest sense creative.

Æsthetic Imagination.—The æsthetic imagination differs from the scientific, especially in the end toward which the constructive process tends. Assuming the same factors or stages in its development, the difference is seen in the fact that the end is no longer knowledge, but beauty. The selective attention therefore, in this case, singles out elements which satisfy the sense of the beautiful, whether or not its construction is realizable in the combinations of fact. The æsthetic imagination is accompanied by a lively play of pleasurable excitement, which continues throughout the continuance of the constructive work. It receives great re-enforcement or decrease, according as the conception is skillfully or poorly worked out. The emotional life is more intimately concerned than in scientific construction, and, instead of disturbing, it greatly assists the operation. The forms of æsthetic construction are also more instantaneous and inexplicable, for the reason that they arise from an emotional stimulus, and have no logical and, often, no conscious development. Great artists are usually men of strong emotional temperament, and frequently show a corresponding lack of high practical and theoretical judgment. Their conceptions take shape spontaneously, with little selection of elements, or conscious blending, and when once satisfactorily executed, they are unwilling to admit modification except in unimportant details. Further, the corrective standard of reference is now not reality, but an ideal of universal acceptance—a form not found in nature, but of which nature in her perfect working would be capable. The question as to the true province of art, imitation or construction, as the two great theories, realism and idealism respectively, announce it, can not be long unsolved from a standpoint of the psychology of ideals. If art is the production of the imagination at all, its ideals are imaginative constructions, not natural facts. The act of putting a conception in oil or marble is not alone the artist's part—a machine might do it better. The art value extends to the conception. The execution is only the more or less adequate means of expression. If imitation of particular things, therefore, be the whole of art, execution would be better left to the camera and the death-mask. There is no reason that æsthetic ideals should not surpass nature as much as the forms of practical invention surpass her rude contrivances for using her own forces. Nature never constructs a phonograph, just as she never puts human thought and aspiration into simple color and form.

References.—See Psychology for systematic treatises; also Galton, *Inquiries into Human Faculty* (London); Flournoy, *La Synopsie*; Krohn, *Pseudochromæsthesia*, in *American Journal of Psychology*, vol. iv.; Calkins, *ibid.*, vol. v.; Baldwin, *Elements of Psychology* (New York, 1893), chap. xiii.; Ward, *Encyc. Britan.*, art. *Psychology*; Hamilton, *Lectures on Metaphysics*, xxxiii.; Carpenter, *Mental Physiology*, chap. xii.; Queyrat, *l'Imagination et ses Variétés chez l'Enfant* (Paris, 1893).

J. Mark Baldwin.

Imbabu'ra: a northwestern province of Ecuador; bounded N. by Carchi, E. by the republic of Colombia, S. by Pichincha, and W. by Esmeraldas; area, 2,415 sq. miles. Most of it is included in the basin or inclosed plateau of Ibarra, similar to the so-called valley of Quito, and surrounded by high mountains of the Andes and Western Cordillera. The volcanoes of Ibarra and Imbabura are properly within the basin, belonging to neither of the great chains. The river Mira, breaking through the Cordillera, makes its way to the Pacific. Cattle-raising is the principal industry. The province suffered terribly in the great earthquake of Aug. 16, 1868. Pop. (estimated, 1889) 68,000. The capital is Ibarra (*q. v.*).

Herbert H. Smith.

Imbecil'ity [from O. Fr. *imbecilite* < Lat. *imbecil'litas*, weakness, deriv. of *imbecil'lis*, *imbecil'lus*, weak]: a condition of mental weakness or defect distinguished from *idiocy* simply by the lesser degree of mental weakness. Where the degree of weakness is but slight the patient may be referred to as being only "feeble-minded." Obviously there are three points of view from which the subject is to be considered: viz., the medical, the medico-legal, and the legal. For a treatment of imbecility from a legal standpoint, see Jurisprudence (Medical) and Insanity.

From the medical standpoint attention must be given to the causation, morbid anatomy, prognosis, and treatment of the condition. Imbecility is either congenital or acquired in early life, before the mental faculties have become developed. What is commonly referred to as the imbecility of old age should be termed *senile dementia*.

The majority of cases of idiocy and imbecility will be found to be due to heredity, to consanguinity, alcoholism, immoral habits, or certain diatheses or taints of the parents, either singly or in conjunction one with another; or, more rarely, to accident or fright of the mother during pregnancy, to injuries in childbirth, such as compression of the head, asphyxia, or apoplexy, or to disease, faulty nutrition, or injuries during infancy or in early childhood. These less frequent causes may either originate the trouble or act as excitants to that which was really congenital but latent. Statistics compiled by the best observers seem to prove that though other malign influences, such as inebriety and scrofula, are usually co-operating for evil, intermarriages of those closely related by consanguinity are, as a rule, marked by a mental and physical deficiency in the children.

Of the other causes of imbecility the larger number are those occurring at childbirth, often due to the misapplication or to the non-application of instruments, and, again, often occurring through no fault of the obstetrician. Prof. Osler believes that "failure of mental development is one of the most serious consequences of hemiplegia"; that "idiocy is most common when the hemiplegia has existed from birth," and that imbecility resulting from hemiplegia "often increases with the development of epilepsy." Lastly, there are some children who seem to develop normally up to a certain point, when from some cause, often a hidden one, cerebral growth is checked and they become imbecile. In many cases convulsions are the cause of this sudden arrest of mental growth.

A detailed account of the morbid anatomy of imbeciles would be out of place here, but it may suffice to say that the patients are apt to be deficient in physical as well as mental development, to be phthisical, scrofulous, or rachitic, to be dwarfed or deformed, often in more than one particular, and that a peculiar physiognomy indicates the lack of normal intelligence. The brain will, of course, be found deficient in some respect or another, and, as Griesinger says, "there is scarcely any portion of the brain which has not been found either altogether absent or quite rudimentary in imbeciles." There may be cerebral atrophy or sclerosis, and the lesions of hemiplegia, hydrocephalus, or epilepsy may be coincident with imbecility and have due weight in its causation.

The cranium may either be normal in size and shape or larger or smaller than normal, and with certain marked peculiarities. It is to be noted that "the bones of the skull are thick, the sutures abnormally obliterated, and the various foramina are liable to narrowing." It is also supposed that the growth of the brain is interfered with by "premature union of the basal sutures."

Among imbeciles the ability to form abstract ideas is lacking, the capacity to receive instruction is limited to but one or two subjects, and though the memory is sometimes strong, the contrary is usually the case, and judgment is

practically always deficient. The power of speech is often a valuable index of the degree of imbecility, varying from a total inability to speak in idiots to a comparative fluency and good use of words in those whose mentality is only feeble.

The prognosis of imbecility is not favorable to extended duration of life. Many are specially prone to tuberculosis and kindred diseases, and almost all, owing to their defective physical constitution, are unable to withstand harmful influences which would be successfully resisted by those of normal vitality. There is a chance, however, in many cases for considerable mental improvement under proper treatment, and it is said that better results often are obtained with some cases that are congenital and apparently hopeless than with others where the imbecility has been acquired and would, at first sight, seem to promise good results. To quote a prominent writer, "As a result of education and training, a small proportion may be permanently improved, so as to take care of themselves and earn their own living. Others, in large numbers, will be able to support themselves under suitable guardianship, while a still larger proportion will never advance beyond a certain point, will always remain liable to retrograde changes, and will demand continuous supervision." Consequently, unless the condition is one of hopeless idiocy a chance should be given wherever feasible for possible enlightenment and improvement. Obviously, the treatment must consist in the use of all hygienic and therapeutic measures to improve the health, strengthen the constitution, and remove or improve physical deformities and weakness; in proper educational methods, carefully employed to develop the brain and to awaken whatever latent mental powers may exist, and, in suitable cases, in surgical operations upon the skull and brain. Each case must be studied and treated by itself.

Experience seems to show that cases due to eclampsia, epilepsy, or inflammatory changes are not hopeful ones; that the improvement of those due to traumatism will depend upon the character and extent of the injury; that microcephalic patients are not capable of more than the simplest training and education; and that some of the most favorable results are to be looked for from certain hydrocephalic and genetous (congenital) cases, though many of the latter class are among the most hopeless. This is as regards training and education. Patience is an absolute essential in the teacher, and the utmost endeavor must be made to find the faculties that are the strongest and most capable of development in the patient, for often a child that is absolutely inert in one respect may attain to considerable brightness and efficiency in another. Manual training has been of the greatest value, and seemingly wonderful results have followed its employment in a number of cases, which is sufficient to indicate that it should always be given a trial.

About the year 1891 Lannelongue proposed the operation of linear craniotomy or craniectomy for the relief of those cases in which the cranium is smaller than normal and the development is apparently checked for want of room; viz., in the microcephalic, or where there has been premature closure of the sutures and fontanelles of the skull. Although the operation is a new one, it has been performed a number of times, both in Europe and in the U. S., and apparently with the best results, many of the patients showing rapid mental development after it, but it is still rather early to determine its ultimate place in the treatment of these cases. Besides the microcephalic cases, the operation would probably be of benefit in certain genetous cases where, as Starr says, "the increased space given the brain by operation stimulates its growth and development," and in cases due to epilepsy or traumatism where there is evidence of depression of the skull or pressure upon the brain. It would probably not be of any avail nor justifiable in cases due to convulsions or to inflammatory action. It must be remembered, also, that such operations are not without considerable risk when performed upon children.

The duty of the State to protect and care for all these unfortunates has long been recognized in the U. S., and there are many institutions, both public and private, where the highest skill is available to maintain their physical welfare and to develop to the utmost the latent faculties. Happily, the good results obtained in many of the cases show that such care and work are neither wasted nor in vain.

SENECA EGBERT.

Im'brex, LICINIUS: a Roman comic poet of the first half of the second century B. C., of whose play, *Neura*, a single fragment is preserved.

Imbriani, VITTORIO: poet and critic; b. in Naples, Italy, Oct. 24, 1840. While still a youth he turned from his historical and philological studies, and became a soldier of the war of liberation of 1859. In 1866 he was a volunteer in Garibaldi's army, and throughout his life he took an eager and sometimes violent interest in the political affairs of Italy. At the same time he did not neglect literature, though his work as a scholar suffers in many ways from the vehemence of his nature and his dislike of the trammels of accepted opinion. Perhaps his best contribution to learning has been his collections of Italian popular poetry and tales: *Canti popolari delle provincie meridionali* (2 vols., 1871–72); *Dodici canti pomiglianesi* (1877); *La novellaja milanese* (1872); *La novellaja fiorentina* (1877), etc. As a critic he has published *Fame usurpate* (1877); *Appunti critici* (1878). A collection of poems with the odd title *Esercizj di prosodia* contains some really powerful verses. D. Jan. 1, 1886. A. R. MARSH.

Im'bros (in Gr. Ἴμβρος; in Turk. *Imros*): a mountainous island in the Ægean; 11 miles W. by N. from the Dardanelles. It is 24 miles in circuit, well-wooded and fertile, producing oil and wine, and abounding in game. Homer calls it the "rocky," παιπαλοέσσης. Belonging to the Ottomans, it frequently serves as a place of banishment for disgraced pashas. The highest peak is 1,833 feet above the sea. Pop. 3,000. E. A. G.

Imhof, čem'hōf, JACOB WILHELM: genealogist; b. in Nuremberg, Mar. 8, 1651; studied at Altorf; traveled much in Germany, the Netherlands, France, and Italy, and settled in 1673 in his native city, where he devoted himself to genealogical studies. His most important works are *Spicilegium Ritterhusiannum* (6 vols., Tübingen, 1683–85), containing seventy new genealogical tables, and *Notitia S. R. G. Imperii procerum* (2 vols., Tübingen, 1684), of which a fifth edition was issued in 1732, containing fifteen plates of arms. He also made numerous genealogical contributions to English, French, and Italian history. D. in Nuremberg, Dec. 20, 1728.

Imitation, or **Imitative Suggestion** [Lat. *imita'tio*, deriv. of *imita'ri*, imitate; akin to *ima'go*, image]: the repetition in movement or thought of what is seen, heard, or received by suggestion from another. For a long period after the child has learned to use all his senses, and after his memory is well developed, he entirely lacks conscious imitation. Preyer attributes imitation to his child at the age of three or four months; but other observers have been unable to find *bona-fide* imitations until the fifth or sixth month, even when allowing for differences in children. But when the imitative impulse does come, it comes in earnest. For many months after its rise it may be called, perhaps, the controlling impulse. Its importance in the growth of the child's mind is largely in connection with the development of language and of muscular movement.

The phenomena of imitation may be divided into two general classes, called "simple" and "persistent" imitation—Preyer's distinction between "spontaneous" and "deliberate" imitation (*Senses and Will*, p. 293). Most psychologists think that he is wrong in making both classes voluntary. By the phrase "simple imitation" reactions are characterized in which the movement does not really imitate, but is the best the child can do. He does not try to improve by making a second attempt. It is peculiar psychologically only because of the more or less remote approximation the reaction has to the movement which the child copies. Viewed more technically, the reaction at which imitative suggestion aims is one which will reproduce the stimulating impression, and so perpetuate itself. When a child strikes the combination required, he is never tired of working it. He finds endless delight in putting a rubber on a pencil and off again, each act being a new stimulus to the eye. This is especially noticeable in children's early efforts at speech. They react all wrong when they first attack a new word, but gradually get it moderately well, and then sound it over and over in endless monotony. The essential thing, then, in imitation, considered as a phenomenon of suggestion, is that *the stimulus starts a nervous process which tends to reproduce both the stimulus and the process again.* On the physical side we have a circular activity, sensor process, motor process, new sensor process, new motor process; and on the psychological side a similar circle: reality, image, movement, new reality, new image, new movement.

But in *persistent imitation* we have a very different phenomenon, marking the transition from "suggestion" to "vo-

lition." Persistent imitation is necessary as a stimulus to the tentative voluntary use of the muscles. Suppose a child endeavoring, in the crudest fashion, to put a rubber on the end of a pencil after seeing some one else do it—a kind of imitation very common with year-old children. What a chaos of ineffective movements! But after repeated efforts, he gets nearer and nearer to it, and finally succeeds. Thus, simply by imitation, many of the most valuable combinations of muscular movement are acquired. The important psychological fact here is that the child is not satisfied with any movement brought up by association, but repeats his effort to get a particular movement; and it is just this apparent violation of association that constitutes real volition. See WILL.

REFERENCES.—Bain, *Senses and Intellect*, p. 413 f. (3d ed. London and New York, 1876), and *Emotions and Will*, p. 344 f. (3d ed. London and New York, 1888); Preyer, *Senses and Will*, chap. xii. (New York, 1890); Tarde, *Les Lois de l'Imitation* (Paris, 1890); Sighele, *La foule criminelle* (Paris, 1892); Sully, *The Human Mind*, vol. ii., p. 218 f. (London, 1892); Compayré, *l'Évolution intellectuelle et morale de l'Enfant* (Paris, 1893); Baldwin, *Science*, Feb. 27, 1891, *Imitation: a Chapter in the Natural History of Consciousness*, in *Mind*, Jan., 1894, and *Mental Development in the Child and the Race* (New York and London, 1894).

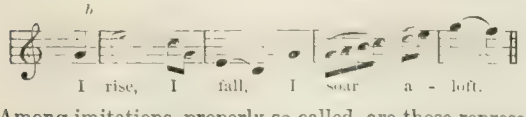
J. MARK BALDWIN.

Imitative Music: such music as is intended to be representative, descriptive, or suggestive of certain ideas and things *external to the music itself*—i. e. to music considered as mere melody and harmony. Music thus possesses two distinct properties or offices. A strain of music may be beautiful, grand, and impressive in its own nature, and capable of producing in the mind certain peculiar feelings and sentiments not obtainable from any other agency; or, on the other hand, music may be so contrived and ingeniously written as to bear so near a resemblance to particular external objects, sounds, motions, and even strongly marked events, as to recall them to the mind of the hearer, in *addition* to the emotions arising out of its own intrinsic powers and emanating from itself alone. A similar effect may also result from mere association of ideas—as, for instance, when theatrical music reminds us of the theater, and church music of the church, because the music and the place where it is generally heard have become associated together in our minds. But such a case must not be confounded with what we call imitative music. Nor can the mere reproduction of certain sounds under new conditions—as, for instance, when the actual notes of the hunter's horn, the military bugle, or the chimes and changes of church-bells are played on other instruments—be included under this term; they are mere copies.

The simplest kind of imitative music is that which represents *motion*, whether on an even plane, or on ascending and descending grades, or by leaps from high to low and low to high, etc. There seems to be some mysterious analogy very generally felt between the grave or acute in the musical scale and the familiar idea of depth and height. When we move from the graver part of the scale to the more acute we call it *ascending*, and progress from acute to grave we call *descending*. A sound is said to be *high* or *low* in proportion as it is acute or grave, and the extremes are regarded as very deep, profound, and abysmal, or very high, lofty, and soaring. Advantage is taken of this impression by composers when they connect with words signifying motion, height, depth, etc., notes suggesting corresponding ideas. That this resemblance is not altogether arbitrary or fanciful, but founded on some natural principle, will appear from an examination of Ex. 1, where at *a* the music and the words seem to be in antagonism, while at *b* they mutually support each other:

Ex. 1.—*a*

b



Among imitations, properly so called, are those representative—or at least suggestive—of a large class of *noises* or *unmusical sounds*, such as the roar of cannon, the clashing of swords, the tramp of horses, the steady marching of troops, the cries of wounded men, the wails of the distressed, and the groans of the dying; the solemn movement of a funeral procession, and the elastic spring of merriment in a ball-room; the familiar sounds uttered by domestic animals, the lowing of cattle, the screams and roaring of wild beasts, the croaking of frogs, and the buzz of insects; the pattering of rain and the clatter of hail; the roll of distant thunder, the moaning of the wind, and the furious rushing of the storm. All these and many other noises, including crying, sneezing, and uproarious laughter, the hum of the spinning-wheel, the strokes on the smith's anvil, the chirp of the cricket, and the rocking of the cradle, have been imitated with more or less success in musical compositions; or, in other words, musical forms and combinations have been so used as to remind the hearer of things which are essentially *un*musical.

More nearly approaching the sounds represented on the diatonic and chromatic scales are the songs or utterances of certain birds, to which may be added the crowing of cocks, the alarm-cry of hens, the cooing of doves, the solitary notes of the cuckoo, and the dismal screech of the night-owl; also the tap and roll of the military drum, the half-musical cries of sailors in hoisting and of hawkers in the streets, together with the rude noises of barbaric music and gypsy songs. Some of these may be imitated so closely as to be understood or recognized by the hearer without effort or previous admonition. With less distinctness music may be made to represent the calmness of eventide, the sweets of pastoral life, the tumult of war, the raging of the sea, the noise of floods, earthquakes, tornadoes, etc. Very few persons would suspect on hearing the introductory movements to Haydn's *Seven Last Words* and the *Creation* that the former was intended for an earthquake, or that the latter was set forth as a "representation of chaos."

The most extraordinary of all musical imitations are those which profess to deal with objects not of hearing but of *sight*. There is an apparent absurdity in all such attempts to represent through one sense things that belong to another. And yet between sight and hearing a certain correspondence has been found to exist, sufficient to form a basis for a partial interchange of symbols. It is very necessary, however, for complete success that *the hearer should be apprised beforehand*, or by words annexed, *what it is that the music is intended to represent*. More than half of the effect lies in the preparation of the hearer's mind; for the very same music *might* have been used—had the composer so pleased—for the stirring up of an entirely different class of emotions. Haydn's representation of the creation of light, for example, has been both severely criticised and enthusiastically admired. *In itself* it is doubtless nothing more than a common major triad coming with sudden force on the ear as the termination of a progression in the minor mode. In connection with any other thought it would have attracted no special notice; but the hearer's mind having been prepared by the previous words and music, and brought into an attitude of eager expectancy by the Divine command, "Let there be light," he is forcibly struck with the outburst on the words, "And there was LIGHT," so that, as Bombet remarks, his eyes are dazzled, "as by the flash of the midday sun on one just emerging from a dark cavern." Many other visual objects are thus successfully illustrated in musical works by an appeal to the ear, as may be seen in the *Creation*, the oratorios of Handel, Spohr's *Last Judgment*, Mendelssohn's *Elijah*, etc. Among these objects are the brooding of darkness over the deep, the fall of the apostate angels, the rushing floods, the upheaval of mountains, the rising of the sun and moon, the growth of plants, the whirl of insect life, the leaping of deer, the dark and bright sides of nature, decay and death, and finally the resurrection. But music representing these, however skillfully written, can not be its own interpreter from the very nature of the case. When, however, its meaning is conveyed by words or otherwise to the hearer's mind, there is no difficulty in tracing resemblances, even though their vividness must depend, for the most part, on the help of imagination.

Revised by DUDLEY BUCK.

Immaculate Conception of the Virgin Mary [*immaculate* is from Lat. *in-*, un- + *macula'tus*, spotted, deriv. of *ma'cula*, spot]: a dogma of the Roman Catholic Church. On Dec. 8, 1854, Pius IX. declared in the constitution *Ineffabilis Deus* that "the Blessed Virgin Mary was in the first instant of her conception, by a special grace and privi-

lege of Almighty God, in view of the merits of Christ Jesus, the Saviour of mankind, preserved free from all stain of original sin." In reply to an encyclical of the same pope (Feb., 1849) asking their views on the matter, all the bishops of the Church, with four exceptions, gave their adherence to the doctrine; thus showing that the formal definition five years later was the expression of Roman Catholic belief.

As to the *meaning* of the dogma it must be noted, 1, that the privilege of an immaculate conception is confined to the person of Mary, and in no way extended to her parents. It is not that *their* generative act *per se* resulted in a stainless offspring, but that the preservation from sin coincided with the creation of the soul and its infusion into the body, whereby the person of Mary was completed. 2. Considered simply as a descendant of Adam, Mary was subject to the general law of the transmission of sin; considered *formally* or as predestined mother of the Redeemer, she was freed from the necessity of contracting that stain. 3. As this preservation was effected through the merits of Christ, it follows not that Mary had no need of the Redeemer, but that her redemption was accomplished in a way befitting her future dignity. The grace of the Saviour who cleanses every Christian in baptism, and who sanctified the Baptist before his birth, preserved from all stain the person of whom he was to be born. The immediate warrant for the Roman Catholic belief in this doctrine is the definition already cited. It is claimed not that Pius IX. was favored with a special revelation on the subject of Mary's conception, but that as supreme teacher of the Church he gave infallible expression to what was contained on this point in the deposit of faith. In this, as in some other instances, the dogma is not formally expressed in Scripture; but according to the Church it is implied in those passages which declare Mary's office and prerogatives. Such are the salutation of the angel (Luke i. 28), the greeting of Elizabeth (*ib.* 42), and especially the Protevangelium (Gen. iii. 15). Whether in the interpretation of the last-named text the reading of the Vulgate or that of the original Hebrew be adopted, the central idea remains—viz., that of a triumphant enmity toward Satan which is common to the woman and her seed. The victory doubtless must be ascribed to Christ as its principal author; but in the divine plan which prepared it Mary and her Son form a pair destined to reverse the tempter's triumph over the first human couple. She could not, then, in God's providence, have ever been in league with the enemy—i. e. in sin. To those, in fact, who take the Catholic view of Mary's dignity as mother of the Incarnate Word, her immaculate conception appears simply as an *initial* grace. It was but fitting that *her* origin should not have been less perfect than that of the first woman.

In the earliest ages of the Church attention was chiefly paid to Mary's sanctity, so to speak, *in toto*, and to the points of similarity and contrast between her and the first Eve. Soon, however, especially in the East, her conception was singled out and honored by a festival, the first traces of which are found in the Liturgy of the seventh century. The Oriental Church, in its hymns and festal sermons, regarded Mary's conception as analogous to that of Christ himself. In the West the festival was introduced mainly through the efforts of Anselm (a nephew of St. Anselm), at one time abbot of a Greek monastery in Rome, and for two years (1136–38) Bishop of London. From England the cult spread into France, appearing at Lyons about 1140. The vagueness of the term "conception" led St. Bernard to write his well-known letter to the Canons of Lyons, in which he obviously opposes the idea of honoring the *conceptio seminalis* of Mary. The same want of clear apprehension marked the scholastic controversy which ensued, and which gave rise to various opinions, until Scotus offered a satisfactory solution of the theological difficulties urged by opposing schools. In these discussions of the theologians, as in the later contentions of religious orders, the teaching authority of the Church took no share, or interfered only to temper the heat of controversy, as did Sixtus IV. in 1483. The Council of Trent refused to include Mary in its decree concerning original sin; and the positive side of this tendency was outspoken by Alexander VII. (1661) in his approval of the custom, then almost universal, of celebrating the feast of the Immaculate Conception. Both liturgical practice and theological discussion reach the final stage of their development in the authoritative utterance of Pius IX.

LITERATURE.—For documents see Roskovany, *B. V. M. in suo Concepto Immac.* (9 tom., Budapest and Nitria, 1873–81); C. Passaglia, *De immac. Deiparæ semper Virg. Conceptu* (3 tom., Rome, 1855); Scheeben, *Dogmatik* (iii., 279); Hurter, *Dogm.*, ii. (patristic extracts). The principal work against the dogma is Joan. Turrecremata, *De Veritate Conceptionis B. Virginis* (1547; new ed. by Pusey, 1869).

J. J. KEANE.

Im'mermann, KARL LEBERECHT: dramatist and humorist; b. at Magdeburg, Apr. 24, 1796; studied 1813 at Halle; took part in the campaign of 1815, and wrote in opposition to the political enthusiasm prevailing at that time at all German universities, *Ueber die Streitigkeiten der Studirenden in Halle* (1817), a book which was solemnly burned at Wartburg by the students. Shortly after he received a government office in his native city, whence he removed to Münster in 1823 and to Düsseldorf in 1827. From 1834 to 1838 he managed the theater of Düsseldorf, in which, however, he succeeded only partly, though his perfect taste and pure enthusiasm exercised a beneficial influence on the German theater. The most remarkable of his many comedies are *Das Auge der Liebe* (1824) and *Die Schule der Frommen* (1829); of his tragedies, *Alexis* (1832) and *Ghismonda* (1839); of his romances, *Epigonen* (1836) and *Münchhausen* (1838). D. at Düsseldorf, Aug. 25, 1840. The most recent edition of his works is that edited by Boxberger (20 vols., Berlin, 1883).

Immigration [from Lat. *immigra're*, move into; *in-* + *migra're*, change residence; cf. Gr. ἀμείβειν, change]: the act of passing or coming into a country of which one is not a native for the purpose of permanent residence. Under the heading EMIGRATION will be found a history of the movements of population in general. The danger involved in the admission of certain classes of immigrants has made the question of restriction or exclusion one of the gravest of modern problems. Great Britain has suffered from the influx of undesirable aliens who take advantage of her time-honored policy of offering the freedom of her shores to the oppressed of all nations, and measures of restriction have been made the subject of parliamentary inquiry. But it is in the U. S. that the question is of extrardinary importance, and for that reason the present article will confine itself to immigration to the U. S.

Principles Involved.—In mediæval times the right of emigration was absolutely denied. The mediæval governments feared that their military strength would be impaired, or that the emigrants would disclose the secrets of trade to other nations. This view was generally acquiesced in, until the spread of republican ideas at the beginning of the nineteenth century. With freedom of commerce came also its natural corollary of freedom of travel and freedom of domicile. With the spirit of liberty came also the liberation of the serfs from bondage and the abolishment of chattel slavery. The climax was reached when the treaties of the U. S. declared it to be the "natural and inalienable right of man to change his home and allegiance." This position was diametrically opposite to that maintained in the Middle Ages, and it declared that "freedom was the natural status of man." It is, however, undoubtedly the right of the State to say who shall enter its borders and who shall not; otherwise it would be abandoning its own sovereignty.

I. EUROPEAN IMMIGRATION.

Statistics.—Prior to 1820 no official returns were made of the arrival of foreigners, but estimates place the number at 250,000. (See EMIGRATION.) Prior to 1856 the figures show the whole number of *aliens* arriving; but from 1856 to 1885, inclusive, the number of *immigrants* only, i. e. of foreign passengers settling in the U. S. Since July 1, 1885, immigrants from Canada and Mexico are not included. Statistics were compiled on the basis of the calendar year up to 1866 inclusive, but beginning with 1867 the fiscal year is used.

The following table gives the arrivals by decades:

DECADE ENDING—	Aggregate arrivals.	Annual average.
1830	143,439	14,343
1840	599,128	59,912
1850	1,713,215	171,325
1860	2,598,214	259,821
1870	2,314,824	231,482
1880	2,812,191	281,219
1890	5,246,613	524,661

The total immigration for 1891 was 590,666; for 1892, 543,847; and for 1893, about 500,000, making the total num-

ber of arrivals from Jan. 1, 1820, to the end of the year 1893, 20,062,137.

The sources of immigration appear from the following table, which gives the total aggregate numbers coming from the different countries since 1820:

Great Britain and Ireland	6,235,277	China	290,655
Germany	4,504,128	Switzerland	171,269
Norway and Sweden	925,031	Denmark	142,517
Austria-Hungary	434,488	Netherlands	100,874
Italy	388,558	Belgium	43,993
France	366,346	Spain and Portugal	43,609
Russia and Poland	324,892		

The following table shows the per cent. of the total immigration received annually from the principal nations since 1884:

COUNTRIES.	1886.	1887.	1888.	1889.	1890.	1891.	1892.	1893.
Great Britain and Ireland	30	33	33	34	27	21	20	21
Germany	22	22	20	22	20	20	22	18
Norway and Sweden	12	12	13	11	9	8	10	10
Italy	6	9	9	6	11	13	11	12
Austria-Hungary	7	7	7	8	11	12	12	13
Russia	5	5	5	7	7	8	9	9

The immigration from the United Kingdom, Germany, and Norway and Sweden is relatively decreasing, while the relative increase comes from Italy, Austria, and Russia; and herein lies the danger: not merely that immigration is larger in amount than ever before, but worse in quality. While the foreign-born population of the U. S. numbers only about one-twelfth of the total population, that class furnishes over one-sixth of the total number of convicts and one-third of the number of almshouse paupers.

Legislation.—A commission for inspection was established by the State of New York as early as May, 1847. From that time until Mar., 1876, the Legislatures of the State provided for the support of the commission and the protection and care of immigrants arriving at the port of New York, by requiring the captain, consignee, or owner of a vessel bringing immigrant passengers, to give a bond of $300 for each immigrant brought, to indemnify the cities, counties, and towns of the State for the support of any immigrant who became a public charge within five years of his arrival; or in lieu of such a bond to pay to the commissioners a per capita tax on the immigrants landed. The per capita tax varied during the twenty-nine years from $1.50 to $2.50, and amounted in the aggregate to $11,229,329.46. In 1876 the Supreme Court of the U. S. declared the State law exacting such bond or commission tax unconstitutional and void, on the ground that it is a regulation of commerce, and as such a usurpation of the powers of Congress.

In 1882 Congress passed an act whose principal provisions are: Sec. 1. A duty of 50 cents shall be levied on every passenger not a citizen of the U. S. from a foreign port. It shall be paid into the Treasury, and shall be known as the "immigrant fund" for the care of distressed immigrants. Sec. 2. All passengers shall be examined, and convicts, lunatics, idiots, paupers, and persons likely to become a public charge shall not be allowed to land. The Secretary of the Treasury shall execute this act, and for that purpose he shall have the power to enter into contracts with such State commission as may be appointed by the Governor of any State. Sec. 3. Foreign convicts shall be returned to the country whence they came, and expense shall be borne by the owners of the vessels in which they came.

In 1885 Congress passed the Alien Contract Labor Law. Its chief provisions were that prepayment of, or assisting foreign emigrants under contract for labor or service made previous to emigration, is unlawful; that such contracts are void; that the penalty for violation of this act is $1,000 for each person participating in such contracts. Foreigners temporarily residing in the U. S. may engage other foreigners, as servants, private secretaries, or domestics. Skilled workmen may be engaged for a new industry not yet established in the U. S. This act does not apply to professional actors, artists, lecturers, singers, or personal servants. Nor does it apply to individuals assisting relatives and friends to emigrate to the U. S. It was amended in 1887 by adding the provisions that the Secretary of the Treasury shall enter into contracts with State officers to take charge of immigration. They shall examine passengers, and prohibited persons shall not be allowed to land; that prohibited persons shall be returned, and expense borne by owners of the vessels, and the Secretary of the Treasury, in case he shall be satisfied that an immigrant has been allowed to land contrary to the prohibition of that law, to cause such immigrant within the period of one year after landing to be returned to the country whence he came, at the expense of the owner of the importing vessel.

In the Fiftieth Congress the so-called Ford committee investigated the subject, and made a report Jan. 19, 1889. It charged Great Britain and Ireland with assisting paupers to the U. S., and the bill recommended prohibited all assisted immigration (even the assistance of friends), and authorized an immigrant tax of $5 per capita. It also demanded a consular certificate. But it was so late in the session that no action was taken on the bill recommended. In the next Congress the Owen committee was more successful, and recommended the bill, which became a law, Mar. 3, 1891. It is entitled "An act in amendment to the various acts relative to immigration and the importation of aliens under contract or agreement to perform labor." Its chief provisions are that the following classes of aliens are excluded: Idiots, insane persons, paupers, or persons likely to become a public charge; persons suffering from a loathsome or a dangerous contagious disease; persons who have been convicted of a felony or other infamous crime or misdemeanor involving moral turpitude, polygamists, and assisted immigrants, unless it is affirmatively or satisfactorily shown on special inquiry that such person does not belong to one of the foregoing excluded classes or to the class of contract laborers excluded by the act of Feb. 26, 1885; but persons may send for relatives or friends who are not of the excluded classes; and political offenders are not excluded. Response to foreign advertisement is deemed a contract. Steamship companies are not allowed to solicit immigration. The act of 1885 is amended by including among the excepted classes "ministers of any religious denominations, persons belonging to any recognized profession, and professors for colleges and seminaries." The office of superintendent of immigration is established as a federal office. The Secretary of the Treasury may prescribe rules for inspection along the borders of Canada, British Columbia, and Mexico. Unlawful immigrants shall be returned at expense of ship-owner, and if any owner refuse to do this he shall be fined $300 for each and every offense; and any such vessel shall not have clearance from any port of the U. S., while any such fine is unpaid. If any alien becomes a public charge within one year after arriving in the U. S. from causes existing prior to his landing, he must be returned at expense of ship-owner. By the provisions of this act the inspection of immigration came under Federal control. The actual transfer took place in July, 1891.

In spite of these laws the fact still stands that throughout the U. S. thousands of paupers are found who were landed only a few years or a few months ago. It has been shown that societies have existed, and still do exist, in Europe, for the avowed purpose of assisting paupers and criminals to emigrate. This is undoubtedly a breach of international comity. The U. S. Government has protested many times, but in vain. The Government can not, of course, deal directly with such societies, but it is its right, through the foreign governments, to have such societies wiped out of existence. They sometimes claim to assist only those persons who have friends residing in the U. S. But such an unnatural impetus to emigration is an injury to the emigrant, an injury to his friends, and especially an injury to the country which must receive him. These people were deported for their countries' good, for no government will assist the emigration of its desirable citizens. The effect of this emigration is manifest in the increased number of convicts, paupers, and other unfortunates among the foreign-born population. The alien contract law is intended to prevent the landing of any alien who comes under contract, expressed or implied, to do labor in the U. S. But in these cases positive proof is usually wanting, and but few persons have been returned under this law. The agent of the contractor usually accompanies the men on the steamer, and by the time of arrival he has thoroughly "coached" the laborers, so that they are able to pass satisfactorily the examination of the inspectors.

Additional Measures Suggested.—1. *Consular Inspection.*—According to this plan, every person who desires to emigrate must give notice to the nearest U. S. consular office, and thereupon investigation is made as to the person's character and condition. If these inquiries are satisfactory, certificates are issued in triplicate, one copy retained in the office, another sent to the collector of the U. S. port, and the third given to the emigrant. No emigrant

shall be allowed to land without the presentation of such a certificate.

It is objected that "this plan would be utterly inadequate, without an enormous increase in the consular service and a corresponding increase of expenses," and that the consuls being entirely dependent on the police for their information would be liable to deception, since the authorities would hardly aid them in taking away the good citizens, while it is the obvious interest of a government to get rid of its criminal and defective classes. Nevertheless, it seems possible that these objections may be met by careful legislation, and a system of inspection established abroad which will meet the approval of the people of the U. S.

2. *Increased Taxation.*—In transmitting to the House of Representatives the report made to him by the special immigration commissioners detailed to investigate the immigration question in Europe, Secretary Foster said that it was his opinion that "the 50-cent head tax should be abolished and a special license tax on the steamships equal to $1 for each immigrant substituted. Owners or agents should be required to furnish a bond of not less than $50,000, to return all alien immigrants found within two years to have been landed contrary to the laws. Some system of preliminary inspection of immigrants before their embarkation is absolutely essential." Others desire to see much heavier taxation. The objection to this is that it would keep out a multitude of desirable immigrants. The fact that a man has no money in his pocket does not necessarily stamp him as a pauper. Immigrants with strong arms, willing to work, willing to become thorough citizens, are invaluable to the country, and it can not afford to turn them away.

3. *Longer Terms for Naturalization.*—This project was suggested more than a generation ago by the American or Knownothing party, not as a measure of industrial protection, but as a safeguard for national politics. The utter collapse of this movement has rendered politicians of all States reluctant to identify themselves with a renewal of any such proposals. But the naturalization laws are so elastic and so loosely administered that some reform is required. It has been objected that this would not meet the evils of the case; in fact, that the very worst evils arise in connection with those classes who do not intend to become citizens in any event.

4. *Absolute Exclusion.*—The chief objection to this policy is the difficulty of enforcing it without causing international complications, or offending an important class of citizens who would set themselves against the exclusion of their friends and kin; but there are cases where people are expelled *en masse* from one country, where other nations may and must refuse to receive them, just as they refuse to receive compulsory or "assisted" immigrants who come individually.

5. *Unrestricted Immigration.*—There is a group of writers, of whom Edward Atkinson is the most prominent exponent, who hold radically different views. They contend that increased immigration is a good thing, and that efforts to check it are unwise. While there is so much unoccupied land in the U. S., every additional laborer, in their view, adds to the national efficiency and national wealth. The danger of degradation of labor they think to be purely imaginary, and the political danger from too rapid influx of immigrants they believe to be at least partly imaginary also. They contend that efforts to restrict immigration are a kind of class legislation hostile to the general interests of the community as a whole. Such writers, as a rule, question the wisdom of the exclusion of the Chinese, while they object radically to the contract-labor law on the ground that it prevents the development of valuable industries, whose product would of itself furnish demand for labor rather than interfere with such demand.

II. Chinese Immigration.

In 1869 a treaty was ratified between the U. S. and China, which is known as the Burlingame treaty. By Art. 5 the right was conferred upon all Chinese subjects to emigrate to the U. S. either for the purpose of curiosity, or trade, or for permanent residence. Art. 6 conferred a similar right upon citizens of the U. S. in respect to Chinese territory, but at places only where foreigners were permitted to reside.

In the decade from 1840 to 1850 the number of Chinese immigrants was 35; from 1850 to 1860, 41,397; from 1860 to 1870, 68,059; from 1870 to 1880 it had risen to 122,436; and from 1880 to the beginning of 1890, in spite of restrictive laws, the reported immigration of Chinese was 59,995, and the actual immigration probably much larger than the number reported.

The practical effect of the Burlingame treaty was one-sided. While very few citizens of the U. S. desired to become permanent residents of China, vast hordes of ignorant and immoral Chinese were brought into the U. S. and thrown into competition with home labor. It was charged that they were coolies, who were brought here under contract for a term of years by the Six Companies; that their labor was controlled by these companies, and that their coming here was not voluntary, and that many were detained here until their contract term expired. Earnest appeals for relief were made by citizens of the Pacific coast, and Congress appointed in 1877 a joint committee to investigate the subject. In its report the committee said: "The testimony seems to be concurrent that the Chinese are non-assimilative with the whites; that they still retain their peculiar costume, and follow their original national habits in food and mode of life; that they have no social intercourse with the white population; that they work for wages that will not support white men and especially white families; that they have no families of their own in this country, or very few of them have, and that by the small amount and poor quality of food which they consume, and their crowding together in close quarters, they are able to compete with white labor in all departments and exclude it from employment. The number of Chinese on the Pacific coast is rapidly increasing, not by births, for there are few of these, but by importations, so that the same uneducated class is supplied perpetually. The Chinese do not come to make their home in this country; their only purpose is to acquire what would be a competence in China, and return there to enjoy it. . . . Congress should solve the question, having due regard to any rights already accrued under existing treaties and to humanity."

In 1879 a bill was passed by both Houses providing that no vessel entering any port of the U. S. should thereafter land more than fifteen Chinese passengers on any one trip, and the bill also directed the President to abrogate Art. 5 and 6 of the Burlingame treaty. This bill was vetoed by President Hayes Mar. 20, 1879, on the ground that it was in violation of the existing treaty. Steps were then immediately taken to effect a modification of our treaty obligations, and the President, acting under a joint resolution of both Houses, appointed a commission which negotiated a new treaty Nov. 17, 1880. Its principal features are (1) that the immigration of Chinese laborers may be limited or suspended, but may not be absolutely prohibited; (2) that Chinese subjects and laborers now in the U. S. may come or go at will. The Forty-seventh Congress passed an act to give effect to this treaty, containing a provision absolutely prohibiting Chinese immigration for a term of twenty years. President Arthur vetoed this bill Apr. 4, 1882, on the ground that prohibiting immigration for twenty years was not a reasonable suspension or limitation. Congress thereupon passed another act May 6, 1882, by which the coming in of Chinese laborers who have never been in the U. S. is prohibited for ten years. Notwithstanding these laws, it was found that the flood of Chinese immigration continued, a very large portion of the influx being ascribed to the fraudulent use of return certificates.

To check some of these evils an attempt was made in 1888 to make a new treaty. The commissioners agreed upon certain articles, and the treaty in its new form prohibits for twenty years the coming of Chinese laborers into the U. S.; but it does not apply to any laborer having a wife, a child, or a parent in the U. S., or property to the amount of $1,000, or debts due him to a like amount. The treaty is to continue twenty years, and if not formally terminated by either government within six months before its expiration, it shall continue another like period of twenty years. This treaty was never ratified by the Chinese Government. In the absence of such ratification, Congress on Oct. 3, 1888, passed the "Scott Act," whose chief provisions are that it shall be unlawful for any Chinese laborer, who shall at any time heretofore have been, or who may now or hereafter be, a resident within the U. S., and who shall have departed or shall depart therefrom, and shall not have returned before the passage of this act, to return to or remain in the U. S.; and that no certificates shall be issued, and all previous certificates are void. Thus by this act certificates are not issued, and all Chinese laborers who have been here and have departed are prohibited from returning; while by the act of May 6, 1882, the coming in of Chinese laborers, who have never been here, is prohibited for ten years. These

two acts, then, working together, form the total exclusion act of Chinese laborers. The justification of the acts, in thus abrogating a treaty, is sought in the following line of argument: Art. 6, Sec. 2, of the Constitution of the U. S. says, "The laws of the United States, and all treaties made under the authority of the United States, shall be the supreme law of the land." Now when the welfare of the country demands that any existing treaty shall be repealed, it is the duty of Congress to pass laws to that effect. It would be a crime to do otherwise. Such action is not a *casus belli*, but may furnish ground for retaliation. The laws of the land stand above treaties, and Congress is the judge of what treaties are injurious to the public welfare. Thus it was that at the October term, 1883, the Supreme Court decided that Congress had the right to abrogate a treaty.

The act of 1882 expired May 6, 1892. In the absence of supplementary legislation, Chinese laborers could have come in freely after that date. On. Apr. 4, 1892, the House passed the Geary bill, a far more severe measure than any previous one, directed not against laborers only, but against all Chinese. This was rejected by the Senate, and the question was then sent to conference; as a result of which conference the following law was passed May 5, 1892:

"An act to prohibit the coming of Chinese persons into the United States." Sec. 1. All laws now in force prohibiting and regulating the coming into this country of Chinese persons and persons of Chinese descent are hereby continued in force for a period of ten years from the passage of this act. Sec. 2. Chinese persons unlawfully in the U. S. shall be removed. Sec. 4. Chinese persons convicted of being unlawfully in the U. S. shall be imprisoned at hard labor for a period not exceeding one year, and thereafter removed from the U. S. Sec. 5. No bail shall be allowed to Chinese persons, on application for a writ of *habeas corpus*, when such person has been denied a landing in U. S. Sec. 6. Chinese laborers must secure certificates of residence. Failure to do this within a year shall constitute evidence that he is unlawfully in the U. S. Sec. 7. Certificates to be issued without charge. Sec. 8. Altering or forging certificates is punishable by a fine of $1,000. The provision in the Geary bill requiring all Chinese persons to secure certificates is stricken out. The act refers, as all previous laws heretofore, simply to Chinese laborers. A. T. Hadley.

Immortality [from Lat. *in-*, un- + *morta'lis*, mortal, deriv. of *mors*, *mor'tis*, death]: the doctrine that the human soul is imperishable, being separable from the body at death and destined to a conscious life beyond the grave. The history of this doctrine is the history of the development of the idea of substantiality, or, indeed, of the idea of God. Without a personal God there could be no immortality. If the substantial is found to be a rigid, lifeless substance or an unconscious force, there can be no persistent individuality. Without regard to philosophical or theological tenets, the belief in a future life is almost universally prevalent. Among ignorant savages, as in Central Africa, it takes the form of demonology, or belief in specters or ghosts. In Asia, where the theological dogmas do not reconcile the Universal or Absolute with the existence of the individual being, making the Supreme Being an unconscious substance destined to absorb the individual man at death, still the popular belief holds to the doctrine of life beyond the grave. Egypt is noted as the country where great stress was laid on the doctrine of immortality. The temples, sphinxes, statues, and pyramids, all had some suggestion of the future life of the soul. The cycle of the rise and fall of the Nile, and of the life of the seed in its germination, growth, fruit-bearing, and decay, is closely connected with the doctrine of immortality. The soul's cycle is set at 3,000 years, after which it returns from its wanderings to the body again. Hence the care with which the Egyptians preserved the body by embalming it, and the extravagant outlay of human labor on the Pyramids as tombs of the kings and symbols of their faith. With Greece the Oriental idea of the subordination of the soul to nature gives way for a more spiritual theory. The Greek conceives the spiritual as something independent of, or at least as a reaction against, nature. Spirit is essentially self-determining and free. The portrayal of its ideals of free activity gave to the world the forms of the divinities of Olympus. The Titans or powers of nature are subdued and made serviceable to spirit. The Roman phase of civilization is devoted to the formulating of the will into laws and defined rights. The subordination of the individual to the general will as embodied in the state is the characteristic Roman principle. Immortality, with Greece and Rome, assumed a definite shape, elevated far above the Oriental conception, inasmuch as it eliminated the principle of transmigration. But there was not an adequate realization as yet of the principle of infinite responsibility, which the Christian religion first added to that of the immortal destiny of the soul, making man, moreover, the object of divine mediation. The growth of the idea of the substantiality of the soul..as thus traced, is marked in the world's history by the corresponding growth of institutions of a humanitarian character.

The proofs of immortality are numerous and of varying degrees of strictness. Among those most relied upon by the popular mind are the following: 1. The return or resurrection from the dead. 2. General belief in the existence of the soul after death; probability that such general beliefs of mankind are well founded. 3. General desire of man to live for ever, and his horror at annihilation. 4. The infinite perfectibility of the human mind, never reaching its full capacity in this life; and the fact that it is contrary to the course of nature or to the Divine character to endow a being with capacities never to be developed. 5. The fact that perfect justice is not dispensed in this life; the good suffer, and the wicked triumph; necessity of future retribution to justify God's government. The metaphysical doctrine of immortality includes various positions, favorable and unfavorable, the most important of which are the following: 1. The highest principle is regarded as indeterminate—pantheism; consciousness considered to be a disease or evil of which death or unconsciousness (Nirvana) is the cure. 2. Highest principle a rational intelligence—monotheism; the soul a transient incarnation which vanishes in death (Arabic interpretation of Aristotle). 3. The soul held to have pre-existed in an intelligible world, and to have come hither through a lapse from holiness or for necessary experience; death releases the imprisoned soul, and it rejoins its former state or enters a new body (emanation theory—Plato). 4. Aristotle's doctrine of the pure reason (*νοῦς*) as an unconditioned energy, imperishable, while the lower faculties of the soul, such as sensation, imagination, feeling, memory, etc., are perishable. This doctrine has been the occasion of much controversy. An immortality which should cut off an individual from his past would not preserve his identity. But the experience of ordinary life exhibits to us a constant waning of the faculties of mere sense-perception, of mere mechanical memory, and of fancy, with a corresponding increase of the higher faculty of inference or reason. Hence the lower faculties may be said correctly to be perishable, while the faculty of insight, which sees in an individual all its past history at a glance, is immortal or continually on the increase. The immortal life would use the perishable faculties less and less, but might never lose them altogether. The long and earnest discussions of the Schoolmen on this question were very important, as leading to the grounds that support the Christian dogma. 5. From the time of the Schoolmen, arguments in favor of immortality, drawn from the "simplicity of the soul," were in vogue, and were later elaborated by the Leibnitzo-Wolffian philosophy. 6. Kant attacks all theoretic proofs of immortality as based on a paralogism involving an unwarranted inference from the phenomenal appearance of the soul as Ego to the same as Noumenon. But he finds immortality to be established as a practical postulate of the will. 7. Hegel exhibited immortality as the essential attribute of conscious beings, denying it to animals (in the closing chapter of his *Philosophy of Nature*). Recent discussions of the subject have been mostly skeptical in their tendency, especially in Germany, England, France, and the U. S., owing to the prevailing evolutional theories in science. (See John Fiske's *The Destiny of Man*.) Spiritualism or spiritism has in the nineteenth century taken hold on a vast number of minds, and led to an empirical doctrine of immortality. Recently the investigations of the Society for Psychical Research (Great Britain and the U. S.) have collected an immense mass of testamentary evidence concerning ghost-seeing, and have done much to establish "thought-reading" as a typical fact that furnishes the key to this class of phenomena. But investigations in hypnotism have done most to throw light on apparent or real manifestations of soul as separate from the body. German literature was prolific in treatises on immortality for several years after the death of Hegel. Feuerbach, Strauss, Conradi, Michelet, F. Richter, and others held a negative attitude toward the doctrine, and contended that the only immortality is that of the race or species. Marheineke, Weisse, Hin-

richs, J. H. Fichte, and, above all, Göschel, defended the doctrine of individual immortality. W. T. Harris.

Immortelles' [Fr., immortal ones], or **Everlasting Flowers**: flowers largely employed in the manufacture of wreaths and crosses for the adornment of churches and cemeteries. The *Helichrysum orientale*, a native of Crete, but cultivated in Southern France, is much used for the above purpose, though there are many other genera of plants, such as *Rhodanthe* (more properly *Helipterum*), which are also occasionally employed. Some of the best immortelles are derived from the genera *Antennaria* and *Gnaphalium*. The "everlastings" of the fields of the U. S. belong mostly to these last two genera. Revised by L. H. Bailey.

Immunity [Lat. *immu'nitas*, exemption, deriv. of *immu'nis*, free from public service; *in* + *mu'nus*, service]: in medicine, freedom from liability to disease. It has long been known that in the case of a number of acute infectious diseases, for example, smallpox, one attack of the disease preserves the individual from any future attack. In almost all of the infectious diseases, as measles, scarlet fever, typhoid, varicella, diphtheria, the same holds true. It is remarkable that certain races show an immunity against certain diseases often without having previously been affected by them. There are various other influences affecting immunity; thus age, and to a certain degree sex, has an influence. Individuals who have passed a certain age possess a relative or absolute immunity to diseases of earlier life. It was first found in studying smallpox that immunity might be produced by inoculation of the body with a very similar disease of cows, cowpox. It has never been definitely known whether this cowpox is a form of smallpox which pursues a milder course or whether it is an essentially different disease. The general belief, however, is that the disease is a modified form of smallpox. With the advance which has taken place in the study of the agents of infectious disease, it was found that by altering in various ways the conditions under which certain infectious bacteria grew, they could be so modified that inoculation with them produced a milder form of disease, which conferred immunity from the virulent form of the disease in the same way that cowpox conferred an immunity against smallpox. This was first definitely proven by Pasteur in the case of anthrax, which is a peculiarly virulent disease of cattle. He found that when the organisms which produced the disease were heated up to a certain point short of destroying them, and also when they were caused to grow under various unfavorable conditions, their virulence was very much lessened. There is little, if any, difference between the appearance of the growth of this modified form of the organism and that of the virulent form, and only slight difference can be seen in the form of the organism. When an animal is inoculated with this modified form, a very mild disease with slight local and general disturbance is produced. This modified form of the organism may be produced by the effects of light, heat, duration of growth, and by the action of certain chemical substances. It was afterward found that immunity could be produced in an animal by inoculation, not only with the modified organisms, but also by injecting into the body certain chemical substances which are produced in the course of the disease. This remarkable fact has long engaged the attention of those studying the infectious diseases and the micro-organisms causing them, and various theories have arisen to account for it. In general, these theories can be reduced to four. The first originated with the French scientist Chauveau. He suggested that both the natural immunity, which is acquired by the animal having passed through the infectious form of the disease, and the artificial immunity, produced by inoculation, are due to the retention in the animal body of some of the products which were formed by the bacteria during the course of the disease. This is known as the retention hypothesis. On the other hand, Pasteur believes that the immunity is due to abstraction from the tissues of the body of some material which is essential to the growth and development of the bacteria in the body. This is known as the exhaustion hypothesis. The third view is that of Grawitz and Metschnikoff. The latter was the first to call attention to the remarkable power of the wandering blood-corpuscles of taking up into their body and destroying certain insoluble substances and bacteria which were injurious to the tissues. He showed that when infectious organisms were inoculated into the body of an animal which was relatively immune to the disease, the leucocytes would take up the bacteria; on the other hand, when the micro-organism used produced a fatal disease in the animal, the white corpuscles did not in this way come in combat, as it were, with the organisms. He supposed that immunity was due to a gradually acquired resistance of the cells of the tissues to the organisms, and that this property was extended to the descendants of the cells. Another theory has been proposed by Buchner. He suggests that in the primary infection, from which the animal may have recovered, there has been produced a reaction in the integral cells of the body that enables them to protect themselves against subsequent inroads of the same organism. This property of the cells is due to the effect of chemical substances, which are found in the blood serum. These chemical substances are not the products of the growth of the bacteria. An epoch was marked in the study of immunity by the work of Behring and Kitasato upon the production of immunity to tetanus. It was found that it was not only possible to render animals immune to the disease, but that the blood of these animals already rendered immune was curative when injected into the circulation of animals which had the disease. It has also been found in acute croupous pneumonia that substances are produced in the body during the course of the disease which are distinctly inimical to the bacteria of the disease. Thus the sudden abatement of symptoms which comes on in the disease and is called the crisis is due to the presence of this protective substance. It is not only inimical to the bacteria themselves, but to the injurious chemical substances which are produced in the disease. This chemical substance is contained in the blood serum, and if the blood serum of an animal taken during the period of crisis is injected into an animal which has been inoculated with the disease, it will be cured. It seems probable from what has already come from these studies of the infectious diseases that in the future very important additions will be made, not only to our knowledge of the means for producing immunity to diseases, but also for curing a disease when it is once established. W. T. Councilman.

Immuta'ta [neut. plur. of Lat. *immuta'tus*; unchanged, *in-*, not + *muta're*, change]: a name frequently applied in historical grammar to those compounds whose meaning is expressed without changing the part of speech of the latter component. Thus in compounds like *goldsmith*, *handbook*, Lat. *agri-mensor*, field-measurer, Gr. *βιβλιο-θήκη*, library, the compound is of the same part of speech as the latter component—viz., a noun; in *jet-black*, *sea-sick*, Lat. *armi-potens*, powerful in arms, Gr. *ἡμί-γυμνος*, half-naked, it remains an adjective. The *immutata* are distinguished from the *mutata*, which are of a different part of speech from the latter component; thus Lat. *æqu-animus*, having an even temper, is an adjective whose latter component is a noun; cf. *ali-pes*, wing-footed, Gr. *ῥοδο-δάκτυλος*, rose-fingered, Eng. *barefoot*, *baldhead(-ed)*. These latter are also called possessive or, as in Sanskrit grammar, *bahuvrīhi* compounds. See Schröder, *Ueber die formelle Unterscheidung der Redetheile im Griechischen und Lateinischen* (Leipzig, 1874). Benj. Ide Wheeler.

Im'ola [Lat., *Fo'rum Corne'lii*, market-place or court-town of Cornelius]: town on the left bank of the Saterno, in the province of Bologna, Italy; about 20 miles E. S. E. of the city of Bologna (see map of Italy, ref. 4–D). It was enlarged and embellished, if not actually founded, by the dictator Sulla, who sent a colony here about 80 B. C., and throughout the Roman period it was a town of some importance. Cato had a villa here. During the Middle Ages it was claimed by the see of Rome as a part of the *gift of Constantine*, but was subject to frequent assaults and occupations by the rival powers that then divided the Peninsula. From the time of Julius II. it formed a part of the Roman states, except when held for a short time by the French in 1797, until the whole papal territory was annexed to the new kingdom of Italy. The town is well built, and surrounded by its old walls with towers and trench, and has a cathedral, a castle, several palaces, a gymnasium, a technical school, a school of music, a public library, a hospital, and a corn exchange. Its manufactures, leather, wax, glass, majolica, silk, and hempen stuffs, are very considerable. A choice wine called *vino santo* is made here. Pop. 11,372.

Imoshagh: a local name given to the Tuaregs of the South in the Sahara; hence applied to the region they inhabit, and thus to the most inhospitable part of the desert. The Tuaregs of the North are called Imohagh. See the article Tuaregs.

Impalement, or **Empale'ment** [from Lat. *impala're*, impale; *in*, in, on + *pa'lus*, stake, pole]: a form of capital punishment by means of a stake thrust through the body. The victim was often raised up from the earth, and one end of the stake was driven into the ground; hence the Greeks applied the name *σταύρωσις* (stake-punishment) to crucifixion as well as impalement. Impalement is still practiced in half-civilized and barbarous countries. The driving of a stake through the heart of a suicide and his burial under the cross-roads arose, it is believed, from a fear that his spirit would otherwise walk and frighten the living.

Impanation [liter., embodiment in bread; Lat. *in*, in + *panis*, bread]: a term belonging to the Eucharistic controversy, invented soon after, and in opposition to, that of *Transubstantiation*. It was intended to express the consubstantiation or intimate union of the blessed body and blood with the consecrated elements, without a destruction of the substance of the bread and wine. Rupert, Abbot of Deutz, near Cologne (d. 1135), who first used the word, likened the mystery implied to that of the incarnation, wherein the divine nature was conjoined with the human nature in the one person of Christ. By body he meant that which hung upon the cross, and by blood, that which flowed from the Crucified; but yet he denied the real presence in a gross and carnal sense: "Fit corpus Christi et sanguis, non mutatum in carnis saporem sive sanguinis horrorem, sed," etc. Impanation, like all terms intended to simplify our conception of a mystery, is liable to misinterpretation. It has been erroneously employed to designate the Lutheran view of Christ's presence in the Eucharist.

Revised by W. S. PERRY.

Impatiens: a genus of upward of 200 species of herbs (or undershrubs) belonging to the geranium family. They are natives of Europe, Asia, Africa, and North America. The seed-pods at maturity burst violently upon being touched, hence the common name "touch-me-not." Two species occur in North America, *I. aurea*, the pale touch-me-not, and *I. biflora*, the spotted touch-me-not. The garden touch-me-not, or, as it is more commonly called, the balsam, is *I. balsamina* from tropical Asia. Touch-me-nots are interesting on account of forming their flowers in such a way that they have to twist upon their stems in order to assume the proper position for insect visitation. In other words, the flowers when in bloom are structurally upside down.

CHARLES E. BESSEY.

Impeachment [from O. Fr. *empeschement*, hindrance, deriv. of *empescher*, hinder < Low Lat. *impedica're*, hinder; Lat. *in*, on + *pe'dica*, fetter]: a method of trying a class of public offenses. Its distinguishing features at common law are (1) a formal accusation and prosecution by the House of Commons; (2) the trial of the accused, the final decision of all questions of law and fact, and, in case of conviction, the sentence of the offender by the House of Lords. Its primary object is the punishment of official offenders, although it has been employed in England against private citizens. It is a form of criminal procedure.

Origin.—Blackstone asserts that this mode of trial is derived "from the constitution of the ancient Germans, who in their great councils sometimes tried capital accusations relating to the public," adding that the English constitution "had much improved upon the ancient model," as reason had suggested that in case of "such crimes as the ordinary magistrate either does not or can not punish," the "branch of the legislature which represents the people must bring its charges before the other branch, which consists of the nobility, who have neither the same interests nor the same passions as popular assemblies." (4 Blackstone's *Com.*, 260–61.) This is a mistaken view. Impeachment trials are brought before the House of Lords, not because of the ideal fitness of that body for such tasks, but because when this procedure was instituted that body was the highest judicial tribunal in the realm. Moreover, a statute of 15 Ed. III. declared "that no peer of the land, crown official, or other, on account of his office, can be brought before the court, . . . rendered responsible, or judged otherwise than through award of the peers in Parliament." Although the Great Council had surrendered many of its judicial functions to the law courts, it retained a jurisdiction which was still indefinite when impeachment proceedings began, and which it was disposed to extend when necessary to advance its class interests. The presentment of formal charges by the House of Commons in these proceedings is not derivable from any custom of our German ancestors. Not until the administrative system of the Normans had developed the grand jury, and the House of Commons had been recognized as a branch of the government, do we discover any signs of parliamentary impeachment. But when the right of indictment by the grand jury had been established as a communal right of each county, the representatives of these communities assembled as a branch of Parliament naturally insisted upon exercising a like right of accusation against those who were abusing their official positions to the harm of the entire state. (Gneist, *The English Parliament*, ed. 1886, pp. 119, 138–142.) Even Blackstone recognizes the family likeness of impeachment and indictment, for he describes the former as "a presentment to the most high and supreme court of criminal jurisdiction by the most solemn grand inquest of the whole kingdom." (4 Blackstone's *Com.*, 259.)

History in England.—The earliest case of impeachment is that of William Lord Latimer and others in 1376, near the close of the reign of Edward III. Charges of gross malversation in office were presented by the foreman or speaker of the Commons; an examination was carried on in full Parliament, and before the Lords only; the latter body determined that Latimer and Lyons were guilty of the offenses named, and condemned them to imprisonment and forfeiture of their offices. During the next reign Michael de la Pole, Lord Chancellor, was impeached for misconduct in office, which was specifically set forth in the charges preferred by the Commons. After the examination of witnesses, and extended arguments against the earl as well as in his behalf, the Lords found him guilty, and upon demand of the Commons sentenced him to removal from the office of Lord Chancellor, to surrender all his acquisitions save his earl's title and pension of £20, and to be imprisoned until he should pay a fine or ransom. (2 Stubbs, *Constitutional History of England*, pp. 516–517.) Preceding, contemporary with, and following these cases of Latimer and Suffolk are records of criminal proceedings in the Great Council, or in full Parliament, directed against state officials, wherein presentment is not made by the House of Commons, or if made by that body a judicial trial by the Lords does not occur. These are treated by some authorities as irregular impeachments. (1 Stephen, *History of Criminal Law*, ch. 5.) Upon close examination, however, they will be found to range themselves either under the head of appeals or of bills of attainder, or bills of pains and penalties. An appeal, as a criminal proceeding, was decided by battle and not by evidence. Such appeals in Parliament were abolished by 1 Hen. IV., c. 14. When proceedings in Parliament, which are called appeals, are accompanied by evidence and a determination reached thereon, instead of by battle, they partake more of the nature of legislative than of judicial acts. The charge of John Cavendish, a fishmonger of London, against the Chancellor Michael de la Pole in 1384 for taking a bribe was answered before both houses of Parliament. When Clyvedon brought a bill of appeal in Parliament in 1381 against Cogan for a riot and other misdeeds, he was sent to the common law courts for redress. The "lords appellant" of 1387–88, in proceeding against the Archbishop of York and others, frankly claimed for Parliament the right to punish the accused, though they might not be guilty of any offense against "the ancient laws and customs of the realm and the ordinances and establishments of Parliament." Such a proceeding is to be classed with bills of pains and penalties, rather than with impeachments. (Anson, *Law and Custom of the Constitution*, pt. 1, 302–303.) In addition to these legislative acts, the regular process of impeachment was frequently resorted to from its institution in Latimer's case to the trial of Lord Stanley in 1459, for not sending his troops to the battle of Bloreheath. During the next 162 years, however, the rolls of Parliament do not disclose a single instance of its use. This is easily accounted for when we recall the fact that trial by impeachment was devised by the Commons as a weapon against royalty. Under the Tudors there was small chance for its employment against crown favorites, while the monarch preferred to rid himself of high offenders by the shorter and surer course of act of attainder. As soon as Parliament felt itself strong enough to renew its struggle with the crown, it reverted to the ancient practice of impeaching royal favorites. Sir Giles Mompesson, who had grossly abused certain monopolies granted to him by the king, was the first to feel the wholesome severity of this mode of trial. In the same year, 1621, Lord Chancellor Bacon was impeached for corruption in office; and from this time until the doctrine of ministerial responsibility was firmly established impeach-

ments of officers were frequent. Occasionally non-official offenders were subjected to this mode of prosecution; for example, Dr. Sacheverell, in 1709, for preaching an improper sermon. Its cumbersome, tedious, and generally unsatisfactory character, which was fully disclosed in the trial of Warren Hastings, has brought it into disrepute, and since 1805 it has not been employed in England. If it is not wholly obsolete there, "the cause lies partly in the conservatism of the English people, and partly in the valid consideration that crimes may still be occasionally committed for which the ordinary law of the land hardly affords due punishment, and which, therefore, may well be dealt with by the High Court of Parliament." (Dicey's *Law of the Constitution*, 380.) For impeachments in Canada, see 6 *Solicitor's Journal*, 804, and Bourinot's *Constitution of Canada*, 172–73.

History in the United States.—It is believed that the Frame of Government of Pennsylvania of 1682 was the first colonial charter to provide for impeachment proceedings. The charter of Massachusetts Bay of 1629, the Fundamental Orders of Connecticut (1638–39, § 10), and the Rhode Island charter of 1643 contain provisions for the removal of officers by the general court for misdemeanors or defaults. The proceedings were summary, however, and did not involve presentment and prosecution by one legislative body and a judicial trial by the other. Both of these characteristics belong to impeachments under the Pennsylvania charter. The General Assembly (the lower house) "shall . . . impeach criminals fit to be there impeached," and all questions relating to judgment of criminals upon such impeachments by the Provincial Council (the upper house) "shall be resolved and determined by ballot."

Many of the constitutions adopted by the colonies soon after the Declaration of Independence provide fully and definitely for impeachment proceedings. Earliest of these is the constitution of Virginia, adopted June 29, 1776, followed by that of Delaware, proclaimed Sept. 21, 1776, and by that of Pennsylvania, proclaimed one week later. For these early charters and constitutions, see Poor's *Federal and State Constitutions*.

It was quite natural, therefore, that the convention of 1787, in preparing a constitution for the U. S., should deem it important to intrench this revered institution in the nation's organic law. The only differences of opinion on the part of the constitution-makers related to proposed modifications of the institution. All agreed that the model furnished by the mother-country ought to be copied in order that the Legislature might be able to properly bridle executive servants. (*The Federalist*, No. 65.) Undoubtedly the provisions of existing State constitutions upon this subject were carefully examined, and apparently the language of those instruments was adopted in part (cf. U. S. Constitution, art. 1, § 3, sub. 6, with art. 33, New York constitution of 1777, in Poor's *Federal and State Constitutions*, p. 1337, and with ch. 1, sec. 2, art. 8, Massachusetts constitution of 1780, p. 963 of the same work, and with New Hampshire constitution of 1784, p. 1286 of the same work); but the statement that impeachment was taken into the Federal Constitution, not directly from English usage, but rather from the constitutions of Virginia (1776) and Massachusetts (1780) (1 Bryce's *American Commonwealth*, 47, n. 2), can not be supported. Certainly the provisions of the Virginia constitution relating to impeachment diverge more widely from those of the Federal Constitution than do the latter from English usages, while the constitution-makers of Massachusetts borrowed their ideas and much of their language from Blackstone and the New York constitution of 1777. (Cf. Poor, 964, art. 6, with 4 Blackstone's *Com.*, 259.) Since the adoption of the Federal Constitution some of the original States and most of the later ones have closely copied that instrument when providing for impeachment proceedings. (Cf. Constitution of Georgia of 1777, art. 49, in Poor's *Constitutions*, p. 383, with the Constitution of 1798, art. 1, §§ 5 and 9, p. 384 of the same work.) In a few States the impeachment trials of certain officers take place in the ordinary courts of justice (e. g. Alabama, Nebraska, Texas). The constitution of Oregon (Art. 7, § 19) declares that "public officers shall not be impeached; but incompetency, corruption, malfeasance, or delinquency in office may be tried in the same manner as criminal offenses, and judgment may be given of dismissal from office and such further punishment as may have been prescribed by law."

Legal Rules.—Notwithstanding the antiquity of impeachment proceedings there is still much uncertainty about the rules of law applicable to them. This is not strange. As impeachment tribunals have been courts of last resort as well as courts of original jurisdiction, it has not been possible to subject their legal rulings to the careful scrutiny and dispassionate correction which appellate courts have applied to the decisions of regular judicial bodies. Moreover, courts of impeachment have not been composed of trained lawyers, and, besides, many of the legal questions involved in the most important trials have been so closely implicated with bitter partisan controversies that fair and impartial conclusions could not be expected.

Who may be impeached? In England private citizens as well as public officers may be subjected to this form of trial. Such was the rule of the colonial charters of Delaware and Pennsylvania. Under the Federal and State constitutions of the U. S. official offenders only can be impeached. Whether such offenders remain liable to impeachment after leaving office, in the absence of an express constitutional provision therefor, is doubtful. In the case of Belknap, who resigned the office of Secretary of War after impeachment proceedings had been proposed in the House of Representatives, but before presentment had been made to the U. S. Senate, the latter body decided by a vote of 37 to 29 that impeachable misconduct while an official rendered the offender liable to impeachment after retirement from office. This view finds support in the constitutional provision that punishment may extend to disqualification for office. On the other hand, it is argued that the great object of impeachment proceedings is to protect the State, not to punish for crime, and that as soon as the offender leaves office the State is free from danger. Although the majority of the Senate held that private citizen Belknap was impeachable for offenses committed as Secretary of War Belknap, the minority refused to accept this as a correct rule of law, and upon the conclusion of the case voted for acquittal on the ground of want of jurisdiction. The doctrine of the minority in this case has been accepted and enforced by the Supreme Court of Nebraska in *State* vs. *Hill*, 55 *Northwestern Reporter*, 794 (June 5, 1893). Differences of opinion have also developed as to the persons designated by the terms "officers of the United States" and "State officers." In Blount's case (Wharton's *State Trials*, 200) the U. S. Senate held that a member of that body was not included in the former term, and the Supreme Court of Colorado has decided that the Speaker of the House of Representatives of that State is not a State officer for purposes of impeachment. (*In re Speakership*, 15 Colo., 520.)

Impeachable Offenses.—Here again we find that opinions are conflicting. On the one hand, it is not only argued, but positively asserted, that only indictable misconduct subjects the offender to impeachment (Dwight on *Trial by Impeachment*, 6 *American Law Register*, N. S., 257); while, on the other hand, it is as stoutly maintained that this proceeding is not confined to indictable offenses. (Lawrence's *Law of Impeachment*, *ibid.*, 641; *State* vs. *Hastings*, 55 *Northwestern Reporter*, 774.) All agree, however, that impeachments are criminal proceedings, and therefore require the prosecution to establish its case beyond a reasonable doubt. (*Impeachment of Barnard*, Opinions of Chief Justice Church, p. 2070, and of Justice Andrews, p. 2071; *State* vs. *Bercklay*, 54 Ala., 599.) In England it appears to be doubtful whether a Commoner can be impeached for a capital crime. Blackstone declares he is subject to this mode of trial only for high misdemeanors (4 *Com.*, 259), and Sir James Stephen (1 *History of Criminal Law*, 146) inclines to that view. Hallam (2 *Constitutional History*, 201) and Anson (*Law and Custom of the Constitution*, pt. 1, p. 305) treat the case of Fitzharris (8 Howell, *State Trials*, 236) as establishing his liability to impeachment even for capital offenses. Some of the State constitutions expressly provide that moral delinquencies shall subject an official to impeachment. The constitution of Alabama specifies "habitual drunkenness, incompetency, or any offense involving moral turpitude" as impeachable offenses. Missouri's constitution of 1873 contains similar language.

Perhaps the most singular case of impeachment in the U. S. is that of the Ohio judges whose alleged misconduct consisted in declaring an act of the State Legislature unconstitutional, and who escaped conviction by a single vote. (20 Ohio R. App., 3.)

Punishment.—The House of Lords is subject to no express limitations in imposing penalties upon those whom it convicts. In the Federal Constitution and in those of most of

the States it is provided that "judgment in cases of impeachment shall not extend further than removal from office, and disqualification to hold and enjoy any office" under the U. S. or the State. Neither in Britain nor in the U. S. does the conviction or acquittal of one impeached affect in any way his liability to indictment and trial according to law for the same act. The right of a person to plead a royal pardon in bar of impeachment was sustained by the Lords in Danby's case (1679) against the protest of the Commons, but was negatived by the Act of Settlement (12 and 13 W. III., c. 2, § 3). It is still within the prerogative of the crown to pardon one after trial and sentence under an impeachment. (Anson, *Law and Custom of the Constitution*, 305.) By the U. S. Constitution the executive is denied the power to pardon or reprieve in such cases (art. 2, § 2), and the same limitation upon the executive is imposed in most of the State constitutions. Whether an officer can be suspended in the U. S. during impeachment proceedings, where the constitution does not expressly provide for suspension, is undecided, although the weight of argument is against such liability. (Dwight, *Trial by Impeachment*, *supra*; Miller, *On the Constitution*, 173–74; *Madison Papers*, 1154, 1528, 1572, 1573.)

Procedure.—Originally the House of Commons orally presented its charges to the Lords, but for centuries the practice has obtained of making these presentment in writing, and such is the custom in the U. S. In England the organization of the court of impeachment is attended with great pomp and ceremony. (See 7 Howell's *State Trials*, 1194; Macaulay's *Essay on Hastings*.) The English mode of procedure is described by Anson (*Law and Custom of the Constitution*, pt. 1, 303). Since the trial of Hastings it has been deemed settled that neither the prorogation nor the dissolution of Parliament abates an impeachment. (2 May's *Constitutional History*, 436.) The methods of impeachment procedure in the U. S. are set forth with much fullness in Cushing's *Law and Practice of Legislative Assemblies* (part ninth). It is worthy of notice that in England the accused is arrested and brought before the Lords for trial, while in the U. S. his presence is not necessary. In the latter country the members of the upper house, when sitting as a court of impeachment, must be upon special oath or affirmation. This is not required in England.

Besides the authorities already cited, the following are of especial value: Bancroft's *History of the Constitution*; Curtis's *History of the Constitution*; *Trial of Addison*, 1 Dall., 329; 5 Webster's *Works*, 502; Hildreth's *United States*; *Impeachment of President Johnson*, in 3 vols., 1868; Story, *Commentaries on the Constitution*; Pomeroy's *Constitutional Law*; Ordronaux's *Constitutional Legislation*, ch. viii.; *Debates of the Virginia Convention*, Richlay, Worsley, and Davis (1805), pp. 353–354; *Prescott's Trial*, Pickering and Gardiner (Boston, 1821); Throop's *Public Officers*; Mechem's *Public Officers*, §§ 468–475; 2 Arnold's *History of Rhode Island*, 528. FRANCIS M. BURDICK.

Impe'dance: in electricity, the effective resistance of a circuit (possessing self-induction) in which an impressed alternating electromotive force, obeying the law of sines, is operative. Instead of Ohm's law $\left(I = \frac{E}{R}\right)$, for such a circuit we have the following relation:

$$I = \frac{E}{\sqrt{R^2 + L^2\omega^2}}$$

where I is current, E the electromotive force, R the ohmic resistance, L the self-induction, and ω is the angular velocity, $2\pi n$ corresponding to the harmonic cycle. For the product $L\omega$, which is the resistance due to induction, the name *inductance* has been proposed. E. L. NICHOLS.

Impenetrability [from Lat. *impenetra'bilis*, impenetrable; *in-*, un- + *penetra'bilis*, penetrable, deriv. of *penetra're*, penetrate, deriv. of *pe'nes*, within, in the house of]: one of the essential properties of matter, implying that no two bodies can occupy the same portion of space in the same instant of time. If a nail be driven into a piece of wood, it does not, properly speaking, *penetrate* the wood, for the fibers are driven aside before the nail can enter. With regard to liquids, the property may be proved by very simple experiments. Let a vessel be filled to the brim with water, and a solid incapable of solution in water be plunged into it; a portion of the water will overflow, exactly equal in bulk to the body immersed. If a cork be rammed hard into the neck of a phial full of water, the phial will burst, while its neck remains entire. The disposition of air to resist penetration may be illustrated in the following manner: Let a tall glass vessel be nearly filled with water, on the surface of which a lighted taper is set to float. If over this glass a smaller cylindrical vessel, likewise of glass, be inverted and pressed downward, the contained air maintaining its place, the internal body of the water will descend, while the rest will rise up at the sides, and the taper will continue to burn for some seconds encompassed by the whole mass of liquid. (Leslie's *Elements of Natural Philosophy*.) The lightest gases are really as impenetrable as the densest solid, although, owing to their compressibility, it is not readily made apparent.

Strictly speaking, this property applies only to the *atoms* of a body. In many phenomena, bodies appear to penetrate each other; thus the volume of a compound body is always less than the sum of the volumes of its constituents; for instance, the volume of a mixture of water and sulphuric acid, or of water and alcohol, is less than the sum of the volumes before mixture. In all these cases, however, the penetration is merely apparent, and arises from the fact that in every body there are interstices or spaces unoccupied by matter.

Impen'nates, or **Impennes** [*impennates* is from Lat., *in-*, un- + *penna'tus*, winged, deriv. of *pen'na*, wing; *impennes* is Mod. Lat. from Lat. *in-*, un- + *pen'na*, wing]: an order of birds comprising only the PENGUINS (*q. v.*), distinguished by having the bones of the forearm flattened and the wing modified into a paddle for swimming, by a short tarso-metatarsus whose component bones are clearly indicated by deep grooves, and by the small, scale-like feathers with which the body is thickly clad. The shoulder-blade is wide, totally unlike that of any other bird, and the first digit of the hand fuses with the second. F. A. LUCAS.

Imperative (Categorical or Moral): in the terminology of the Kantian school of psychological ethics, an expression denoting the idea of Duty. "Man, in the consciousness of his moral liberty, recognizes two great laws regulating his will; the first prompts him to seek his own well-being; the second *commands* him to be virtuous, even at the sacrifice of happiness. From this opposition in his moral nature between Desire and Conscience springs up the Idea of Duty," otherwise the Moral Imperative, to which term Kant added the epithet *categorical* to indicate that its commands are absolute and unconditional (and not hypothetical).
Revised by W. T. HARRIS.

Imperative Mood: See VERB.

Impera'tor [Lat., liter., commander (deriv. of *impera're*, command), but with meaning also from *impe'rium*, inviolable military authority attaching to a general, hence general, and later emperor]: one who enjoyed the *imperium* (authority) appertaining to the higher offices of the Roman state, such as that of prætor, consul, or dictator. In accordance with ancient custom, however, the title was not assumed by such an officer while at Rome, at least until he had earned the right to employ it, either by the acclamations of his soldiers in the event of victory, or by special decree of the senate in view of distinguished services. The transition to the specific meaning attached to the word in imperial times (as the designation of the emperor) was afforded by the fact that Cæsar, who possessed *imperium* from the time of his victories over the Helvetii to his death, employed the term, contrary to the usual custom, within the city as well as without in the manner of a regular *cognomen*. Octavianus, the adopted son and heir of Cæsar, apparently considering or choosing to consider the designation thus, as a *cognomen*, adopted it as an hereditary name, using it, however, in place of a first name (*prænomen*). The three emperors succeeding Augustus (Octavianus) did not follow him in this custom, but it was revived by Nero, and by the time of Vespasian *imperator* had become a part of the imperial title. But throughout the whole of the first century A. D. the word is chiefly used of the emperor in his capacity of commander of the army, and it is not until well into the second century that it comes to be used as a general designation for the head of the state. G. L. HENDRICKSON.

Imperfect: in music, a term indicating deficiency or a want of completeness or finality. An imperfect interval is one which is a semitone less than the perfect. Thus the interval B—F is an imperfect fifth; but by the addition of a semitone to either the higher or lower term—i. e. by flattening B or sharpening F—the interval becomes per-

fect. An imperfect chord is one in which some of its intervals are wanting; as when, in a chord of the seventh, we occasionally omit the third or the fifth. The imperfect cadence (or half cadence) is that in which the harmony of the tonic triad is followed by that of the dominant, being the exact contrary of the perfect cadence.

Revised by DUDLEY BUCK.

Impeti'go [Lat., deriv. of *impe'tere*, rush upon, attack]: a form of skin disease which includes two quite distinct varieties. The older writers applied the term to pustular eruptions generally, but some of these are now grouped with other species. The varieties of impetigo are the simple non-contagious and the contagious, both of which, however, are very similar and only distinguished by careful examination of the circumstances attending the incidence of the disease.

WILLIAM PEPPER.

Im'peyan Pheasant: popular name of the *Lophophorus impeyanus*, a fine, large pheasant from the Himalayas, nearly as large as a turkey, and splendidly colored. It is a native of the high, cold regions of the Himalayas.

Imports: See COMMERCE.

Impost: See ARCH.

Impos'tors, The Three [transl. of Lat. *De Tribus Impostoribus*]: i. e. Moses, Jesus, and Mohammed; a supposed work attacking the Jewish, Christian, and Mohammedan religions, which at various times since the tenth century has been written of by theologians and others. It is mentioned in the encyclicals of Gregory IX., May 21 and July 1, 1239, as a work used by Frederick II. The most diverse statements have been made as to its authorship and character, and it is very doubtful if a genuine work of this title ever existed. There have been many spurious works written, pretending to be the real *De Tribus Impostoribus*. Not one of them is of any great antiquity or of any possible value. Revised by S. M. JACKSON.

Impressionism: in painting, one of the forms of realism in art (see REALISM); the practice of representing the effects of nature upon the artist's eye, without analysis of their causes, and without the observance of rules or traditions; especially, since about 1875, the work of a small body of French artists and their followers in other countries, who have been called *Impressionistes*. The leaders of this movement are probably Édouard Manet, Claude Monet, and Auguste Renoir, though some critics would add to these the name of J. F. Raffaelli; others are Camille Pissaro, Paul Signac, Sisley, Caillebotte, Besnard, and two ladies named Berthe Morizot and Marie Cassat. In their pictures the effect of color in strong daylight is one of the important things. What we call green when seen under sunshine is not green, but yellow; the shadows cast upon snow by sunshine are almost pure blue; a white dress seen in the shade of trees on a bright day has violet or lilac tones; and these effects of color, which the ordinary spectator hardly sees or suspects, are much valued by these artists, and form, indeed, their principal subject. In like manner the effect of sunset color upon water or rocks or a horse's smooth hide is considered worth devoting a whole picture to; everything else has to give way to the one need of getting all possible brilliancy out of this. So a number of sunflowers, with a grassy field seen between the blossoms, is so treated that the *impression* on the painter's mind of vivid yellows of different kinds, mingled with such other tints as the half-dazzled eye receives, shall be reproduced for those who look at the picture. Some of these artists cover the canvass with small touches of pure bright color so mingled as to produce at a considerable distance the effect of mingled and graded color desired; this plan has sometimes been followed by lovers of brilliant color belonging to other schools. Some of the impressionists have tried to preserve the exact relation between different colors as they are in nature, as far as it is possible. That, of course, is only possible to a very small degree; painting can not approach the highest lights of nature nor the deepest shades; the gray shades in a distant thundercloud may really be lighter than white paper, and yet they must be represented by putting dark colors upon that white paper. So the usual custom is to make the few gradations possible in painting stand for the whole immense range of nature, in proportion, and this is one of the *conventions* of painting. But one of the attempts of the impressionists has been to neglect this generally accepted scale of light and shade, and to paint a small part of the real aspect of things in nature in its own colors and light and shade, ignoring the rest. The work of the impressionists is sure to seem very incomplete to the spectator who is not especially interested in painting, and generally seems sketchy and a mere memorandum of one or a very few observations, but it excites very great interest among students of graphic art, and can hardly fail to exert a great influence on future painting.

RUSSELL STURGIS.

Impressment [< M. Eng. *impressen* < *imprimere*, to press upon]: the exercise of the royal prerogative in levying land or naval forces in time of war by compulsory process. This method of raising armies was so limited by statutes under Edward III. and his immediate successors that as early as 1402 it was deemed illegal to require any man to serve as a soldier out of his country, except in case of invasion. Under the Tudors and Stuarts the crown exercised its ancient prerogative, as shown by 35 Eliz., c. 4, which was enacted for the relief of disabled soldiers who had been "pressed . . . for her majesty's service," and fresh limitations were imposed by 16 Car. I., c. 28. Since that act soldiers have not been impressed except under the authority of special statutes, the latest of which is 19 Geo. III., c. 10 (1779). As Parliament never regarded the navy with fear, no such limitations were imposed upon the impressment of marines as have been noted in the case of soldiers. The legality of royal press-warrants was upheld in *Rex* vs. *Broadfoot*, Foster, 154; 18 State Trials, 1323, decided in 1743. A form of press-warrant and a valuable sketch of the history of impressment will be found in the opinion delivered by Mr. Serjeant Foster in that case. His conclusions received the approval of Lord Mansfield and Lord Kenyon, who declared that "the power of pressing is founded on immemorial usage," and "extends to all seafaring men." This power has never been renounced, but no sovereign or minister would now think of exercising it. By statutes "able-bodied rogues and vagabonds and persons following no lawful calling," although not seamen, have been subjected to seizure by the press-gang. Until recent years Great Britain claimed the right "of impressing British subjects out of neutral merchant vessels, and of deciding by her visiting officers who, among the crews of such merchant vessels, were British subjects." The exercise of this alleged right was one of the causes of the war of 1812 between that country and the U. S. Although in the treaty of Ghent Great Britain did not renounce her pretensions on this subject, she has practically abandoned them, and, so far as the U. S. are concerned, has acquiesced in the doctrine stated by Webster: "In every regularly documented American vessel the crew who navigate it will find their protection in the flag which is over them." Letter of Webster to Ashburton, Aug. 8, 1842; 2 Stubbs's *Constitutional History*, 311; 3 *ibid.*, 94; 1 Blackstone's *Commentaries*, 419–420. FRANCIS M. BURDICK.

Imprisonment: in its technical and most comprehensive sense, any deprivation of personal liberty, whether by actual confinement or simply by forcible restraint or detention against a person's will. Such imprisonment may consist in a restraint or detention imposed by the exercise of actual force (in which case the imprisonment is termed *actual*), as by detaining a man in a public street or highway, or by taking him into actual custody; or it may consist in restraint which is imposed by the exhibition of such real or assumed authority as secures his submission, or by threats or menaces in view of which a person is reasonably led to suppose that unless he acquiesces in the restraint or detention actual personal violence will be resorted to (in which case the imprisonment is called *constructive*). When the restraint upon a man's person is unlawful it is called *false* imprisonment, and this is a violation of personal rights, for which an action at law may be instituted and damages recovered. See FALSE IMPRISONMENT.

The word imprisonment, however, is used in a narrower and more general sense to denote an actual confinement of the person under legal process in some prison or jail which is specifically employed for such a purpose, in accordance with the provisions of law. The power to so imprison a person is inherent in courts or magistrates, as one of their essential prerogatives, or is conferred upon them by statutes, and may be exercised in both civil and criminal proceedings. Imprisonment may be employed as a punishment for crime, to insure obedience to the summons or orders of the court, as where in a criminal case persons are confined to secure their presence as witnesses, or as a civil remedy, as where a debtor is arrested and held in custody in order to force him to pay a debt.

Imprisonment in criminal proceedings is employed both as a means of detaining alleged offenders in custody to insure their appearance at the time of trial, and also as a form of punishment to which a convicted person may be sentenced. It is the most common form of punishment, both in cases of felony and of misdemeanor, and the classes of crimes for conviction of which it may be imposed and the term of the imprisonment are generally regulated by statutory provisions.

The minimum and maximum period are usually provided for in the case of each particular crime, and the magistrate may impose a greater or less term within these limits, according to his discretion. It is also frequently provided that, upon conviction of a crime for which there has been a previous conviction, the term of imprisonment shall be of longer duration than in the case of the first offense. The readiness with which the severity of the punishment may be varied by the magistrate by imposing a longer or shorter term of imprisonment according to the nature of the offense or the character of the criminal, and the opportunity which is given for the reformation of offenders when confined in prisons, renders this one of the most salutary modes of punishment which the law provides.

When, in criminal proceedings, a recognizance with sureties may be required of a witness for the prosecution to insure his attendance for the purpose of testifying at the trial of an alleged criminal, and he fails to furnish the same, he may be detained in prison for that purpose. Imprisonment for contempt of court is discussed in the article on CONTEMPT (*q. v.*).

Imprisonment for debt was, at common law, in former times generally allowed at the suit of a creditor as a matter of course, but this has been found to be productive of so much hardship and injustice that imprisonment for debt has been abolished by statute both in Great Britain and in the U. S., except in particular cases, among which are usually included those where a debt is founded upon fraud or misfeasance, non-payment of fines and penalties, etc.

In England the first statute of this kind was passed in 1838, but the act which at present (1894) regulates this subject was enacted in 1868 (32 and 33 Vict., c. 62). This provides that no person shall be imprisoned for making default in the payment of a sum of money, except in cases of penalties not arising upon contract, in cases of default by trustees or solicitors in making payments directed by a court of equity, of default in payment of a sum recoverable summarily before a justice, and in a few other cases of less importance. In these excepted cases the imprisonment can not continue longer than a year. There are also some further qualifications of the general rule in special instances. Thus when a person makes default in the payment of any debt due in pursuance of the order or judgment of a competent court, and is proved to have had the means to pay since the order or judgment was rendered, he may be committed to prison for a term not exceeding six weeks, or until payment is made. Arrest and imprisonment upon mesne process is abolished entirely, with the single exception that where the suit is for £50 or more, and there is reason to apprehend that the defendant will leave the country, he may, on proper evidence, under oath, of these and a few other necessary facts, be imprisoned for a term not exceeding six months, or held to bail. In Scotland imprisonment for civil debt was abolished by the Debtor's Act of 1880 (43 Vict., c. 34, § 4), excepting in case (1) of taxes, fines, or penalties due her Majesty, and rates and assessments lawfully imposed, and (2) sums decerned for aliment. Imprisonment in the excepted cases can not be for more than a year.

In the U. S. nearly all of the States have, either by constitutional provisions or by statute, abolished imprisonment for contract debt, except in certain cases specifically mentioned; and the laws of the U. S. provide that no person shall be imprisoned for debt in any State where imprisonment for debt is abolished, but the State course of proceeding shall be followed.

The laws of the different States providing for the cases in which imprisonment may be imposed vary in their details; but in general they provide that no person shall be imprisoned for a debt, except in case of non-payment of fines or penalties, in cases of fraud (as the fraudulent contracting of a debt, the concealing of property, removal from the jurisdiction, etc.), in actions for the recovery of money received by persons acting in a fiduciary capacity, and in certain cases of execution upon a judgment recovered for a tort. These provisions are in general made applicable to arrest and imprisonment either on mesne or final process, the imprisonment on final process being made applicable when execution has been returned wholly or partly unsatisfied.

The above are the purposes for which imprisonment under authority of law is chiefly employed, though particular classes of persons may be placed in legal confinement for still different reasons, as, for instance, where lunatics are confined in asylums; but places of this kind are not usually known as prisons, and this kind of imprisonment will therefore not be considered here. See INSANITY.

Discharge from imprisonment may be effected in various ways. In the case of a criminal sentenced to a designated term, he is entitled to be discharged on the expiration of his term, less any deductions of time to which he may be entitled by law for good behavior. In the case of one sentenced to two or more terms of imprisonment for distinct offenses, the period at the expiration of which he is entitled to be discharged is the total of all the terms to which he is sentenced, less the accumulated deductions.

In the case of an imprisoned debtor the statutes usually provide that he shall be released upon making an assignment of all his property (less any exempted by law) for the benefit of his creditor or all his creditors, according to the special provisions of the law.

A prisoner who desires to obtain a release or discharge upon the ground that he is unlawfully imprisoned, or by showing that the reasons for his confinement no longer exist, or who desires to have the reasons for his detention investigated and their validity determined, may make or procure to be made on his behalf a petition upon *habeas corpus* to the proper court, or the petition may be made in behalf of the prisoner by another of his own motion. The rules upon this subject are fully treated in the article upon HABEAS CORPUS (*q. v.*).

F. STURGES ALLEN.

Improvisation [from Lat. *improvi'sus*, unforeseen; *in-*, un- + *pro*, before + *visus*, perf. partic. of *vide're*, see]: the art of composing poetry extemporaneously. Although the term embraces every rhythmic form of impromptu song or recitation, and is sometimes even applied to unpremeditated prose declamation, especially to that of a highly figurative and impassioned character, yet it is restricted in popular use not merely to metrical compositions, but to those which please by syllabic consonance or correspondence of sound. The modern ear, in the countries and classes where improvisation is most practiced, has been trained to demand not only a regular recurrence of metrical feet or accentual longs and shorts, but full or half rhyme, assonance, or at least alliteration, as an indispensable condition of this species of intellectual entertainment. But even in Italy and Spain, especially in the more elevated and refined exercise of the art, that satiety of rhyme which led Trissino to invent modern blank verse—first employed in his *Sophonisba* in 1524—sometimes induces improvisators to dispense with this ornament, and to content themselves with a simple iambic or trochaic arrangement of syllables in verses of a determinate length. There are, too, nations in whose extemporaneous poetry parallelisms in sense or imagery, coupled with meter, supply the place of consonance.

There have been *improvvisatori* in almost all European peoples, but in no country except Italy have they been numerous enough and gifted enough to have had any real literary importance. Even in Italy it was not till late in the fifteenth century that improvisation became more than a popular amusement. The first famous name we have is that of a certain Niccolò Leoniceno; and slightly later was Serafino, known as Aquilano (d. 1500), who obtained favor from many great people, among others the King of Naples, the Duke of Milan, and Cæsar Borgia. Perhaps the most noted in the whole list of such poets was Bernardo Accolti, who sprang into notoriety in the time of Pope Leo X. Until his death in 1534, he roused indescribable enthusiasm whenever he appeared before the public. Such successes gave dignity to the art, and persons of education and real poetic power took it up. Some of the Italian *improvvisatori* of the sixteenth century composed in Latin as well as in their native language, and many of those of the seventeenth and eighteenth centuries, as well as of the nineteenth, were persons almost as remarkable for learning as for dexterity in the production of unpremeditated verse. Perfetti in the seventeenth century, Corilla in the eighteenth, Sgricci in the early part of the nineteenth, were all persons of high culture, and later Regaldi and Giannina Milli have combined with a surprisingly ready command of varied versification a range of thought and of

illustration which shows a wide acquaintance with history, with life, and with literature. Some of the published works of Italian *improvvisatori* are of unequivocal merit, and few of them are without more or less frequent flashes of genius; but as a general rule we admire the art rather than the product, the loom rather than the tissue. As we have already hinted, improvisation is now much less common than formerly as an entertainment of highly cultivated circles in Italy. Though still occasionally practiced in fashionable society, it is, so far as such society is concerned, substantially a thing of the past, but it exists with almost unabated vitality among the peasantry of many provinces. Tigri's *Canti Popolari* and Giuliani's *Linguaggio Vivente della Toscana*, which contain many specimens of impromptu verse taken down as faithfully as possible from the lips of peasant reciters, are well worth the attention of the reader. The astonishing quickness of intellect of the Italian people shows itself as brilliantly in the unpremeditated lays of the rustic as in animated discussion and action in the educated classes. Improvisators of both sexes, who are what the Italians call *analfabeti*, or unable to read or write, extemporize, like their brethren of higher culture and social condition, in every meter, every structure of verse, couplet and stanza, every style of poetic composition, lyric, narrative, didactic, dialogue between two rival bards, *arcades ambo*, and dramatic; and it is worth noticing that at many of the popular theaters the playwright only furnishes the characters—which indeed are usually regular stock *rôles*—and the skeleton of the drama, leaving the personages to extemporize the dialogue, which is often most genial and spirited, as the action proceeds. Indeed, this dramatic improvisation has long played an important part in the Italian theater, being, for example, the chief characteristic of the so-called *Commedia dell' Arte*. See ITALIAN LITERATURE.

Revised by A. R. MARSH.

Impulse [from Lat. *impul'sus*, push; *in* + *pel'lere*, set in motion]: a tendency to action, originating in part within an organism or an agent. By an impulsive character we understand one in which activity predominates, but activity of a somewhat capricious kind. We contrast a creature of impulse with a creature of reason. And that means more than that the impulsive individual can give no adequate reason for his outbursts; it means also that no one else can. Impulses are essentially unreasonable to the onlooker. They are capricious in the sense that they are to a degree idiosyncratic.

Sensuous Impulse.—Looked at from the side of physiology, processes of sensation and impulse are such only as they are correlative and antithetic to each other. The physiological unit is an arc, a reaction. Psychologically we find a similar state of things. At the beginning, so far as investigation can discover, there is an element of motor feeling—of going out as well as of taking in. And this "going-out" element gets to itself, wherever we find consciousness, a kind of personality or idiosyncrasy, seen in its selective reactions, and in the kind of character which it builds up. The ribs, so to speak, of consciousness go in pairs, just as the sensor and motor nerves serve as rib-pairs in the nervous system; and taken together as pairs they constitute, in our last analysis, the foundation of all conscious life. In dealing with sensibility, we deal with one side of this pair. What sensibility is, is an inscrutable mystery; it is an ultimate psychological fact. And the same is true of impulse; it is the other element in the fundamental pair.

Yet in the way of description, we may make the following observations about impulse: (1) Impulse belongs to the reactive consciousness; it does not involve deliberation and will. A deliberative character is a man who controls his impulses; that is, one who brings his will to bear effectually upon his impulses. On the other hand, very strong and varied impulses tend to overpower and paralyze the will. Impulse should therefore find its general condition in the physiology and psychology of the involuntary life. It follows that the end of impulse is not pictured in consciousness. (2) Impulses are never quite beyond control in normal circumstances. They are sufficiently internal and unreflex to be subject to voluntary negation. Yet their influence on the volitional life may be very great. In cases of long indulgence or weak resolution their subjugation can only be indirectly accomplished—that is, by the active pursuit of other lines of activity, by which the force of the unprofitable impulse is drained off into adjacent channels. (3) The idiosyncratic character of impulse must be due largely to constitutional tendencies of individuals, derived from inheritance or peculiar conditions of life. The effects of inheritance in this particular are very marked. Nothing is so evidently inherited as active temperament. And in the individual life the growth and decay of impulse is easily observed. Discouraging circumstances or continued ill-fortune may reduce a man of hopeful impulses to a prevailing pessimism and lack of interest. This characteristic individuality of impulse prevents its division into classes, and makes it impossible to formulate for single impulsive reactions any exact laws of stimulation. (4) Impulse is largely internally stimulated, and can not generally be analyzed into definite reflex elements. This is true on both the physiological and the psychological side. A physiological impulse can not be traced directly and uniformly to a particular stimulus; it seems to be rather the outcome of what is peculiar to the central process, and to result from the growth of the system. And on the other hand, we can not trace impulses in consciousness to uniform psychological antecedents. They seem to represent the state of consciousness as a whole, apart from the theoretical worth of particular images. Impulses of fear in nervous persons are, and persist in being, quite independent of argument and persuasion. Our reasoned conclusions frequently have to fight their way through many opposing impulsive tendencies. Yet it is generally through the presence of some definite object or image that impulses are clearly manifested. What may have been a vague feeling of unrest or disquiet turns into an impulsive motor reaction whenever it finds its appropriate object, as Jessen remarks. Accordingly, we may reach a more adequate definition of sensuous impulse: it is the original tendency of consciousness to express itself in motor terms as far as this tendency is not due entirely to particular stimulations of sense.

Confining ourselves for the present to the sensuous side of impulse, we find that such tendencies are either *positive* or *negative*—toward or away from a present stimulating object. The impulses following pain are away from the cause of pain, those arising from pleasure toward the source of pleasure. They do not involve, however, definite purpose or the adoption of conscious ends. The purposive character which they have is a case, as far as psychology goes, of original adaptation largely on the part of the nervous organism. Further, such impulses are either *furthering* or *inhibitory*, respectively, of motor reaction. The effect of moderate pain is generally quieting or inhibitory. Yet an important class of physical pains induce definite and violent motor agitation, such as the discomforts arising from physical lack or unsatisfied appetite. All the animal appetites, further, are native, and their appropriate motor apparatus comes into impulsive activity. The impulses which spring from pleasurable states are uniformly furthering.

Ideal Impulse.—The intellectual life seems to be carried forward, also, by impulses which may be called *ideal*—such as curiosity, the impulse to attend, interest, the impulse to pursue trains of thought, etc. The whole range of emotion (see IDEAL FEELING) rests upon certain great classes of impulsive tendencies toward or away from certain classes of mental pictures. Among these ideal tendencies there are logical impulses, impulses toward self-gratification, sympathetic impulses, æsthetic and ethical impulses.

Theories of impulse, which attempt to account for its rise in race development, take two great forms: those, first, which hold that impulse and INSTINCT (*q. v.*) are due to earlier volition, and so represent "lapsed intelligence"; and, second, those which hold that impulse is simply an organic or intellectual tendency to the repetition of a function. Both of these views hold that impulse arises from motor HABIT (*q. v.*); so whether the habitual action was originally voluntary or not is a matter of little importance for psychological theory. As a phenomenon of habit, impulses represent the tendencies and needs of the physical and mental life, as they have developed in the midst of the physical and moral environment.

REFERENCES.—Schneider, *Menschliche Wille*, and *Thierische Wille*; Bain, *Emotions and Will* (London and New York, 1888, pt. ii., ch. i.); Beaunis, *Les Sensations Internes* (Paris, 1889, chaps. ii.–iv.); Prever, *Mind of the Child* (New York, 1890, vol. i., ch. ix.); Baldwin, *Handbook of Psychology* (New York, 1891, vol. ii., pp. 304 ff. and 320 ff.) and *Mind*, Jan., 1894, article on *Imitation*; Sully, *The Human Mind* (London, 1892, vol. ii., pp. 188 ff.); Wundt, *Physiologische Psychologie* (4th ed. Leipzig, 1893, vol. ii., pp. 404 ff.).

J. MARK BALDWIN.

Imputation [(from Lat. *imputa're*, reckon in, set to the account of; *in*, in + *puta're*, estimate, reckon). *Impute*, translation of Gr. λογίζεσθαι and Heb. *hāshābh*, think, esteem, reckon, impute]: in Christian theology, the transference of a person's guilt or personal righteousness. The Hebrew and Greek equivalents of the word imputation are of very frequent occurrence in the Scriptures. Particular passages in which they are variously translated in our version are the following: *to think* (Job xxxv. 2 and Rom. ii. 3); *to regard* (Isa. xxxiii. 8); *to esteem* (Isa. xxix. 16, 17, and Rom. xiv. 14); *to reckon* (2 Sam. iv. 2); *to be reckoned for or among* (Rom. iv. 4; Luke xxii. 37); *to impute* (Lev. vii. 18 and Rom. iv. 6–8); *to lay to one's charge* (2 Tim. iv. 16), etc.

The following statement of the doctrine is from the pen of an eminent theologian: "*Sin* includes two essential elements: (1) *Macula*, moral pollution or defilement, as sin stands opposed to holiness; (2) *reatus, guilt*, as it stands opposed to justice. Again, *reatus* or guilt must be distinguished as (1) *reatus culpæ*, desert of blame, and (2) *reatus pœnæ*, just obligation to punishment. It is agreed by all parties that neither the *macula*, pollution, nor the *reatus culpæ*, desert of blame, can be separated from the person sinning, and imputed or charged to the account of another person. But the whole Christian Church, Roman, Lutheran, and Reformed, is agreed that the *reatus pœnæ*, or just liability to punishment, may be charged to the account of other persons than the actual transgressor when those other persons stand in such a relation to the actual transgressor as, for any reason, to be justly responsible for his action. 'To impute sin or guilt,' therefore, is to charge the legal responsibility for transgression upon any one as the ground of judicial process. 'Not to impute sin' is to 'cover it,' remit its punishment, and so refuse to make it the substance of a penal indictment (Rom. iv. 6–8). Thus, though for very different reasons, was the guilt (*reatus pœnæ*) of Adam's act of apostasy imputed or charged to the account of all his natural descendants, who are punished together with him; and the 'many offenses' of all his people were 'laid upon' or charged to the account of the Lord Jesus, and he suffered their punishment vicariously—i. e. in their stead and behalf. 'The Lord hath laid on him the iniquities of us all' (Isa. liii. 6–12; Gal. iii. 13; 1 Pet. ii. 24): 'Therefore as by the offense of one, judgment came upon all men to condemnation' (Rom. v. 18).

"*Merit* must also be distinguished (1) as worthiness of praise, which is inseparable from the person, and (2) worthiness of reward, which may be 'imputed' or credited to all who by previous union or stipulation may have rights involved in the action of the meritorious agent. *Righteousness* means 'that which satisfies law' (*Cremer*), all that constitutes the condition of acceptance or of reward—i. e. of forensic justification. This righteousness may be wrought out personally in behalf of one's self, or vicariously in behalf of another. Thus by the rewardableness of Christ's obedience, or his vicarious righteousness imputed to all who believe, as the ground of their sins being pardoned and their persons accepted and treated as those with regard to whom all the demands of the law have been fulfilled. 'Even so by the righteousness of one the free gift came upon all men unto justification of life'; 'So by the obedience of one shall many be made righteous'" (Rom. v. 18, 19 and iv. 3–9).

In regard to this statement it is to be said that the idea of the imputing of righteousness causes no difficulty, provided we keep in mind that the righteousness imputed is not a subjective moral quality, but is good standing before the law, thought of as something objective; a gift bestowed by God, and accounted as belonging to the person on whom he has bestowed it; not Christ's personal righteousness, but God's objective righteousness, provided for men through Christ. Phraseology of this sort is scriptural (Rom. iv., for example).

The case of the imputation of guilt is different. Verbally, the only imputing of guilt spoken of in the Scriptures is that of a person's own guilt to himself. When we speak of the sin of the first man being imputed to the race, or of the sins of men being imputed to Christ, we use phraseology that was not taken from the Scriptures, but was coined for theological purposes. For purposes of comparison, it is convenient to use the same term in regard to guilt that we use in regard to righteousness, but there is a radical difference between the two. Good standing before the law may be bestowed as a gift, and reckoned accordingly, but guilt may not. In our current thinking guilt and punishment are connected with blameworthiness; and as long as we make this connection, it is repugnant both to Scripture and to natural conscience to say that God holds a person guilty, or punishes him, for that for which he is not to blame. In the statement cited this difficulty is met by distinguishing between *reatus culpæ*, blameworthy guilt, and *reatus pœnæ*, "just obligation to punishment," whether one is to blame or not. In human government, owing to human imperfection, this distinction sometimes exists; whether it is conceivable as existing in the perfect government of God is not so clear to all minds.

Three different opinions now prevail in the Churches: First, the opinion of those who accept the definition of imputation given in the statement above, accept the distinction of two kinds of guilt, and so accept the doctrine; second, the opinion of those who accept the definition, but do not make the distinction, and therefore reject the doctrine as attributing immorality to God; third, the opinion of those who formulate the doctrine differently, saying not that Christ suffered the punishment of our sins, but that his finished work was *instead of* the punishment due us, and not that we are guilty and punished or punishable for the sin of the first man, but that, through our race connection with him, we are involved in the consequences of his act. A particular theory on the subject is that sometimes described as the theory of "mediate imputation." In the Revised Version of the New Testament several of the current proof-texts on imputation appear in a form different from that given them in the King James Version. An admirable exegetical discussion of the subject may be found in *The Pauline Theology*, by Prof. Stevens, of New Haven (1892).

Revised by WILLIS J. BEECHER.

In'achus (in Gr. Ἴναχος): in Greek mythology, son of Oceanus and Tethys; the god of the river Inachus in Argos, who in the dispute between Poseidon and Here about the possession of Argos decided in favor of the latter, and hence was deprived of his water by Poseidon and made dry except in the rainy season. Being a river-god, he was reckoned as the first King of Argos, who, after the flood of Deucalion, led the Argives from the mountains into the plains; hence Argos is often called Inachian. He was the father of Io, and through her the progenitor of the royal families of Egypt, Phœnicia, Crete, Thebes, and Argos. J. R. S. S.

Inagua (ĕe-naa'gwăa), **Great**: the largest and most southerly of the Bahama islands; 54 miles N. E. of the eastern extremity of Cuba. The northwest point is in lat. 21° 7′ 30″ N. and lon. 73° 39′ 30″ W. (see map of West Indies, ref. 4–G). It is irregular in shape, 50 miles long from E. N. E. to W. S. W., and 25 miles in greatest width; area, 665 sq. miles. Pop. (1891) 994. The island is nowhere more than 150 feet high, and is surrounded by reefs which make navigation dangerous. The land affords good pasturage, and in the interior there is a salt lake which has been utilized for the manufacture of salt. The principal village is Matthew Town. Little Inagua (8 miles by 6), 12 miles northward, has a few inhabitants. H. H. S.

Inanition: See STARVATION.

Inarching: See ARCUATION.

Incan Antiquities; architectural relics found in Peru, and believed to have been the work of the Incas. The area controlled by the Incas included through conquest several diverse nations not on the same plane of culture. Three of them, however, nearly approached each other in this respect —the Kechuas, the Aymaras, and the Yuncas or Chimus. As the two first named lived in contiguity in the valleys and on the lofty plains of the interior, and by some ethnologists are believed to belong to the same stock, their remains will be treated together in this article.

General Characters.—The architectural relics of the Incas do not yield in size and importance to any of the ruined cities in Mexico and Yucatan (see MAYA ANTIQUITIES and MEXICAN ANTIQUITIES); they present, however, features so apart from these and so peculiar to themselves that they must be regarded as independent in origin, and the product of a local and spontaneous culture. There are also evident distinctions between the architecture of the Kechuas and the Aymaras, although in later times they were closely connected. The special features of the Kechuan structures are cyclopean walls of huge stones fitted together without mortar; structures several stories in height, not erected on mounds or pyramids; doors narrowing in width toward the top; the absence of pillars and arches of any description; the avoidance of exterior and mural decora-

tion; the frequent disposal of niches in the walls, apparently for decorative effect; and the extreme solidity of the foundations. Figures of animals or men in low or in high relief are exceedingly rare, and the elaborate external ornamentation, so common in Central America and Mexico, is practically unknown. In specimens believed to be of Aymara origin this is not unusual, the walls occasionally presenting designs of an ornamental character in low-relief; columns were erected as supports, and statues chipped from large blocks are also found. The Aymaras preferred the right angle in their edifices, and the narrowing doors of the Kechuan builders were not imitated by them.

Localities.—The most celebrated locality is that of the ruins at Tiahuanuco, on a plain near Lake Titicaca, at a height of 12,900 feet above sea-level. The climate is cold and the soil sterile, which adds to the surprise of finding in the midst of such surroundings one of the most remarkable proofs that a high state of civilization was attained. The ruins cover more than a square mile, and represent the remains of many small and several large structures. The latter have been named the Temple, the Fortress, the Hall of Justice, etc., from fancied resemblances to edifices of such purposes. The Temple forms a rectangle of 338 by 445 feet; the Fortress was built on an artificial mound 620 feet long, 450 feet wide, and 50 feet high; the rectangle of the Hall of Justice is 420 by 370 feet. The buildings themselves were built of large stones, polished and fitted together so accurately that a knife-blade could scarcely be inserted between them. These were not kept in place by mortar or cement, but by T-shaped mortises cut in the body of the stone, and by copper clamps, traces of which can still be seen. Some of these stones are 25 feet long, 14 feet broad, and more than 6 feet thick. They are of fine-grained red sandstone, or of a hard basalt, and must have been transported a considerable distance. Several of the doorways are cut from solid single blocks of stone. One called the great monolithic doorway is about 14 feet in height and 18 inches thick, of exceedingly hard trachyte, cut and polished with absolute precision, and ornamented with figures in low-relief. All these edifices were in ruins when the Spaniards first conquered the country, and the natives had no traditions as to their builders or the object of their construction. On the islands in Lake Titicaca and at other points on its shores there are other ruins, but of less unusual character.

The peninsula of Sillustani, in Lake Umayo, about 15 miles from Lake Titicaca, offers a number of curious remains of tombs, circular groups of massive cut and rough stones, and stone pillars with figures in low-relief. At Cuzco, which was the capital city of the ancient empire of the Incas, many remains still exist to testify to their skill as workmen and the vast areas of the buildings they erected. Many of the walls constructed long before the conquest are incorporated in the plans of modern edifices, and have been traced by careful antiquarians. Of the native buildings the Temple of the Sun was the most conspicuous, and was probably the most imposing edifice in Peru. It is now incorporated into the church and convent of San Domingo, and the existing remains confirm substantially the descriptions of the early Spanish chroniclers, which by some have been rejected as grossly exaggerated. The temple proper was in area about 300 by 50 feet, and formed one side of a rectangular court, around which were placed the numerous dependent structures. The walls of all were of beautifully cut stones, so perfectly fitted and faced that they remain today, where not removed by the Spaniards, in as good condition as when completed. No mortar was employed, but bronze and copper clamps were occasionally called into requisition. The Palace of the Virgins of the Sun was another celebrated monument of high antiquity. One of its side walls still remains. It is 750 feet long, from 20 to 25 feet high, and resembles those of the Temple of the Sun in the size and finish of its stones. Other structures called "palaces," the walls of which remain in part, measure from 200 to 800 feet square, and furnish excellent illustration of the neatness of the work performed by the native stone-cutters. Humboldt remarked of some of them which he examined that the joints are so perfect that their lines of junction could scarcely be traced if the faces of the stones were dressed down smooth.

At Cacha, on the Vilcañota river, are the remains of the famous Temple of Viracocha. Its dimensions are 330 by 87 feet, and though ruined and plundered of much of its material, there are still erect solid walls, 5 or 6 feet thick and 40 feet in height. These are not wholly of stone, but of adobes or sun-dried bricks resting on base courses of stone. The remains of columns are visible, and the whole was surmounted with a pitched roof, as certain details indicate. On the lower course of the Vilcañota, there known as the valley of Yucay, a region of mild climate and fertile soil, and therefore a favored place of residence of the Incas, many stupendous remains of their works are visible. The steep sides of the mountains are terraced so as to form garden plots, known as *andenes*, or hanging gardens. They constructed roads along the mountain slopes with elaborate masonry, of easy gradients, and wide enough for six persons to walk abreast. The gardens were watered by artificial aqueducts running along the sides of the cliffs for long distances, the water from which was carefully distributed to the hillside plots. Both terraces and aqueducts were constructed of rough or cut stone, well laid and slightly inclining inward. One of the most remarkable ruins at this locality is that of the fortress of Ollantay Tambo. It is a work of defense situated on a spur of the mountain and commanding the river. Its walls are about 25 feet high, built of masses of hard red porphyry, some of the single stones being nearly 20 feet long, 5 feet wide, and 4 feet thick, the surfaces finely polished, and occasionally with designs upon them in low-relief. Some massive stone structures, apparently for residential purposes, two or three stories high, still remain. Many other localities in Northern Bolivia and Central and Eastern Peru display the remains of extensive buildings of the same general character, and are to be attributed to the same native population, either of Aymaran or Kechuan stock.

In the extreme north of the Incas' dominions ruins are found somewhat diverse in features, but doubtless constructed by the same powerful government. One of the most noteworthy localities is that of Callo or Pachuzala, not far from Quito, in what is now Ecuador. It is supposed to have been erected by the Inca Huayna Capac. The walls are of stone, the material being a gray trachyte, and are polished and fitted with considerable skill, so that most of them are still erect. On the interior surface they are rough, in order to hold the cement. The general design and the details of this large edifice show a more barbarous period of art or else less skillful workmen than the ruins in and near Cuzco.

Another class of remains consists of the so-called *huacas*, a word which means sacred or holy. It is applied to mounds of earth, of adobe bricks, or of stones, which were constructed either as sepulchers of the ancient inhabitants or as memorials to mark some sacred spot, and served as chapels or altars. These are common in many parts of Peru, though it is rare to find any with trustworthy traditions respecting them preserved. Large, elaborately sculptured stones sometimes called "seats of the Incas," are found in various localities. A celebrated one is at Concacha, on the road from Cuzco to Lima. Its surface is about 20 by 15 feet. These are supposed to have been intended for altar-stones upon which the victims were sacrificed. Other huge sculptured blocks, apparently left in despair of removing them, are called "tired stones," or "stones of fatigue," the tradition being that those employed to drag them to their destination broke down in the effort. Chulpas—the tombs of the Aymaras—differed from those of the Kechuas of Cuzco, as they were erected above ground, and formed stone towers from 10 to 30 feet in height. Small apertures were left at the base through which the corpse was placed in the sepulchral chamber. Sometimes these *chulpas*, as they are called, are solitary structures located on some prominent point; at others they are in groups. One of the most celebrated of the latter is the Pataca Chulpa, "the field of a hundred tombs," in the province of Carancas; another is on a promontory jutting out into Lake Umayo, 15 miles from Lake Titicaca, at Sillustani, where a great group of them is found, some fallen to ruin, others in a state of complete preservation. See Squier, *Travels in Peru*; Rivero and Tschudi, *Peruvian Antiquities*; Wiener, *Perou et Bolivie*.

D. G. Brinton.

Incandescent Lamp: See Lamps (electric, etc.).

Incandescent Light: See Electric Lighting.

Incanta'tion [from Late Lat. *incanta'tio*, incantation, deriv. of *incanta're*, sing over, sing a magic formula over, enchant (> Fr. *enchanter*, whence Eng. enchant), *in*, in, on + *canta're*, sing]: a form of magic once of universal acceptance, used not only by the barbarous but by the civilized peoples of the Old World, Egyptians, Babylonians,

Hindus, Greeks, and all others, nor is its use even yet entirely extinct among the descendants of these peoples. It was much believed in during the Middle Ages by all Germanic and many other nations, and some remnants of it are still extant in certain popular superstitions in England, Scandinavia, and Germany. It consisted in chanting or solemn recitation or mystical murmuring of certain phrases, generally of no meaning, but of a striking rhythm. In the mouths of certain persons these phrases had the power of killing or curing a man, of blessing or blasting a field, of raising or laying a storm; or they could compel the spirits of the elements, or even the spirits of the dead, to appear and make revelations. Most often, however, incantation was applied only as an accompaniment to other witchcraft, as, for instance, to the preparation of love-potions or similar magical drugs; and remnants of this form are still existing among the European peasantry. In many places the first use of a new tool, a new dress, etc., is invariably accompanied by the pronunciation of certain phrases; and now and then some old woman may be met with in Scotland, Norway, Jutland, and certain parts of Germany who claims that she can cure fever, aches, rheumatism, consumption, heart disease, etc., by means of a formula she has received in some mysterious way from another old hag. The incantations in *Macbeth* and *Faust* give a very vivid picture of this kind of magic. Revised by S. M. Jackson.

Incarnate Word, Ladies of the: a congregation of nuns founded 1625 by Jeanne Marie Chezard de Matel (1596–1670), approved by the pope in 1633. Their work was at first one of instruction, but in 1866 they assumed the care of hospitals. They have several houses in Texas.

Incarnation [viâ O. Fr. from Late Lat. *incarna'tio*, deriv. of Late Lat. *incarna'ri*, to be made or put into flesh; *in*, into + *ca'ro*, *car'nis*, flesh, whence Eng. *carnal*]: a term which, in general, describes deity as present in a mortal form. It is mainly used of the doctrine of the union of God and man in the person of Christ. The earliest full statement of this doctrine is in the first chapter of the Gospel according to John. There a being is spoken of who is called the Word. Of the Word it is affirmed that he is in some sense different from God, but that he is yet very God, existent in the beginning, the maker of all things, having life in himself (verses 1–4). It is further affirmed that the Word became flesh, that he "tented" among us, that is, had here his transient abode as distinguished from his eternal abode, that his glory was visible, and all this in the person of Jesus Christ (verses 14 and 17). Language is used concerning him which indicates that he was very man, both in body and soul, and yet that he was more than man, full of grace and truth, manifesting such glory as might be expected in the only begotten of the Father (verses 14–18).

The purpose for which the Word became incarnate is stated in the chapter in four different ways: First, that he might be the light of the world (verses 4, 5, 7, 8). Second, that he might bring in grace and truth (verses 14, 16, 17). Third, that he might render God apprehensible (verse 18). Fourth, that he might obtain for men the right to become sons of God (verses 12, 13). These are not four different purposes, but four ways of stating the one purpose. The last is more insisted upon than the others, and so the doctrine of the incarnation is especially connected with that of the fatherhood of God and the sonship of men.

The synoptic Gospels do not speak of the incarnation in this formal way, but they imply it when they speak of Jesus as being miraculously born of a virgin through the power of the Holy Ghost. The resultant doctrine of the person of Christ, as held by the great majority of Christians, is that he is very God, and not merely in some lower sense divine; and at the same time in both body and spirit very man. In modern times the positive humanity of Christ is increasingly insisted upon, and this is quite as much the case among those who earnestly and strenuously worship Christ as God as among those who hold that he is a mere man, or who hold an indifferent position.

Several of the great controversies of Christianity have been connected with this doctrine. It is a part of the early creeds, and enters into all systems of theology. A large portion of the heresies that have names are heresies touching this doctrine. For further information, therefore, the reader may be referred to any work on systematic theology, or to discussions of such topics as the Nicene Creed, the Athanasian Creed, the Gnostics, the Docetæ, the Sabellians, the followers of Paul of Samosata or of Origen, the Manichæans, the Arians, the Eutychians, Monarchians, Patripassians, Unitarians, Socinians. Willis J. Beecher.

Incas: the reigning aristocratic and sacerdotal caste in ancient Peru. It has been supposed that the Incas were originally a small gens of the Quichua race near Cuzco, but this can not be known positively. According to the Quichua traditions all the Incas were descendants of Manco Capac and his sister and wife, Mama Ocllo Huaco. Like Romulus and the Greek heroes, this pair marks the boundary of what may be fairly regarded as legitimate history with the vague region of fable. The legends recount that they were children of the sun. After various wanderings they were miraculously directed to found the city of Cuzco, where Manco Capac instructed the surrounding Indians in the worship of the sun and showed them how to till the ground, while Mama Ocllo taught the women to spin and weave. Their eldest son succeeded as the ruler or inca (lord) in a more restricted sense; he and his successors married their own sisters, and the eldest son by this union was always the legitimate heir to the throne. Other children by any of their numerous wives were nobles of the blood royal, and from them all the great offices of the army, state, and temple were filled; hence the Incas became the ruling class. The Quichuas had no written records, unless the quipus, or knotted cord, can be called so; but their carefully preserved traditions were gathered in the sixteenth century by several historians, including some of their own race. These accounts show a substantial agreement as to the succession of the Inca monarchs, though they differ as to the length of the different reigns. We must suppose that Manco Capac was a real person, probably a petty chief of unusual intelligence, who laid the foundation of the future monarchy. The following list, after Markham, gives the names of the Incas, with the proximate dates of their accession:

Manco Capac	1240	Yahuar-huaccac	1360
Sinchi Rocca	1260	Uira-Cocha	1380
Lloque Yupanqui	1280	Pachacutec Yupanqui	1400
Mayta Capac	1300	Tupac Yupanqui	1440
Capac Yupanqui	1320	Huayna Capac	1480
Inca Rocca	1340	Huascar and Atahualpa	1523

At first the Incas ruled only the immediate vicinity of Cuzco, drawing in surrounding tribes rather by peaceful means than by conquest. Gradually their territory was enlarged, and at length Uira-Cocha—the first great warrior of the race—invaded the Titicaca basin, and this, as well as portions of the eastern slope of the Andes, was added to the Inca empire. Pachacutec Yupanqui and Tupac Yupanqui were still more renowned conquerors; and finally, under Huayna Capac, the empire attained its greatest development, embracing all the coast and mountain region now included in Peru and Ecuador, the Titicaca basin, portions of the eastern slope of the Andes, and Chili as far south as the river Maule. The extreme length of this strip from north to south, was about 2,200 miles, and its breadth varied from 400 to 100 miles.

On the death of Huayna Capac in 1523, Huascar inherited the southern and larger part of the empire, with the capital at Cuzco; but for some ill-understood reason his illegitimate brother, Atahualpa, took the northern part and Quito. Quarrels between the two resulted in the defeat and capture of Huascar, and Atahualpa was on his way to assume the supreme power at Cuzco when he was seized by Pizarro at Cajamarca (Nov., 1532). His death and that of Huascar followed. Pizarro, on his arrival at Cuzco, had Huascar's brother, Manco Inca, crowned. Manco, at first a puppet king, finally rose in arms against the Spaniards and besieged Cuzco (1536), but was defeated and driven to the mountains, where he was murdered in 1544. His eldest son, Sayri Tupac, was induced to renounce his sovereignty in exchange for a Spanish pension, and he died near Cuzco. Sayri Tupac's brother Cusi Titu Yupanqui died in the mountains, and a second brother, Tupac Amaru, a mere boy, was seized by the Spaniards and cruelly put to death (1571). Long afterward a descendant of the Incas assumed the name Tupac Amaru (1780), and set up the standard of revolt as the legitimate heir of the Peruvian throne; he was defeated, and in the series of frightful tortures and executions which followed, even the remote lines of Inca lineage were persecuted. A few survived, and some of their descendants are respected citizens of Peru.

The Inca monarchy, unlike that of Mexico, was a substantial institution and not a mere loose conglomeration of tribes. Its form was remarkable, and there is no exact

paralled to it in history. It may be regarded on the one hand as an exaggerated form of feudalism, and on the other as a system of state socialism under a despotic head. The Inca was the absolute but, in most cases, kindly ruler; land was held by the state, portions being allotted to each family to cultivate under fixed rules. The most careful and systematic management, with irrigation on a vast scale, gave the greatest possible value to the ground; huge granaries were established for the use of the armies and to provide against poor years; rapid transfers of supplies were made to points where they were needed. For years after the Spanish conquest supplies were forwarded from these granaries to supply the peasants, and this without orders from their less civilized white rulers. The Incas built excellent roads, established rest-houses for travelers, had a rapid and very efficient post, and a well-organized army. All gold of right belonged to the ruler, and he decorated his palaces, and especially the temples, with great magnificence. In many respects the Inca government will compare favorably with any which at that time existed in Europe. See INCAN ANTIQUITIES and INDIANS OF SOUTH AMERICA.

REFERENCES.—Prescott, *Conquest of Peru*; Markham, *History of Peru* (1892), *Cuzco and Lima*, and *Rites and Laws of the Incas*. The works of Acosta, Montesinos, Balboa, Garcilaso Inca de la Vega, Betanzos, Velasco, Cieza de Leon, etc.; Squier *Peru* (1877). HERBERT H. SMITH.

In'cense [readapted to Lat. from M. Eng. *encens* = O. Fr. < Late Lat. *incen'sum*, incense, liter., burnt or enkindled stuff, neut. perf. partic. of *incen'dere*, set on fire (whence Eng. *incendiary*); *in*, in + *cande're*, glow, burn (whence Eng. *candle*)]: a substance burned for the fragrance of its smoke, and used in the performance of a religious ceremony. The ancient Egyptian, the Hebrew, the Brahmanical, and other religious ceremonials made use of incense-burning. The Roman Catholic Church and some of the Eastern Churches use incense in their services. The Catholic Apostolic (Irvingite) Church has adopted the practice. Various gums and spices are employed, but in the Roman Catholic Church olibanum is used, mixed with storax, cascarilla, and other ingredients. It is burned in a thurible or censer swung by chains. Revised by S. M. JACKSON.

Incest [M. Eng. *incest*, from O. Fr. *inceste* < Lat. *inces'tum*, incest, liter., that which is unchaste, neut. of *inces'tus*; *in-*, un- + *castus*, chaste, whence Eng. *chaste*]: cohabitation or carnal intercourse between a man and a woman related to each other in any of the degrees within which marriage is prohibited by law.

This was not a criminal offense at common law in England at the time of the settlement of North America (although it had formerly been a felony punishable in the common law courts; 4 Blackstone's *Commentaries*, 64, 65), but, like adultery and fornication, it was left to the cognizance of the ecclesiastical courts, which had power to annul incestuous marriages and to require the offender to perform a public penance in the parish church. An incestuous marriage, therefore, was not void, but voidable, and sentence declaring its nullity was required to be pronounced during the lifetime of both of the parties, or it could not be pronounced at all; but by statute 5 and 6 William IV., c. 54 (1835–36), marriages between persons within the prohibited degrees are declared absolutely null and void. What these degrees are is not stated by the statute, and this point is to be determined by the previously established rules of the canon law and older statutes, under which marriage was prohibited between persons related, either by consanguinity or by affinity, within the so-called Levitical degrees. It is held that marriage with a deceased wife's sister is within these degrees, and consequently void. The disability by consanguinity applies to those who are of illegitimate as well as to those of legitimate birth. No statute has, however, been passed declaring incest to be a crime, so that it is not indictable at present any more than formerly in England, Ireland, or Wales. In Scotland, however, incest was until 50 and 51 Vict., c. 35, sec. 56, a capital crime; but penal servitude has long been the usual sentence.

In the U. S. statutes have quite generally been passed specifically declaring the degrees within which marriage is prohibited as incestuous, and making intercourse or marriage between persons related within those degrees a crime. Relationship by affinity is not usually included within the prohibitive degrees, and marriage between blood relatives as far removed as cousins is permitted in many of the States.

Revised by F. STURGES ALLEN.

Inch'bald, ELIZABETH SIMPSON: actress and dramatic author; b. at Stanningfield, Suffolk, England, Oct. 15, 1753; married in 1772 the actor Inchbald, and went upon the stage the same year; acted in London and other English cities with considerable success, but retired from the stage in 1789, and devoted herself to literary pursuits. She translated a great number of dramas from the French and German, and published *The British Theatre*, a collection of dramas in 25 vols. (1806–09); *The Modern Theatre*, a collection in 10 vols. (1809); and a collection of *Farces* in 7 vols. Her greatest success, however, was her romance in 4 vols., *A Simple Story*, published in 1791, and translated into several of the European languages. D. in London, Aug. 1, 1821.

Revised by H. A. BEERS.

Incineration: See FUNERALS.

Inclined Plane: in mechanics, one of the so-called mechanical powers, or simple machines, by which a small force acting through a long distance is made to overcome a greater force acting through a shorter length of path. The wedge and the screw are particular instances of the application of this principle. See MECHANICAL POWERS.

Inclined planes on canals are used for raising and lowering boats from one level to another, as substitutes for lift-locks. The plane consists of an ordinary railway track of wide gauge laid on a graded plane leading from the lower to the higher level or pool to be connected. The track leads from the bottom of the lower pool along the plane, over, into, and down to the bottom of the upper pool. The boats are carried up or down the plane on wheeled carriages running on the railway track. The carriages are moved by an endless wire rope passing around large horizontal pulleys fixed at the head and foot of the planes in each pool, and attached to a winding drum operated by a turbine motor. The turbine is operated by a head of water taken from the upper pool. The boats are received by being floated over the carriage in either level, and made fast thereto, and the machinery being put in motion the boat settles down upon the carriage as it rises along the plane, and is carried to the other level, where the carriage sinks to the bottom of the pool, the boat floats, is detached, and passes on its way. Planes may have one or two tracks, and are single or double track planes. The carriages may be arranged with caissons filled with water carrying the boats. The boats are taken into and discharged from the caisson at the foot of the plane in the same general manner as for the carriage-planes. At the upper end of the plane there is a masonry chamber with one pair of gates, the caisson having a falling gate and a projecting end. The caisson is drawn up to the masonry chamber, which receives the projecting end of the caisson, making a water-tight connection. The gates of the chamber and the door of the caisson being opened, the boat passes into the pool of the canal. Boats are taken into the caisson and down the plane by the reverse operation.

Carriage-planes, varying in height from 40 to 100 feet, are in use on the Morris Canal in New Jersey, and others on the Bridgewater Canal in England; and caisson-planes are in use on the Monkland Canal near Glasgow, Scotland. A caisson-plane is in use as an outlet of the Chesapeake and Ohio Canal, near Georgetown, D. C. Caisson-planes were used in 1793 on the Middlesex Canal, in Massachusetts, but afterward discarded. Vertical hydraulic lifts are, however, now more generally used than inclined planes as a substitute for locks.

Inclined planes on railways are tracks built on grades so steep that ordinary locomotives can not effect an ascent, where special devices, such as cables, rack-rails, or gripping-wheels are necessary. The popular terms gravity roads, switchbacks, cable-planes, and rack railways usually imply the existence of inclined planes. On a grade of 5 per cent.—that is, of 5 feet vertical rise in 100 feet of horizontal distance—a locomotive can make the ascent on an ordinary railway track only with a light train and slow speed, and for grades much steeper the ascent becomes impracticable on account of the lack of the necessary adhesion between the rails and the driving wheels. The earliest method for operating a railway having such an incline was to pull up the cars by a rope or cable, the power being derived by a stationary engine at the top of the grade. The next method devised was a rack-rail laid on the track having teeth into which engage cogs on the circumference of the driving-wheel of the locomotive, this device thus furnishing the necessary adhesion. Another method is to

gripe an endless moving cable by means of wheels on the car, as in the cable system of street railways. These methods are sometimes combined, particularly the cable and the rack system, and the electric-trolley system is also frequently used for moderate grades.

One of the first railway tracks laid in the U. S. was that completed in May, 1827, near Mauch Chunk, Pa. Its length was 9 miles, its grade 1·82 per cent. (96 feet per mile), and it was used to transport coal from Summit Hill to Mauch Chunk by gravity, while the empty cars were drawn back by mules. In 1844 a new route for returning the empty cars was constructed, having two inclined planes, up which the cars were drawn by stationary engines at the tops. The Mt. Pisgah plane has an elevation of 664 feet and a length,

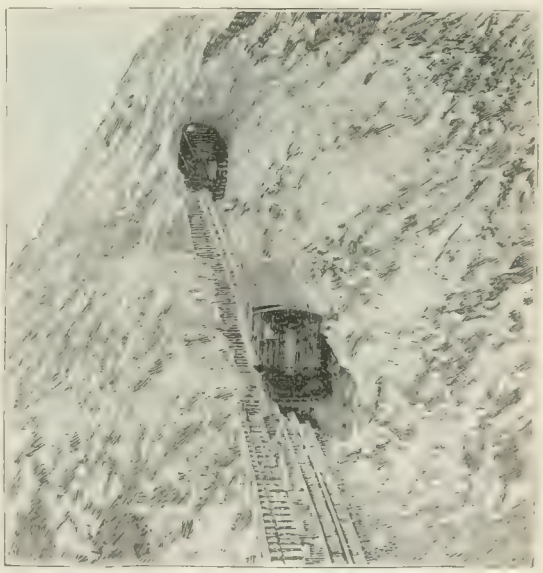
Mt. Pisgah plane, Pennsylvania.

measured on the slope, of 2,322 feet, which corresponds to a grade of 29·8 per cent. The Mt. Jefferson plane has a length of 2,070 feet on a grade of 23 per cent. This road has been for many years used for pleasure travel, and the illustration shows the present appearance of one of the planes. There are two tracks, and upon each runs a small safety-truck, to which is attached an iron band 7½ inches in width. These bands pass around drums, 28 feet in diameter, in the engine-house at the top of the plane. The safety-truck has attached to it an iron arm which engages with the teeth of a ratchet-rail laid between the tracks, in order to arrest the downward motion of the car should any accident occur to the band or to the machinery. Several other similar roads with inclined planes were constructed in Pennsylvania for coal-traffic; they are usually called switchback roads from the fact that the cars pass around a circuit, the entire journey, except that on the planes, being made by the action of gravity alone.

The Allegheny Portage Railroad in Pennsylvania, completed in 1833, was 36 miles in length, extending from Hollidaysburg to Johnstown. It had ten inclined planes, the grades of which varied from 7¼ to 10¼ per cent. The longest plane was 3,116 feet in length on a grade of 10¼ per cent. These planes were worked by stationary steam-engines at the summits. An endless rope of 3 or 3½ inches in diameter passed around a horizontal grooved wheel at the head of each plane, and around a smaller one at the foot, being supported by sheaves in the middle of the tracks. These planes were used for both ascending and descending traffic; they were abandoned after having been in use about twenty years.

A large number of inclined planes operated by cables in essentially the manner above described have been constructed in Europe and the U. S., principally for tourist and excursion travel. The track-gauge is usually one meter in Europe and 3 feet in the U. S. The maximum limit of grade appears to be reached at about 60 per cent. The Burgenstock Railway in Switzerland has a length of 3,071 feet, with a grade of 57 per cent. The plane up Lookout Mountain, Tenn., completed in 1887, has a length of 4,360 feet, with an average grade of 26 per cent. The longest cable plane in the U. S. is the Catskill Railway, finished in 1892, which is 7,000 feet long, has a maximum grade of 34 per cent. and an average grade of about 12 per cent. The longest cable inclined planes are in Italy, the one on Mt. Vesuvius being 10,500 feet long, which, however, is operated in two divisions, 6,900 feet and 3,600 feet respectively. Another plane, 10,243 feet long, ascends the Supurga Mountain, but its maximum grade does not exceed 20 per cent. The railway up the Stanserhorn in Switzerland, opened in 1893, has three planes, 5,281, 3,510, and 4,067 feet long respectively, the grade on the first plane ranging from 10 to 27 per cent., and on the second and third from 40 to 62 per cent., the average being 57 per cent. On this road the drums which wind the cables are driven by electric motors whose electricity is generated by water-power derived from mountain streams. Some of these railways have a ratchet-rail in the middle of the track as a precautionary measure in case of the breakage of the cable, while others use track-brakes or wheels which gripe the ordinary rails. The very steep incline—62 per cent., or nearly 32°—of the Stanserhorn Railway has no ratchet-rails.

The rack-rail system of operating inclined planes consists in the use of locomotives having toothed wheels on the driving-axle which engage with the teeth of rack-rails laid on the track. The first application of this system was at Madison, Ind., where an incline of 7,040 feet, having a grade of 5·8 per cent., was built and operated in 1847, and continued in use until 1868. The railway up Mt. Washington, completed in 1869, has an incline of about 3½ miles in length, the minimum grade being 13 per cent. and the maximum 40 per cent.; the gauge of the track was 4 ft. 7½ in., and the locomotives were so built that the boilers were horizontal when on the average grade. A plane at Mt. Desert, Me., built in 1882, has a length of 6,300 feet, with a succession of steep grades alternating with light ones, the maximum gradient being 33 per cent.; one car only is drawn up by the locomotive at a speed of 3 miles per hour. Numerous examples of the application of the system are familiar to tourists in Switzerland, the Righi Railway and the Mt. Pilatus



View on the Pilatus Railway.

Railway being the best known. The latter, of which a portion is shown in the illustration, has a total length of 2·8 miles, and its maximum gradient is 48 per cent. The Pike's Peak Railway in Colorado, finished in 1890, is about 8¾ miles in length, and its maximum grade is 25 per cent., 10,229 feet

having a gradient of nearly this amount, while most of the remainder is from 12 to 22 per cent. A narrow-gauge street railway between St. Gallen and Gais, Switzerland, has five planes with rack-rails, on one of which there is a maximum gradient of 92 per cent.

The rack-rail systems may be divided into two classes, the Riggenbach and the Abt, so called from the names of the inventors of special forms of rails. The Riggenbach rail is similar to that first used on Mt. Washington, being of the ladder type, or consisting of round bars fastened between the vertical sides of an iron trough. Of this class are the Righi road and others in Switzerland, the Drachenfels road on the Rhine, and a few in Austria and elsewhere. The Abt rail consists of two or more simple toothed bars placed side by side, and it is used on the Pilatus, the Pike's Peak, and the Mt. Desert Railroads, as well as on many others.

The literature of this subject is mostly contained in the columns of engineering periodicals. A historical and descriptive paper by W. W. Evans will be found in *Transactions of the American Society of Civil Engineers* for 1886. See also the articles ELECTRIC RAILWAYS, RAILWAYS, ROADS, and STREET RAILWAYS. MANSFIELD MERRIMAN.

In Coe'na Do'mini [Lat., at the Lord's Supper; its first words as at one time written, it having after 1627 been read annually for many years on Holy Thursday, the anniversary of the first Eucharistic feast]: a famous bull against heretics, schismatics, sacrilegious persons, pirates, forgers, and others. This bull is of very ancient and uncertain date. It has been traced back to Boniface VIII. (1294–1303), and in its final form to Urban VIII., 1627. Unlike other bulls, it is not the work of any one pope. It is, indeed, rather a collection of Church censures. Opposed by several governments of Europe as an infringement upon royal privileges, this bull was declared void in 1510 by the Council of Tours; but it still was annually read at Rome, though often modified in form, until 1770, when its annual promulgation ceased, a more modest document taking its place. Easter Monday was finally appointed for its annual promulgation. S. M. J.

Income Tax: a form of direct tax based upon the actual annual income of individual citizens. Theoretically, it is the most equitable of all taxes, according most fully with the generally accepted maxim of Adam Smith that "the subjects of every state ought to contribute to the support of the government as nearly as possible in proportion to their respective abilities; that is, in proportion to the revenues which they respectively enjoy under the protection of the state." It would seem fairest that a small percentage should be levied on all incomes; but most advocates of this tax insist that incomes below a certain amount should go altogether untaxed, and that the percentage should be increased on the larger incomes. Usage has adopted these two features. The chief objection to an income tax is the difficulty, almost impossibility, of ascertaining men's real incomes; partly because many keep no accurate accounts, and partly because few, comparatively, will make truthful report of their incomes, and the inquisitorial nature of the tax is offensive. The Wilson Tariff Act of 1894 provided for an income tax of 2 per cent. on all excess over $4,000. Arrangements were made for its collection, but doubt having been thrown on its constitutionality, a test case was submitted to the Supreme Court, who decided (5 to 4) that it was a direct tax and not apportioned to representation, and therefore unconstitutional and void. See FINANCE and TAXATION. A. T. HADLEY.

Incommensurable: a term applied to two quantities when no unit can be found which will measure them both. Such is the case with the side of a square and its diagonal; if we call the side of the square unity, the diagonal will be $\sqrt{2}$. But no fraction can be formed whose square shall be exactly 2. It is, however, a fundamental property of such quantities that their ratio can be represented as nearly as we please by the quotient of two whole numbers. The quantities $\frac{3}{2}$, $\frac{7}{5}$, $\frac{17}{12}$, etc., come nearer and nearer to being the square root of 2; in fact, if we square each of them, we shall find that the numerator comes within a unit of being double the denominator. The series may be continued to any extent, so that we can always find a fraction which shall differ from this quantity by less than any small quantity we choose to name. S. NEWCOMB.

Incorporeal Hereditaments: See HEREDITAMENTS.

Incubation [from Lat. *incubatio*, deriv. of *in-*, on + *cubare*, to lie down]: the process by which eggs are hatched. It consists essentially in keeping the eggs at a temperature of about 102° F. for a period which varies in the different species, though it is constant, or nearly so, in each. The heat necessary for the development of the young is usually supplied by the female bird, whose temperature during the period of incubation is considerably above the normal. The humming-bird uses 12 days to hatch her young ones, the canary from 15 to 18, the common fowl 21, the duck from 28 to 30, the guinea-fowl 28, the turkey 30, the swan from 40 to 45, etc. Incubators, as the devices for artificial hatching are called, have been in use from very early times. The modern incubator is a chamber of convenient size, carefully insulated from the outer air and provided with devices for supplying heat, air, and moisture to the eggs, which are placed in trays within the chamber. As the embryo within the eggs develops, heat is evolved, and the amount of extraneous heat necessary gradually decreases.

Incumbrance, or **Encumbrance** [from O. Fr. *encombrer*, hinder; Lat. *in* + *cumula're*, heap up]: a burden, impediment, a hindrance; in law, a legal claim on an estate, for the discharge of which the estate is liable. The term is a general name for liabilities by which an estate in lands and hereditaments may be burdened, such as mortgages and annuities.

Incunab'ula [Lat., liter., swaddling-clothes, cradle]: the name given by bibliographers to books printed before 1500. They are important not only as illustrating the progress of printing, but also for artistic and scientific reasons. The number of such books is probably not far from 20,000. In his *Repertorium Bibliographicum*, Hain enumerates 16,299, and, as he died before he had completed his work, it is consequently not exhaustive. Most incunabula are rare books, eagerly sought after by collectors; some of them have, as *editiones principes* of Greek or Latin classics, also a considerable critical value. The principal works treating of the subject are Panzer, *Annales Typographici, ab Artis Inventæ Origine ad Annum MD.*, continued to 1536 (Nuremberg, 1793–1803, 11 vols.); Maittaire, *Annales Typographici, ab Artis Inventæ Origine ad Annum 1557*, continued to 1664 (The Hague, 1719–25, 5 vols.); Lerna Santander, *Dictionnaire Bibliographique Choisi du XV. Siècle* (Brussels, 1805–07, 3 vols.); Bernard, *De l'Origine et des Débuts de l'Imprimerie en Europe* (Paris, 1853, 2 vols.); and the work by Hain (Stuttgart, 1828–38, 4 vols.).

Indenture: See DEED.

Independence: city; capital of Buchanan co., Ia.; on the Wapsipincon river, and the Burl., Cedar Rap. and N. and the Ill. Cent. railways; 65 miles W. of Dubuque (for location, see map of Iowa, ref. 4–J). It is in an agricultural region; is the seat of the State Hospital for the Insane, which cost nearly $1,000,000; has a free public library (opened in 1873), public-school property valued at more than $75,000, 3 public parks, large fair-grounds, 4 weekly newspapers; and is widely known for its trotting-horse breeding-farms. Pop. (1890) 3,163; (1895) 5,142. EDITOR OF "CONSERVATIVE."

Independence: city (founded in 1870); capital of Montgomery co., Kan. (for location of county, see map of Kansas, ref. 8–I); on the Verdigris river, and the Atch., Top. and S. Fé and the Mo. Pac. railways; 165 miles S. of Kansas City. It contains 14 churches, 4 public-school buildings, waterworks, natural gas, steam grist and planing mills, and a daily and 3 weekly newspapers, and is an important jobbing and manufacturing point. Pop. (1880) 2,915; (1890) 3,127; (1895) 3,665. EDITOR OF "MORNING REPORTER."

Independence: city (founded in 1827); capital of Jackson co., Mo. (for location of county, see map of Missouri, ref. 3–E); on the Chi. and Alt., the Kan. City and Ind. Air Line, the Kan. City and Ind. Rap. Trans., and the Mo. Pac. railways; 3 miles S. of the Missouri river, 10 miles E. of Kansas City. It is in an agricultural region, is the seat of Woodland College (Christian) and of the Kansas City Ladies' College, and has a daily, a monthly, and three weekly periodicals. The city is interesting historically because of the fact that it was for many years a headquarters and outfitting dépôt for the overland routes to California, New Mexico, Oregon, and Utah, and that in 1837 a settlement was made there by the Mormons, who were subsequently expelled and sought refuge in Illinois. Several families belonging to the Reorganized Church of Jesus Christ of Latter-day Saints are located in and near the city. Pop. (1880) 3,146; (1890) 6,380. EDITOR OF "SENTINEL."

Independence of States: in political science, and especially in international law, that condition of states in which

they are self-governing so far as internal relations are concerned, can perform toward other states all international acts, and are capable of fulfilling all international obligations. The term, when that term is taken in its strict sense, is the negative side of sovereignty. Thus no State of the U. S. is independent, because the separate States are not absolutely self-governing and because they have properly no international character, while the quality belongs to the U. S. as really as to any simple form of monarchy; but the word does not imply the power of absolutely free action, because treaty, temporary or perpetual, may have limited such free action. When a political body fails of complete independence by reason of its obligations of fealty or tribute to another state, as Bulgaria to Turkey, it is called a semi-sovereign or protected state. Revised by T. S. WOOLSEY.

Independents: I. A politico-religious party in the time of the Commonwealth of England. The conflict which became a civil war in the reign of Charles I. was, politically, a conflict between a king who thought himself a sovereign by divine right with absolute power, and a people determined to maintain their inherited liberty and to guard it with new securities. But the political questions of the time were intimately blended with religious and ecclesiastical questions, which had been agitated for 100 years. The English Reformation, if we regard it as proceeding from the people, was characterized by a violent antipathy against the ecclesiastical system of the Middle Ages, and therefore against all compromises with what was, in the view of the Reformers, a mischievous superstition. Regarded as proceeding from the Government, it was mainly an attempt to make England independent of Rome by conferring upon the sovereign the ecclesiastical jurisdiction which had belonged to the pope. Consequently, there arose a conflict between the ideal reformation, expected but not yet attained, and the government reformation, abhorrent of radicalism and disposed to retain whatever of the ancient system was not incompatible with the supremacy of the crown in ecclesiastical affairs. As the conflict proceeded, the Puritan or reforming party became almost identical with the political party opposed to absolutism in the state; and, on the other hand, the court party, devoted to the king, became the conservative party in the Church. At the beginning of the Long Parliament (1640) the party of law and liberty in the state, and of reformation in the Church, had no definite plan for the reconstruction of the ecclesiastical establishment, and all who were opposed to that establishment as then organized and administered could act together. But when the conflict had become a war between the king and the Parliament, and especially after "the Solemn League and Covenant" between the Puritanism of England and that of Scotland (1642) had brought a powerful Scottish influence into the southern kingdom, diversities of opinion as to the future constitution of the Church of England began to be important in their relation to public affairs. It was assumed that the desired reformation of the national Church was to be effected by the authority of the nation, as, in the preceding century, the reformation under Henry VIII. and Edward VI., and afterward under Elizabeth, had been effected. Accordingly, the Parliament had convened, not a representative synod or convocation that might assume to be the Church and to set up an authority co-ordinate or in conflict with the authority of the state, but only an "Assembly of Divines," who were to consider such matters only as might be referred to them by the Parliament, and to give advice which the Parliament might accept or reject. The members of the Assembly were selected with the evident design that all Protestant diversities of opinion concerning the constitution and order of the Church should be fairly expressed and considered. Such diversities of opinion developed parties both in the Assembly of Divines and in the Parliament. Some had for their ideal a reduced episcopacy, with a liturgy expurgated in the interest of thorough Protestantism. Others, formidable in number and in zeal, desired to see the national Church governed by presbyterial and synodical assemblies, after the fashion of the Reformed or Calvinistic Churches on the Continent and in Scotland. Still another party had heard of "the New England way," and, being in correspondence with Puritan friends who had removed to Massachusetts and Connecticut, and were there instituting what they deemed a more primitive system of ecclesiastical order, they had learned to recognize no other church government than that of voluntary churches, self-governed under Christ and mutually independent, yet bound to each other in relations of comity and mutual intercourse. Those who preferred that "New England way" to the scheme of a reformed and purified national Church were known as *Independents*.

In both Houses of the Long Parliament there were some eminent men who, while heartily agreeing with the majority in the subversion of the ecclesiastical system which had been established in the reign of Elizabeth, were not willing to establish in its place a presbyterian discipline like that of Scotland. Among the peers, Lord Say and Seal, Lord Brooke, and a few others were in full sympathy, on religious grounds, with the "dissenting brethren," or Independents, who were a persistent minority in the Assembly of Divines. In the House of Commons a few men of eminent ability had accepted, with religious faith, the New England Church polity as better than any reformed episcopate or any presbyterial and synodical government. One of them was Sir Henry Vane, the younger, who had lived a year or two in New England, where he had made his entrance into public life as Governor of Massachusetts. Another was Nathaniel Fiennes, who was a son of Viscount Say and Seal, and a trusted leader, and was associated with his father in the Committee of Safety, the executive council through which Parliament governed England while in conflict with the king. Another was Oliver Cromwell, who was the kinsman and close friend of John Hampden, and had already succeeded to a large share of that illustrious patriot's influence in the House. To these may be added the name of Oliver St. John, one of the most eminent lawyers of England, who had been counsel for John Hampden in the ship-money case, who was afterward solicitor-general, and who was no less a statesman than a lawyer. In the strictly ecclesiastical use of the name, the Independents, differing from the Presbyterians not on doctrinal points, but only on church government, were a small though able minority in the nation, as well as in the Assembly of Divines and in the Parliament. Their demand was not that their ecclesiastical system should be established by law and all others suppressed, but only that the churches which they were constituting by voluntary agreement might be tolerated. Politically, however, the Independents became a numerous and powerful party. The Baptists (or, as they were then opprobriously called, the Anabaptists) were Independents, religiously as well as politically. All the swarming "sectaries" in that age of excitement, the "sects and schisms" which so terrified those who had set their hearts on national uniformity, were counted with the same party, and the army was full of them. In the progress of inquiry and controversy about ecclesiastical reconstruction the scheme preferred by the majority of the Puritan clergy was not, on the whole, gaining favor in Parliament. An increasing number of enlightened men were determined that the Presbyterian discipline, enforcing by church courts its strict morality and its rigid dogmatism, should not, with their consent, be established in England as a system to which all Englishmen must be by law subjected. Most of the laymen in the Assembly of Divines—among whom the lawyers Selden and Whitelocke were conspicuous—seem to have favored the opinion that there ought to be no distinction between ecclesiastical government and civil, that participation in Christian sacraments should be the right of every citizen, and that there should be no excommunication or church censure but by the magistrate. These men were called Erastians; and two of the clergymen in the Assembly—the two. Lightfoot and Colman, who were in some respects the most learned—held the same theory. The learning and ability of the Erastians, as well as the zeal and enthusiasm of the "sectaries," went to increase the strength of the Independents as a political party in the Parliament and in the nation. What had been the great Puritan party, intent on the reformation of the national Church and the vindication of English liberty, was divided and broken up. On one side were the Presbyterians, as zealous for uniformity of doctrine and discipline in the national Church as Queen Elizabeth and her prelates had ever been for uniformity of ritual, and as abhorrent of sects as Archbishop Laud himself had been. On the other side were the Independents, including all those who thought or felt that an ecclesiastical government of England by presbyteries and synods might be as irksome as that which had been so lately abolished. The division had been, from the first, inevitable, for it was the result of principles that could not be reconciled, and that could not but come into conflict over any definite proposal for ecclesiastical recon-

struction. Puritanism, looking to Scotland and relying on the "Solemn League and Covenant," had become Presbyterianism, and, the king and his party being vanquished, it found a new antagonist in the party of the Independents.

When the control of affairs in the name of the Parliament had passed from the Presbyterians to the Independents, the king, who had been for some time a prisoner, and who in his negotiations with all parties had shown himself too faithless to be trusted, was brought to trial before a commission constituted for the purpose, was condemned to death, and was beheaded (Jan. 29, 1649). For that transaction the Independents as a party were responsible. In connection with it, and as preliminary to the ordinance which constituted the commission, the House of Commons, then reduced to a small remnant of its original number, made a formal declaration that the people, under God, are the original of all just power; that the Commons House in Parliament, being chosen by and representing the people, have the supreme power; and that whatever is by them enacted has the force of law, though the consent of king and peers be not added to it. A few days after the death of Charles I. (Feb. 6) it was voted in the same assembly that the House of Peers in Parliament is useless, dangerous, and ought to be abolished. The next day it was voted that the office of a king in the English nation, and to have the power in a single person, is unnecessary, burdensome, and dangerous to the liberty, safety, and public interest of the people. A council of state, to be annually appointed, was invested with the executive power. Of that body, five were peers (for though the House of Lords had been abolished, such of the peers as had not adhered to the king in his war against the Parliament were permitted to retain their estates and their titles of honor); two were sons of peers; five were baronets; two were keepers of the seal; three were the chief judges respectively of the three great courts of law; three were eminent military commanders in the service of the Parliament; five were knights, and the remaining seventeen, untitled, were, all save one, members of the body that appointed them. John Bradshaw, who had presided in the trial of the king, was chosen president of the council, and his kinsman, John Milton, was its Latin secretary, for it had determined that its correspondence with foreign governments should be only in the language which was common to Christendom.

The attempt of the Independents to convert England into a republic failed, as similar attempts have failed in other countries. It was the attempt of a republican minority against the will of the anti-republican majority. Of the three parties into which the English nation was at that time divided, the Independents, though strong in the ability and enthusiasm of their leaders and in their control of a veteran and victorious army, were numerically the weakest. The most numerous party, when the residuary Parliament decreed the abolition of monarchy, was the Presbyterian, animated with zeal for a national Church and for religious uniformity, but abhorrent of that religious liberty which the republic was to establish, and which, to the average Englishman of that age, seemed almost identical with irreligion. But only less numerous was the party which, having adhered to the king, retained its sympathy with the lost cause, and which favored an episcopal rather than a presbyterial government over the national Church, and the beauty of a venerable liturgy rather than the fervor of extemporaneous prayers in the worshiping assembly. These two parties together were in truth the body of the English people; and as they were agreed in desiring a national Church, together with the old government by king, lords, and commons, they were also agreed in hating and fearing the victorious Independents. In a true republic the majority must rule, but the founders of "the Commonwealth of England" attempted to establish a republican government over an anti-republican people. Conscious of being sustained by only a small minority, the Parliament, a mere residuum of the great body which met in 1640, dared not appeal to the people by dissolving itself and calling for a new election. All the ability with which it governed through its council of state could not win for it the confidence of the nation. It aimed at the establishment of liberty and justice, but by the great majority of Englishmen it was felt to be a usurpation supported by military power.

In the fifth year of the Commonwealth the republican Parliament, derisively called "the Rump," was working at a bill for its own dissolution, and was endeavoring to provide such arrangements for the election of its successor as would secure the ascendency of its own party, when it was dissolved and dispersed (1653) by the military power which had made it what it was. Then followed the protectorate of Oliver Cromwell, who attempted in another way what the statesmen of the Rump were unable to do. Had his reign been prolonged, the vigor and splendor of his government might have reconciled the English people to that principle of government which first made the Independents a political party; which was so abhorred by the Presbyterians that to escape from it they aided in the restoration of Charles II.; which was only imperfectly recognized in the Act of Toleration (1689); and which is now attempting the disestablishment of the national Church in England. On that principle the Independents were united, though it is not to be supposed that all of them—perhaps not that any of them—saw clearly the reach, or consented to all the legitimate applications, of the principle. See the histories of England, especially Godwin's *Commonwealth of England*. Gardiner's *History of England from 1603 to 1643* and his volumes on the *History of the Civil War in England* are to be commended.

II. A religious body in Great Britain and Ireland holding that every stated congregation of Christian believers associated under a voluntary agreement, formal or informal, for Christian worship and for mutual watchfulness and helpfulness in the Christian life, is a complete Church, invested with every prerogative which Christ has conferred on any Church, and dependent for the exercise of ecclesiastical functions on no authority exterior to itself, whether secular or hierarchical. (See CONGREGATIONALISM.) The most considerable difference between Independency in England and Congregationalism in the U. S. is that in the former the principle of the fellowship and mutual responsibility of churches, though recognized, is not so fully developed and made practical as in the latter. The ecclesiastical history of England gives no definite trace of a Church constituted on the platform of Independency earlier than 1567. More than ten years later Robert Brown, or Browne, a clergyman of the Established Church, began to preach against all national churches, and to urge the duty of falling back upon the original constitution of Christian societies as deduced by him from the New Testament. Compelled by persecution to take refuge in the Netherlands, he printed there (1582), for circulation in England, two books, in which he propounded his new idea and method of church reformation—a method as unwelcome to the Puritans, who were working and suffering for a reformation by act of Parliament, as it was to the bitterest enemies of Puritanism. His idea was "reformation without tarrying for any," or separation from the national Church as an essentially anti-Christian institution, and the formation of independent churches. It was impossible to suppress the idea, for, notwithstanding the prison and the gallows, the early "separatists" would not attend the parish churches, would hold their conventicles, would propagate their revolutionary opinions, and persecution exacerbated their enthusiasm into fanaticism. They were called "Brownists," though Brown eventually deserted them. They were also called "Barrowists," from Henry Barrowe, another of their champions, who was one of their martyrs. At a later date (in the time of the Long Parliament) they began to be called Independents, and they accepted the name. By that name their successors have ordinarily been designated, though now they prefer to call themselves Congregationalists.

The Independents or Congregationalists in Great Britain and the British colonies are a numerous and enterprising body of Christians. There are in Great Britain and Ireland more than 4,660 churches, chapels, and "mission stations," more than 2,760 ministers, and about 378,000 communicants. The London Missionary Society, though not exclusively theirs, is the organization through which they conduct their foreign missions. They have a home missionary society for their work in England, and a colonial missionary society to aid their churches in the colonies. Until late in the nineteenth century they were excluded from the universities. They have established colleges of their own for the classical and theological education of their ministers, and their colleges in England are now affiliated with the London University. Besides their other institutions, they have founded, at Oxford, Mansfield College, for the education of ministers, which was opened in 1889, and is a prosperous establishment. Several journals, weekly and monthly, are conducted in their interest. See Stoughton's *Ecclesiastical History of England* and Skeat's *History of the Free Churches of England*.

Revised by GEORGE P. FISHER.

NORTHERN INDIA

For Southern India see next Map

Indeterminate: in mathematics, a term applied to a quantity when it admits of an infinite number of values. An *equation* is said to be *indeterminate* when the unknown quantities that enter it admit of an infinite number of values. Thus the equation of a straight line $y = ax + b$ is indeterminate; for if we give to x any value, we can find from the equation a corresponding value of y such that the assumed and deduced values will satisfy the equation; that is, there are an infinite number of sets of values of x and y that will satisfy the given equation. It may be shown that any equation which contains more than one unknown quantity is indeterminate; it is obvious that any group of simultaneous equations is indeterminate when the group contains fewer equations than there are unknown quantities; hence the equations of lines and surfaces used in analytical geometry are indeterminate. For this reason analytical geometry is often called indeterminate geometry. A *problem* is said to be *indeterminate* when it admits of an infinite number of solutions. A problem will be indeterminate when the number of independent conditions is less than the number of required quantities, for in that case the number of equations that express the imposed conditions will be less than the number of unknown quantities; the equations of the problem will therefore be indeterminate, and consequently the problem itself will be indeterminate. Thus the problem in which it is required to find a point from which the tangents to two given circles shall be equal is indeterminate; the solution of the problem shows that there are an infinite number of such points, which, taken together, make up a straight line called the radical axis of the two circles.

Indeterminate Analysis: that branch of analysis which treats of the solution of indeterminate problems. In most practical cases the given conditions limit the number of solutions, without affecting the mode of treatment. It is now generally treated as a branch of the theory of numbers.

Indeterminate Coefficients: an *identical equation* is an equation that is true for all values of the unknown quantity or quantities that enter it. In every such equation the unknown quantity or quantities are indeterminate, and the coefficients of the different powers and combinations of powers of these quantities are called *indeterminate coefficients*. If an identical equation containing any number of unknown quantities is cleared of fractions, the coefficients of the like powers and combinations of powers in the two members are respectively equal to each other. This is *the principle of indeterminate coefficients*; it is much used in developing quantities into series and in resolving fractions into partial fractions.

Indeterminism: See FREE WILL and WILL.

In'dex Libro'rum Prohibito'rum [Lat., index of forbidden books]: in general, a list of books the reading or retaining of which is forbidden by proper authority; in the Roman Catholic Church the list of writings which, by reason of the danger they imply to faith or morals, are prohibited. The spirit of the Church in regard to such publications has always been the same; her methods have varied according to circumstances. The motives which actuated the converts of Ephesus (Acts xix. 19) in burning their books persisted as an unwritten law during the first three centuries. But when the Church, under Constantine's reign, began to enjoy a wider liberty, her action took a positive turn. The first general Council (Nice) forbade the works of Arius, and subsequent councils condemned the writings of Origen, of the Nestorians, Eutychians, and Monothelites. With these enactments of ecclesiastical authority the imperial power co-operated by ordering the condemned books to be burned, and by severely punishing those who refused compliance.

This total destruction of pernicious works was carried on during fifteen centuries, and explains the fact that in this whole period no "index," properly speaking, was issued, unless the term be applied to the list of works said to have been made out by Pope Gelasius I., 496, in his *Decretum de libris recipiendis vel non recipiendis*. But the invention of printing necessitated other means. At first censors were appointed, and publications to which they refused their license were burned. As this method, however, in spite of state support, failed of its purpose, recourse was finally had to the publication of *Indices*. The first was issued in England by Henry VIII. (1526), and was followed by that of Charles V. (1529), which formed later on a part of the Louvain *Catalogue* (1546). In 1559 appeared the first Roman index with papal authorization (Paul IV.), and in 1564 the *Tridentine Index*, compiled by the Council of Trent and sanctioned by Pius IV. The application of the rules and principles laid down by the council was intrusted to the Congregation of the Index, which Pius V. established in order to maintain by purely ecclesiastical measures this portion of church discipline no longer upheld by the civil authority.

The congregation has issued some forty editions of the index, adding at times new observations and instructions (1596), or general decrees concerning books which are forbidden, though not mentioned in the index (1758). In the nineteenth century indices have been published by Pius VII., Gregory XVI., Pius IX., and Leo XIII. (1881).

Besides these, the Church authorities in various dioceses have issued from time to time special indices, with such additions to the Roman index as local circumstances required. Along with books absolutely prohibited, these lists indicated in some instances works which might be rendered fit for use by the elimination of certain portions. Among such *Codices Expurgatorii* the most important appeared at Antwerp (1571) and at Dublin (1837).

The *Rules of the Index* formulated by the Council of Trent, and modified by pontifical decrees (Benedict XIV. and Clement VII.), forbid all books condemned by popes and councils up to 1551, all the writings of heresiarchs and such works by other heretics as deal expressly with religious matters, books that are professedly immoral or encourage superstition. They also define under what conditions the Scripture may be read in the vernacular, and the use of objectionable books permitted by proper authority. As to the *temper* of these regulations, it is to be noted, first, that they pertain to church discipline and not to infallible teaching; second, that they are primarily a warning for Catholics, and, as a consequence, a censure of the author whose works they condemn. The penalties incurred by their non-observance are purely ecclesiastical. The implied censure may be for motives of discipline as well as doctrine, and may mean anything from a slight disapproval to downright total condemnation.

The civil power, even in modern times, has not altogether dispensed with the index. Instance the *Catalogi librorum a Commissione aulica prohibitorum*, issued under Joseph II. of Austria, 1752–1780, and the list of works, about a thousand in number, forbidden by the German Government (1882). The most elaborate treatment of the subject is in F. H. Reusch's *Der Index der verbotenen Bücher* (Bonn, 1883–85, 2 vols.). JOHN J. KEANE.

Index of Refraction: See REFRACTION.

India [= Lat. = Gr. *Ἰνδία*]: the great triangular peninsula which juts out southward from Mid-Asia into the Indian Ocean. The name is derived from *Sindhu*, Sanskrit for river, an appellation originally given to the ocean-like river in the Punjaub which was the first striking physical feature encountered by the early invaders and immigrants from the West. Eventually the name came to be applied by them to the country itself. By geographers it is applied not only to India proper (Hither, or British India), but also to a group of countries lying E. of Burma—Siam, Annam, Cambodia, Cochin-China, and Tonquin—these forming what is called Farther India.

Physical and Political Boundaries.—From the continent of Asia India is shut off on the N. by the scimitar-shaped chain of the Himalayas, the loftiest mountains of the world; on the N. W. it is bounded by the highlands of Afghanistan and Baluchistan, and on the N. E. by part of Tibet and a tangled knot of semi-independent country where the frontiers of Tibet, Burma, and China march together. But from a political point India extends now, as it has done at times in the past, far beyond its geographical limits. Upper and Lower Burma form a part of the Indian empire, while Nepal, Bhutan, Kashmir, Afghanistan, and Baluchistan owe varying degrees of allegiance to her as the paramount power. The exact definition of the political frontier of India in the W. and N. W. is thus a matter of difficulty, depending on the degree of control exercised by the suzerain power; on the N. the boundary is better marked, and India may be said to be there conterminous with Tibet, while on the E. it is bounded by the Chinese province of Yunnan, the Shan states, and Siam. The western and eastern shores of the tongue of the peninsula, as well as the coast of Burma and Tenasserim, are washed by the Arabian Sea and the Bay of Bengal respectively.

Area.—The area of India is over 1,500,000 sq. miles. The

empire included is rich in the most varied forms of scenery and climate, from mountains clothed with perpetual snow down to vast river-deltas extending for hundreds of miles at a height of only a few inches above the level of the sea. But from a geological even more than from a geographical point of view it may be said to consist of three separate and well-defined regions—viz., the Himalaya Mountains, the Indo-Gangetic plain, and the triangular Deccan plateau, buttressed by the Vindhya Mountains on the N. and by the Eastern and Western Ghats which run down the coast on either side till they converge near the apex of the triangle at Cape Comorin.

Mountains.—The loftiest and most important mountain-chain is the Himalayan, called by the Greek geographers *Emodus or Imaus.* This range extends from the south-eastern angle of Tibetan territory for a distance of 1,600 miles to the Wakhjir Pass, the point of convergence or watershed between the basins of the Yarkand, Indus, and Oxus rivers. It may be described as presenting the aspect of a double mountain wall, bounded on the N. by a trough or series of deep valleys. Both these walls are pierced by the Sanpu, Sutlej, and Indus, which, rising on the lofty plateau of Tibet, diverge to shed their waters, after long and devious courses, into the Bay of Bengal on one side, and the Arabian Sea on the other.

The true structure of the Himalayan chain is a subject of vast complexity, almost defying generalized treatment. Col. Godwin-Austen separates the Central Asian chain into five principal divisions, with some minor sub-divisions, viz.: (1) The main axis or Central Asian, Kuenlun; (2) Trans-Himalaya; (3) Himalaya; (4) Outer or Lower Himalaya; (5) Sub-Himalaya. The first three are grouped under the head of the Tibetan and the last two under that of the Himalayan region. From the culminating ridge to the plains averages about 90 miles, a space which may be divided into three equal longitudinal zones, the lower comprising the Dhuns, or Maris, of Nepal, and the Duars of Bhutan, as well as the *bhabur* or *sál* forests and the *terai* or swampy lowlands; the middle between the Dhuns and the snow-line; and the upper or alpine zone. The amount of heat and cold in these several zones depends almost entirely on the elevation, there being a diminution of temperature equal to 3° or 3¼° F. for every 1,000 feet of height, while as regards moisture every step to the N. or N. W. takes the traveler into a drier climate, and farther from the influence of the rainy monsoon. From the Wakhjir Pass the main range of the Himalayan system converges to the S. W. under the name of the Hindu-Kush, and forms what has been not inaptly termed the mountain bulwark of India on the N. W. It is pierced by a score or so of passes, some of great strategic value, giving access as they do from the valley of the Oxus to that of the Indus. Gilgit and Chitral are garrisoned outposts in this direction, commanding important lines of advance on India. Curving round the basin of the Cabul river, we follow the line of the watershed till, under the name of the Safed-Koh, or White Mountains, it rejoins British territory. Here a fresh mountain system, called the Sulimanis, consisting of parallel ridges, increasing in number as they extend southward, shuts in the Derajat, or plains of Sind, on the W., and its offshoots continue their southward trend till the ocean is reached in a bold headland at Cape Monze. See HIMALAYA.

Rivers.—The Ganges, the Indus, the Brahmaputra, and the Irawadi are each between 1,000 and 2,000 miles in length, and derive their waters from basin-areas varying from about 100,000 to close on 400,000 sq. miles in extent, while there is good reason to believe that the Salwen, if it were possible to ascend the stream to its sources in Tibet, would be found to fall not far short of these figures. The interesting geographical problem of the rise and upper course of the Salwen is still unsolved. The Indus, Brahmaputra, and Sutlej spring from the vicinity of the sacred Kailas Mountain, in Tibetan territory, at a height of upward of 15,000 feet above sea-level. The first named passes through Northern Kashmir, and then, curving round, emerges into a difficult and only partially explored belt of independent country, re-entering British territory near Amb in the Punjaub. The name of this province is derived from two Persian words signifying "five waters," but as a matter of fact the great rivers which flow through it are six in number—viz., the Indus, Jhilum, Chinab, Ravi, Bias, and the Sutlej. The combined waters eventually unite with those of the first named, and join the sea through its deltaic mouth S. E. of the port of Karachi. The Brahmaputra, like the Indus and Sutlej, rises near Lake Manasarowar, but flows, under the name of Sanpu river, almost due E. through Great Tibet, until close on the meridian of 95° E. it turns abruptly southward, and bursts through the Himalayas, emerging into British India under the name of Dihong. After a course of 450 miles down the Assam valley, the Brahmaputra (as it is there called) sweeps round the spurs of the Gharo Hills, and flows due S. into the Bay of Bengal, its delta becoming commingled with that of the Ganges and the drainage of the Cachar valley. Under the name of the Bhagirathi the Ganges issues from an ice-cave at the foot of a Himalayan snow-bed in native Garhwal, 13,800 feet above sea-level, flowing in a generally southeastern course. On the right bank near Hardwar it gives birth to the great Ganges Canal, while at Allahabad it is joined by the Jumna, which has an independent course of 860 miles, with a catchment basin of about 118,000 sq. miles. Both the Brahmaputra and Ganges are important highways of commerce and inland traffic, while the latter is remarkable also for the extensive system of arterial irrigation derived from it. Both these great rivers also wash down vast floods of silt, which fertilize the riparian districts and form at their mouths an ever-growing alluvial archipelago. According to Sir Charles Lyell, the total mass of mud annually brought down by these combined river systems is at the lowest estimate about 40,000,000,000 cubic feet of solid matter spread over the delta, or five times as much as is conveyed by the Mississippi to its delta.

The Burman rivers, the Irawadi and Salwen, rise to the N. of British territory. The former issues from unexplored highlands, N. E. of Assam, and after a course of about 1,060 miles discharges its waters by some dozen mouths into the Bay of Bengal. It is navigable by river steamers as far up as Bhamo. The Salwen comes in all probability from a remote and obscure part of Tibet, and joins the ocean near Maulmain. In Southern India the Godavari and Krishna are the most notable streams, both over 800 miles in length, and emerging through deltaic mouths into the Bay of Bengal, while the Nerbudda and Tapti, flowing in the reverse direction, from E. to W., discharge into the Gulf of Cambay.

The total areas of the river-basins which drain into the Bay of Bengal and the Arabian Sea are 1,441,900 and 629,600 sq. miles respectively.

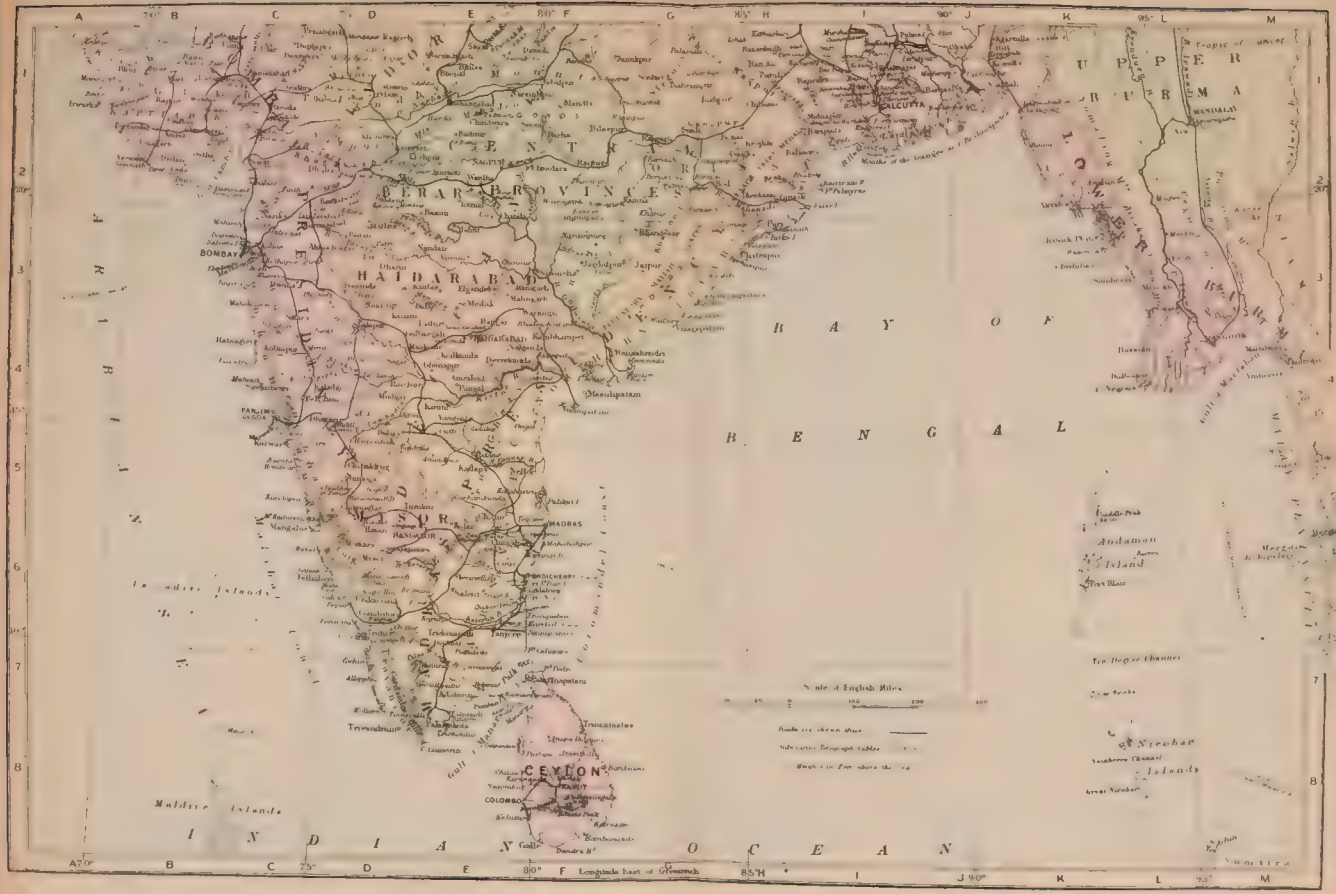
The *lakes* of India are insignificant compared, for instance, with the great lakes of North America, but mention must be made of the important salt lake at Sambhur, in Rajputana, and the Kolair and Chilka lakes on the Madras coast, while innumerable smaller lakes, reservoirs, and tanks, many of artificial construction, are scattered over the face of the country and play an important part in the irrigation of the land.

Coast.—The coast-line is estimated at 9,185 miles from Cape Monze to the Pakchan estuary. Harbors of varying importance are studded along this periphery, from first-class ports like those of Karachi, Bombay, and Madras down to little-known anchorages visited by occasional coasting craft. The first named is the capital of the province of Sind and the extreme northwestern emporium for the traffic brought down from the north and the northwest of India by the Sind, Punjaub and Delhi Railway and the adjacent Indus. Between this and Bombay there are several localities capable of being converted into good harbors. Bombay itself is the best harbor on the west coast of India, and the natural westward outlet for the produce of Calcutta, Madras, and India generally. Further down we come to Cochin, which, with its splendid backwater and adjacent anchorages, to the leeward of the Narakal and Alleppi mud-banks, has all the advantages for being a first-class harbor. Madras, the presidential capital, was an open roadstead until 1876, when two fine L-shaped piers, running out parallel to one another from the shore, were constructed. The saving on the former cost of landing and shipping cargoes has been enormous. At the mouth of the Mahanadi there is a sheltered anchorage called False Point, which, were it not prejudicially affected by the river, would be of great importance for the development of Orissa. Calcutta, the capital and the winter seat of the supreme government as well as of that of Bengal, lies 80 miles up the Hugli river. The traffic is very considerable. On the eastern coast of the Bay of Bengal lie the two harbors of Chittagong and Akyab, while a few hours' sail up the Rangoon river is Mandalay, the capital of Burma, a thriving and improving port.

The *islands* geographically and politically attached to British India are numerous and important. Foremost are the Andamans and Cocos, about 200 miles W. of the coast of Tenasserim, in Burma. North Andaman was the scene of the assassination of Lord Mayo, at the hand of a fanatical

SOUTHERN INDIA

For Northern India see preceding Map



convict. To the S., about midway between the Andamans and Sumatra, lie the Nicobars. They formerly belonged to Denmark, but came into the possession of Great Britain in 1869. To the W. of Ceylon are the Maldives (*Malediva*, or thousand isles), a chain of coral islands, composed of seventeen atolls, while northward lie the Laccadives, a cluster of coral islands, with a population of about 8,000 souls, under the jurisdiction of the collector of South Kanara. See J. G. Bartholomew, *Constable's Hand Atlas of India* (London, 1893), also, ADEN, PERIM, and SOMALI COAST PROTECTORATE.

Geology.—From a geological point of view, as already mentioned, India proper is conveniently divisible into three regions, viz., the peninsular, extra-peninsular area, and the Indo-Gangetic plain; but to these must be added Burma, which, though geographically distinct, has formed since the annexation in 1886 of King Theebaw's dominions a fourth homogeneous region, necessitating separate treatment. Over this entire expanse of country a geological survey has been at work since the year 1856. The rocks are easily separated into a few great groups, as follows:

6. Alluvial plains.
5. Sedimentary rocks of Cretaceous and Tertiary ages.
4. The Deccan basalt of Cretaceous and Lower Tertiary ages.
3. The Gondwana system, comprising the Indian coal measures and ranging, inclusively, from the age of the English coal measures to that of the Portland and Purbeck beds of England.
2. The Vindhyan system, a formation peculiar to India, the age of which can not be guessed, as it has yielded no fossils, but which is immensely older than the Gondwanas.
1. The Archæan or metamorphic rocks, such as gneiss and crystalline schists, with the granite often occurring in them, and with some remnants of slaty rocks that have partially escaped the general metamorphism.

Of the above list No. 5 might be omitted in a brief sketch of India proper, for, although Cretaceous and Tertiary strata occur in enormous thickness to the W. in Sind and to the E. in Burma, only small patches of them occur along the coasts of the peninsula, which must have been high and dry before those countries were formed. The mighty Himalayan Mountains, too, have been for the most part formed within this comparatively recent geological time, for marine Tertiary deposits are now found in some of their highest ranges. In the Indo-Gangetic plain rocks are of course generally absent; one might travel for 2,000 miles from the mouths of the Indus to those of the Ganges without coming in sight of a hill or finding a stone. It is the climate that makes the difference and produces striking contrasts in different parts of the same plains; in the rainy regions of the lower Ganges the vegetation is exceedingly luxuriant, whereas in the plains of Upper India, in the Punjaub and Rajputana, immense tracts are barren desert, though the primitive soil is the same in both. The plains have been almost entirely made by the Himalayan rivers, and the process is still going on, although greatly modified by human agency and interference. The great basaltic formation called the Deccan trap, occupying nearly a third of the peninsula toward the N. W., is the remains of prodigious volcanic eruptions that took place about the time the chalk and the London clay were deposited. The volcanic cones of that period have long been washed away; only traces of centers of eruption have been observed on the western borders of the area, whence the lava must have poured out to the eastward, or else have come up through fissures now represented by the great dikes of basalt that are common enough all over the area. These beds of water deposits are often found between the trap flows, and they mostly contain fossils, but all of fresh-water shells, so that the whole must have been then as now well above sea-level. The flows being still in their original flat position, the features of this region take the form of plateaus and terraces, though of course a plateau will at last wear down into a pillar, of which fact there are many picturesque examples along the scarp of the Western Ghats.

The Gondwana rock system is mostly a great sandstone or freestone formation with subordinate clays, and limestone rarely occurs. In one of its lowest members coal is very generally present, and the basal group of all, below the coal measures, displays everywhere the most unmistakable characters of glacial formation. The Gondwanas lie almost exclusively within the northeastern quarter of the peninsula, in basins more or less corresponding with the chief river valleys. All the fossils found in them, except near the sea margin, are of land or fresh-water species, so for all that time too the peninsula was a land surface.

The Vindhyan rocks are distinct from and vastly older than the Gondwanas, but their age is rendered uncertain by the absence of fossils, though the strata are for the most part undisturbed, such as commonly do contain organic remains. The Vindhyans, too, seem to occupy approximately their original local basins in the primitive surface of Archæan rocks, and are probably fresh-water deposits.

Of the metamorphic or local Archæan rocks little can be said, for here, as in every country, they are the most difficult to study, being squeezed and metamorphosed almost beyond recognition of their sedimentary origin.

For long ages India has been inhabited by a people highly skilled in the arts, including metallic wares. As a matter of fact, coal is the only mineral they made no use of, although in many places it crops out abundantly at the surface. Though diligent search has been made for workable deposits, not one has been discovered that the natives had not made use of long ago, even obscure ores of cobalt and manganese having been worked by them. Old mines, some of great extent, have been found in the most remote jungles, and many of these have been examined by experts and pronounced unworkable. India is not rich in metallic minerals. Few countries, however, have a more abundant supply of pure iron ores, and in old times iron-smelting was common all over the peninsula, and Indian steel was famous. Crossing the Bay of Bengal to the younger crystalline axis of the Malay Peninsula in the Tenasserim and Martaban provinces of Burma, and passing northward close to Mandalay, one finds the mineral deposits much richer. The tin ore of the Malay peninsula has long been famous, and deposits of the same ore occur in Tenasserim. Lead and antimony have also been noticed in these regions.

Of non-metalliferous minerals there is some trade in mica and in garnets, both as gems (carbuncle) and as a substitute for emery. True emery (corundum) is also exported; a very pure and massive corundum occurs at Pipra in Rewah. The agates and jaspers of Cambay and Broach are well known; they are derived from the detritus of the Deccan trap in which these quartz minerals occur in drusy cavities. Jade occurs largely in the Northern Himalayas and in Upper Burma, as do rubies and sapphires. The diamonds of India maintain their pre-eminence for purity, but the search for them is less active than it used to be. They occur as pebbles in old gravel-stones of the Vindhyan period, but the true mother-rock of the gem is still unknown. The trade in borax, derived from some mineral springs in Tibet, is still kept up. Niter is largely collected in the plains, as formed through organic refuse about the sites of human habitations, ancient or modern. Immense deposits of rock-salt are extensively worked in the salt-range of the Punjaub.

In the peninsula, coal is confined to the lower Gondwana deposits. The supply is very great, and much of it is of good quality, but the distribution is of course unequal, as the coal-bearing rocks do not occur in Southern or Western India. In Outer India workable coal is found only in much newer rocks, Cretaceous and Tertiary. These coal measures are traceable through a great portion of the border districts from Malay to Sind, but the seams have proved too poor for working. In Upper Assam, however, they attain immense development, and the coal is remarkably good, being particularly free from ash-forming impurities, which form a drawback to much of the Gondwana coal.

Rangoon oil has long been an article of Indian commerce, and more recently copious springs of petroleum have been tapped by borings in the Baranga islands and elsewhere on the Arakan coast. There are also abundant oil-springs in or about the coal measures in Upper Assam.

Brick is the universal building material in the plains, but along the southern margin thereof the Vindhyan sandstones have supplied a perfect stone. The grand palaces and stately mausoleums of Delhi and Agra are built of it, in conjunction with the marbles of Rajputana. It is also turned to account for railway viaducts. In the Deccan the basalt yields very durable stone, though of somber hue, while in Southern India the granitoid gneiss is almost the only material available, but the great patience and perseverance of the Hindu workers have turned it to wonderful account in elaborately carved temples of great beauty and massiveness.

Fauna.—According to an estimate made in 1881, the total number of known kinds of animals in India and its dependencies (not including the seas) amounts to upward of 12,000;

of these, 405 are mammals, 1,681 birds, 514 reptiles (snakes, lizards, tortoises, etc.), about 100 amphibians (frogs, toads, and newts), and 1,357 fishes, the remainder being insects and other lower animals. Among the fauna of the Himalayas are the ounce, or snow-leopard, the lynx, two kinds of bears, the yak, the ibex, the *gural*, or Himalayan chamois, the musk deer, Kashmir stag, and the *kyang*, or Tibetan wild-ass, the *shou*, or so-called Sikkim stag, and the cat-bear. On the plains and lower hills of India, the tiger, leopard, several kinds of wild-cats, civets and palm-civets, the sloth-bear, hyæna, wolf, fox, jackal, and so-called wild-dog (*cuon*), the elephant and wild-hog, the *gaur*, or wild-ox, the *arna*, or buffalo, *nilghai*, four-horned antelope, and various kinds of deer. Monkeys of many different kinds are abundant. The cheetah, or hunting leopard, is found in Central and Western and parts of Southern India; rhinoceroses of three kinds, and a lemur in Bengal, Assam, and Burma, another lemur in Madras, and the gibbon in Assam.

Among the most noticeable reptiles are the crocodiles, two kinds of which abound in the larger rivers and sometimes attain a length of 18 or 20 feet, and the gavial, a long-snouted crocodile, which occurs only in the Indus, Ganges, and Brahmaputra, in the Mahanadi of Orissa and the Kuladan of Arakan. The python occurs in all parts of India, though not common, and sometimes grows to 30 feet in length. Of the venomous snakes the largest is the ophiophagus, which sometimes measures 12 feet, and is active and deadly. It is, however, less common than the cobra and the karait. The sea-snakes are all very venomous.

Flora.—The plants indigenous to or commonly cultivated or domesticated in India are so numerous that only a few of the most characteristic and familiar can be mentioned. As a general condition far more kinds flourish in the warmer and damper atmospheres than in the opposite regions, and thus the species of Assam, Cachar, Arakan, Pegu, Tenasserim, and the Malabar coast are more numerous and varied than those of any other part of the country, while those of Sind and the Punjaub, except along the foot of the Himalayas, include but few kinds of either. The great talipot palm is found only in the forests of Ceylon and Travancore. The cocoanut thrives only in the tropics, and then only near the sea. The tál, or Indian palmyra, is found neither in the Punjaub nor generally in Northwestern India, though common elsewhere. Two of the most valuable timber-trees of India are the teak and sál. The sál grows vigorously along the foot of the Himalayas, and forms considerable forests in Chota Nágpur and the N. E. of the peninsula, while teak is abundant in the Western Ghats and also in Burma as far N. as 25° N. lat. The babúl, or gum-arabic tree, occurs all over India; sandalwood in Mysore and the adjacent Bombay districts above the Ghats. Pines and cedars, of the Indian kinds, grow in the Himalayas and higher Assam hills. Among trees utilized for shade or ornament, and in some cases also for fruits, the commonest are, besides the palms, the banyan, with its numerous rooting branches, the pipal, or sacred fig-tree, the tamarind, mango, nim, country almond, the jack, mahowa, the fleshy flowers of which serve as food for man and beast, the casuarina, the sisu, the acacia-like *siris*, the graceful cork-tree (*Millingtonia*), and in dry tracts the tamarisk, also the gorgeous flowering trees, the flamboyant gold mohur tree (*Poinciana*), the yellow and scarlet cotton-trees (*Bombax*), the crimson *dhák* or *palas*, the shoeflower-tree (*Hibiscus*), and the fragrant *champák* (*Michelia*), a favorite offering at the shrines of Hindu deities. Other valuable timber-trees are the toon, gum-arabic trees, ironwood, blackwood, sandalwood, satinwood, ebony, and in the Himalayas the deodar, box, and several pines. The India-rubber fig-tree is common in Assam and Upper Burma.

The commonest cultivated fruits are the mango, the banana, or plantain, the orange, pumple-moose, or pummelo, lime, jack-fruit, bér-plum, guava, papáya, custard-apple, water-melon, and many other gourds, pineapple, and peach. The grape and musk-melon are grown only locally, and the apricot only on the hills of Northwestern India. Of these the mango, banana, orange, jack, and bér-plum are indigenous, growing wild in the jungles.

The chief cereals are wheat and barley in Northern India; rice, the wild form of which is indigenous, and which is everywhere grown in marshy ground, especially in Bengal, Madras, and Burma; also maize, sorghum, and many other kinds of millet, which, except in Bengal and Burma, are the staple food of the agricultural classes. Among pulses, dal, gram, peas, and lentils; among oil-seeds, sesamum, mustard, rape, linseed, castor-oil seeds, cocoanuts, and ground-nuts. Among fiber-plants, cotton universally, jute, chiefly in Bengal, and cocoanuts for coir on the seacoast; for dyestuffs, indigo, madder, safflower, and arnatto; as condiments, chillies, ginger, turmeric, and cardamoms. And for food or stimulants, sugar-cane, arrowroot, tobacco, tea, coffee, Indian hemp, opium, betel, pepper, and the *supári*, or areca-nut.

Climate.—There are three very distinct types of climate within the limits of India, though united by innumerable gradations—viz., the damp and uniform, but moderate warmth characteristic of equatorial regions, best represented by the southwest coast of the peninsula, by Travancore and Malabar; the annual alternation of extreme heat with positive cold, the dry atmosphere, and rare and scanty rainfall which characterize the Western Punjaub and Upper Sind; and lastly the perpetual damp and frequent and heavy rainfall, with marked but not extreme vicissitudes of a warm summer and a cool winter, which especially distinguish the valley of Assam. In Baluchistan there are in the early months of the year spells of snow, sleet, and bitter winds, while in a diametrically opposite direction the Andamans, Nicobars, and forest-clad islets of the Mergui Archipelago afford types of true tropical scenery.

Of all the provinces the Punjaub is that in which the vicissitudes of climate are greatest. It has the coldest winters and the hottest summers. The adjacent province of Sind is at once the driest and, as a whole, the hottest of all. Rajputana is transitional between the foregoing region and the plateau of Central India, where agriculture can be carried on extensively and regularly, at least in the summer months, without artificial irrigation. The annual rainfall varies from only 5 or 6 inches in the extreme west to a little under 20 inches along the Aravalli hills. To the E. of the latter it is generally over 20 inches, and in the extreme south it amounts to over 40 inches. The Northwest Provinces and Oudh, which constitute the most fertile and highly cultivated, also the most densely populated, provinces of India, are peculiarly subject to vicissitudes of rainfall, and have been repeatedly—e. g. in 1804, 1834, 1861, 1868, and 1877—devastated by famine, resulting from the failure of the season's rains. (See FAMINE.) It was as a protection to this tract that after the destructive famine of 1834 the Ganges Canal, the greatest work of the kind in the world, was planned and executed by Sir Proby Cautley. It was begun in 1848, and was completed and opened in 1854. The Central Indian plateau is drier than that of the Gangetic plain, the rainfall is moderate (between 30 and 50 inches), and from the beginning of November to the beginning of March bright, clear, and pleasant weather lasts uninterruptedly for weeks at a time. Behar has a higher average rainfall than the Northwest Provinces and Oudh, but, like the former, is subject to the occasional failure of the rains; while the Chota Nagpur plateau to the S. has a more copious rainfall than most parts of Central India in general—but little short of 50 inches. Bengal and Orissa include the whole of the alluvial plain that skirts the northern shore of the Bay of Bengal, that of Bengal being the combined deltas of the Ganges and Brahmaputra up to the slopes of the Himalayas and Assam hills. The weather is here as characteristically damp and relaxing as that of Northwestern India is the reverse. At Calcutta the cool weather lasts from the second week in November to the middle or latter end of February, while the hot season is tempered by a southerly breeze which blows from the wide estuary of the Hugli. Here, as in the other parts of India, the monsoon rains arrive in June, and in the case of Bengal their advent is usually accompanied by a cyclonic storm from the bay or delta. The extremes of rainfall are Berhampore and Burdwan, with 55 and 58 inches respectively, and Chittagong with 106. Assam and Cachar are uniformly moist. The annual rainfall of four of the chief stations is 93, 94, 85, and 120 inches. A complete contrast is presented by the peninsula of India, for there the seat of the heaviest rainfall and the dampest atmosphere is the west coast. In the Deccan shade trees are rare, and, notwithstanding the natural fertility of the soil, all agriculture is more or less precarious, owing to the uncertainty of the scanty rainfall.

Political and Administrative Divisions.—The British Government has respected the possessions of native chiefs, and one-third of the country still remains in the hands of its hereditary rulers. Their subjects make about one-fifth of the whole Indian people. The native princes govern these states with the help of British residents or agents appointed to their courts by the viceroy. The chiefs form a

body of feudatory rulers possessed of revenues and armies of their own. They are, however, forbidden to make war upon one another, or to have any separate relations with foreign states. The British possessions are distributed into twelve governments, each with a separate head, but all of them under the orders of the supreme Government of India, consisting of the viceroy or governor-general, in council. The latter holds his court and government at Calcutta in the cold weather, and at Simla during the summer.

The following tables give the area and population of each of the British provinces and groups of native states, according to the census of 1891:

PROVINCE, STATE, OR AGENCY.	Area in sq. miles.	Population, 1891.	PERCENTAGE OF TOTAL	
			Area.	Pop.
Bengal	151,543	71,346,987	9·71	24·84
Madras	141,189	35,630,440	9·05	12·40
Northwest Provinces	83,286	34,254,254	5·34	11·93
Oudh	24,217	12,650,831	1·55	4·40
Punjaub	110,667	20,866,847	7·09	7·26
Bombay	77,275	15,985,270	4·95	5·56
Sind	47,789	2,871,774	3·06	1·00
Central Provinces	86,501	10,784,294	5·55	3·75
Upper Burma	83,473	2,946,933	5·35	1·03
Lower Burma	87,957	4,658,627	5·64	1·63
Assam	49,004	5,476,833	3·14	1·91
Berar	17,718	2,897,491	1·14	1·01
Ajmir	2,711	542,358	0·17	0·19
Coorg	1,583	173,055	0·10	0·06
Aden	80	44,079	0·01	0·02
Quetta, etc	.....	27,270	....	0·01
Andamans	.....	15,609	....	....
Total British provinces	964,993	221,172,952	61·85	77·00
Haidarabad	82,698	11,537,040	5·30	4·02
Rajputana	130,268	12,016,102	8·35	4·18
Central India	77,808	10,318,812	4·99	3·59
Mysore	27,936	4,943,604	1·79	1·72
Baroda	8,226	2,415,396	0·53	0·84
Kashmir	80,900	2,543,952	5·19	0·89
States connected with				
Bombay	69,045	8,059,298	4·42	2·81
Madras	9,609	3,700,622	0·62	1·29
Central Provinces	29,435	2,160,511	1·89	0·75
Bengal	35,834	3,296,379	2·30	1·15
Northwest Provinces	5,109	792,491	0·32	0·28
Punjaub	38,299	4,263,280	2·45	1·48
Fort Steadman, Shan outposts	.....	2,992	....	....
Total feudatory States	595,167	66,050,479	38·15	23·00
Grand total India	1,560,160	287,223,431	100·00	100·00

The following table gives the populations of the British tracts which were unavoidably excluded from the operations of the census of 1891, and of the French and Portuguese settlements and possessions:

Sikkim (registered)	30,458
Manipur (estimated)	250,000
British Baluchistan (registered)	147,417
Cis-Salwen Shan states (registered)	372,960
Burma frontier tracts	116,493
Rajputana hill tracts (registered)	204,241
Total excluded	1,121,569
French settlements	282,923
Portuguese possessions	561,384
Total foreign	844,307
Included in the census	287,223,431
Grand total	289,189,307

Ethnology.—The first historical movement into India was that of the Aryan race, hailing from the temperate zone beyond the Himalayas. They appear to have come by way of the Cabul river or upper Indus, and, according to the Vedic hymns, to have warred against a lower race of black-skinned aborigines, remnants of which would seem to linger in the Anamalai Hills, the Central Provinces, and in the tributary states of Orissa. The Aryan or Sanskrit-speaking race comprises the Brahman and Rajputs. Next comes the great mixed population known as the Hindus, which has grown out of the Aryan and non-Aryan elements (chiefly from the latter), while last of all come the Mohammedans. The non-Aryans would seem from their language to have belonged to three great stocks known as the Tibeto-Burman, the Kolarian, and the Dravidian. The first named in some prehistoric time had dwelt in Central Asia, side by side with the forefathers of the Mongolians and Chinese, and crossed over into India by the northeastern passes. The Kolarians also entered Bengal by the northeastern passes, and are now found chiefly as isolated tribes, like the Santals and Kurkus, scattered along the northeastern edge of the triangular tableland. They, as well as the Dravidians, who came from the northwest, pushed on for the south of the peninsula, but the Dravidians proved the stronger, and, breaking up and thrusting aside the Kolarians, settled down in the south, where they have given their language to close on 53,000,000 people. The aboriginal races on the plains have supplied the hereditary criminal classes, alike under the Hindus, Mohammedans, and British. Those in the hills differ in character, and are brave, faithful, and attached to their superiors.

The Aryans, a nobler race, belonged to the Indo-European stock. At the time of their advent into India they had tamed most of the domestic animals, were acquainted with some metals, understood the arts of weaving and sewing, wore clothes, and ate cooked food. The ancient religions of Europe and India had a similar origin and, as is also well known, there is a remarkable affinity in the languages of the two countries. One of the most famous Aryan settlements in India lay between the two sacred rivers, the Saraswati and the Drishadevati, in the Punjaub. Before the embassy of the Greek Megasthenes, at the end of the fourth century B. C., the race had spread at least to the verge of the Gangetic delta, 1,500 miles distant, and at the time of the Periplus, about 70 A. D., the southernmost point of Cape Comorin was apparently a seat of their worship. Those settled on the Ganges, in the "Middle Land," found themselves divided into three classes: (1) the priests or Brahmans; (2) the warriors or king's companions, called in ancient times Kshattriyas, and at the present day Rajputs; and (3) the husbandmen or agricultural settlers who retained the old name of Vaisyas. A fourth or servile class called Sudras were distinguished from their Aryan conquerors as being "once-born" instead of "twice-born." In the course of centuries these divisions developed into castes; intermarriage between them was forbidden, and each kept more or less strictly to its hereditary employment.

Language.—The linguistic distribution of the population requires but brief notice here, as further details will be found under the heads of the different languages themselves (e. g. Arabic, Dravidian, Iranian, Sanskrit, etc.). Mr. Baines, in his report on the census of 1891, separates the Indic-Aryan, or inflectional or synthetic class, into three geographical groups, viz.: the northern, comprising Hindi, Punjaubi, Pahari, etc., and numbering over 106,000,000; the western, of which Marathi, Gujarathi, and Sindi are the chief, amounting to 33,000,000; and the eastern group, over 51,000,000, of which Bengali with 41,000,000 adherents is by far the most important, Uriya and Assamese coming a long way after in point of numbers. The Dravidian section in Southern India, numbering about 50,000,000, comprises Telugu, Tamil, Canarese, Malayalam, Gônd, and other tongues less important in numbers. (See DRAVIDIAN LANGUAGES.) The Kolarian class numbers barely 3,000,000, of which the Santhals are the principal tribe, while the Tibeto-Burman group amounts to over 7,000,000. Passing the Taic, Môn, Malay, and Sinitic classes, which include tongues found on the confines of Siam, the Shan states, and China, but are unimportant, we note that about 1,330,000 persons are returned as speaking languages of the Iranic-Aryan class, viz., Pushtū, Baluchi, and Persian, the first named being by far the most numerous, and that 53,000 speak Arabic. English is spoken by 238,499 persons. German comes next with 2,215, and then French with 2,171, and Italian with 690. See J. A. Baines, *Transactions of the Ninth International Congress of Orientalists*, i. pp. 80–127 (London, 1893).

Religion.—For information regarding the origin, development, and tenets of the principal religions of India, see BRAHMANISM, BUDDHISM, CASTE, HINDUISM, etc. The following table exhibits the number of adherents to each:

RELIGION.	Population, 1891.	Percentage of total population.	Approximate percentage of increase since 1881.
Brahmanic	207,731,727	72·32	+10·82
Animistic	9,280,467	3·23	
Sikh	1,907,833	0·66	+2·12
Jain	1,416,638	0·49	+14·86
Zoroastrian	89,904	0·03	+4·91
Buddhist	7,131,361	2·48	+24·46
Jew	17,194	0·006	+20·93
Christian	2,284,380	0·80	+21·85
Mussulman	57,321,164	19·96	+10·61
Others	42,705	0·014	
Totals	287,223,431	100·00	+10·98

Education.—Public instruction is directly organized by the state, and is assisted by grants under state inspection. But at no period of its history has the country been without some system of popular education independent of state organization or aid. Throughout every change of dynasty vernacular instruction has always been given at least to the children of respectable classes in each large village. Modern efforts to stimulate education have been most successful when based upon the existing indigenous institutions. Warren Hastings was one of the foremost pioneers in this work. He founded the Calcutta Madrasa for Mohammedan teaching (1781), and extended his patronage alike to Hindu pundits and European students. During the next fifty years successive viceroys vied with one another in promoting educational works, and the Sanskrit Colleges at Benares and Calcutta, the Agra College, the Hugli Madrasa and the Medical College were established. Meanwhile the Christian missionaries made the field of vernacular education their own. Although discouraged by the authorities, and under the company liable to deportation, they not only devoted themselves to their special work of evangelization, but they were also the first Europeans to study the vernaculars. The present educational system originated with Sir C. Wood (afterward Lord Halifax). In the midst of the tumult of the mutiny in 1857 the universities were calmly founded at Calcutta, Madras, and Bombay. Schools for teaching English were by degrees established in every district; grants in aid were extended to the lower vernacular institutions and to girls' schools. A department of public instruction was organized in every province, under a director with a staff of inspectors. A network of schools was extended over the country. All received some measure of pecuniary support, granted under the guarantee of regular inspection, while a series of scholarships at once stimulated efficiency and opened a path to the university for the children of the poor.

In 1891–92 the total educational expenditure in British India was 30,731,836 rupees, of which 8,891,738 were contributed by Government grants and provincial revenues, 5,400,105 by local rates and cesses, 1,427,650, by municipal funds, 8,894,120 by fees, and 6,119,232 from subscriptions, endowments, and other sources.

There are universities at Calcutta, Allahabad, Lahore, Madras, and Bombay, and during the years 1887–91 4,143 out of 15,352 candidates successfully passed the entrance examination. Next come the colleges or institutions for higher instruction, comprising those which teach the arts course of the universities and those devoted to special branches of knowledge, and after these come the upper schools, in the higher of which English is not only taught but is also used as the medium of instruction. The middle schools explain their own position. Some of those teach English, but others only the vernacular. Lastly come the lower or primary schools, which are scattered throughout the country, and the organization of which is by no means uniform in the different provinces. In Burma it is still left to a great extent in the hands of the Buddhist monks, who receive little or no aid from Government, and admit only boys; but there are lay teachers who admit girls to their classes. The total number of institutions of all kinds and grades was 142,038 in 1891–92, and the grand total of all scholars on the rolls of the last day of that official year was 3,870,228.

Literature.—The venerable Sanskrit epic of the *Mahábhárata* ranks first, as the traditionary legend dates its compilations by a sage, Vyasa, some 5,000 years back. It has been described as a cyclopædia of Indian mythology and legendary lore, extending over eighteen books and 220,000 lines. The second great epic, the *Rámáyana*, recounts the advance of the Aryans into Southern India. Unlike the *Mahábhárata*, it is ascribed to a single poet named Valmiki. The name of Kalidasa has come down as the composer of two later epics and also as the father of the Sanskrit drama, a class of works which probably belongs to the period between the first century B. C. and the eighth century A. D. Kalidasa's most famous drama is *Sakuntalá*, or *The Lost Ring*. It has been translated by Sir William Jones. There are others of the Hindu dramas and domestic poems of almost equal interest and beauty. The *Upanishadas*, the *Puránas*, and *Tantras* mark various epochs in the development of Hinduism. The *Puránas*, which recount the deeds of the Brahman gods, belong to the period after the mass of the people had split up into their two existing divisions as worshipers of Vishnu or of Siva, after 700 A. D. While claiming to be founded in Vedic inspiration, they practically superseded the Veda, and have formed during ten centuries the sacred literature on which Hinduism rests. An idea of the literary activity of the Indian mind may be found from perusal of the annual lists of the publications issued in the different provinces. These are combined into an annual review printed in Calcutta. A vernacular literature of provinces and elementary works, also of more advanced works, chiefly translations, is springing up, great numbers of such books appearing annually. See the *Modern Vernacular Literature of Hindustan*, by George A. Grierson; *Journal of the Asiatic Society of Bengal* (Part i. for 1888, printed as a special number, Calcutta, 1889).

Occupations of the People.—India is a huge agricultural country, and the vast majority of its inhabitants derive their livelihood directly or indirectly from the land. The census of 1891 showed that 52·98 per cent. of the total population were classified under the head of landholders and tenants, 6·5 per cent. as agricultural laborers, 8·87 as general laborers, 1·45 as graziers, shepherds, and wool-workers, and 3·07 as cotton-workers, while mendicants, leather-workers, grain and pulse dealers, carpenters, and village servants ranked next in inferior proportions. The above are more primitive callings, which account altogether for 85 per cent. of the total population. Mention may be made of the following supplementary callings, viz., milk-sellers, shopkeepers, money-lenders, grocers, tailors, piece-goods dealers, toddy-drawers, cane-workers, grass and firewood sellers, and other miscellaneous businesses which exhaust the remaining 15 per cent.

Industries, Manufactures, and Products.—Although a great agricultural country, the village crafts, such as those of the weaver, potter, blacksmith, brazier, and oil-presser, have maintained their standard of usefulness from very early times. Cotton-weaving is also a very ancient industry, and the native piece-goods are still in demand. The number of cotton-mills throughout the country is steadily increasing. There are about 125 steam cotton-mills at work, of which about 90 are in the Bombay Presidency. These mills employ over 112,000 persons, and with their 23,855 looms and 3,197,700 spindles represent a nominal capital of about Rx. 11,800,000.

The jute-mills, 26 in number, and all but two in Bengal, are beginning to rival those of Dundee. The weaving of jute into gunny-cloth is an indigenous industry throughout Northern Bengal, and the export of bags is very large. There are 53 rice-mills for husking and cleaning rice, and 62 sawmills, most of which are in Burma. Among other industries specified in the returns for 1890 may be mentioned woolen-mills, 5; silk-mills, 6; soap-factories, 2; tanneries, 46; iron and brass foundries, 55; sugar-factories (large), 11; coffee-works, 26; cotton and jute presses, 397; cutch and lac factories, 64; oil mills and factories, 63; flour-mills, 55; ice-factories, 28; pottery and tile factories (large), 19; bone-crushing factories, 14; tobacco and cigar factories, 31. Besides the above, there are silk filature, indigo, and tea factories, and workshops and yards for repairing rolling stock, which are attached to all the chief railway lines and form valuable training-schools for young mechanics.

Art Products.—Silk-weaving is a common industry, and in Assam and Burma silk is the ordinary material of clothing. As Mohammedans are not allowed to wear clothing of pure silk, mixed fabrics called *mashm* or *sufi* are largely woven in the towns of the Punjaub and Sind, at Agra, at Haidarabad in the Deccan, and at Tanjore and Trichinopoli. Embroidery, on groundwork of silk, cotton, wool, or leather, is a special Indian industry, and muslin, embroidered with silk and gold thread, is made at Dacca, Patna, and Delhi. The historical seats of the trade of weaving carpets and rugs, from both cotton and wool, are in Kashmir, the Punjaub, and Sind, and at Agra, Mirzapur, Jabalpur, Warangal, Malabar, and Masulipatam. Velvet carpets are also made at Benares and Murshidabad, and silk-pile carpets at Tanjore and Salem. Gold and silver and jewels, both from their color and their intrinsic value, have always been the favorite material of Oriental ornament. The workmanship is often rough, but quaint and characteristic, and in Trichinopoli, Cuttack, Delhi, and Kashmir the jeweler's work is really artistic. Throughout Southern India the ornamentation consists of figures of Hindu gods in high-relief. The hammered *repoussé* silver work of Cutch, though now entirely naturalized, is said to be of Dutch origin. Similar work is done at Lucknow and Dacca, and, generally, highly ornamental metal-work may be said to be a favorite and world-famous Indian industry. Naturally the chief duty of the smith is to make agricultural implements, but in many cities

the manufacture of arms and cutlery is carried on successfully and artistically. Matchlocks, chain armor fine as lacework and said to be of Persian origin, firearms and swords damascened in gold and silver, are produced at various towns in the N. W. Pottery is made in almost every village, but Sind is the only province where it is produced with regard for artistic considerations. Stone sculpture is an art of high antiquity and wood-carving is an important art in Western India, while in Amritsar, Benares, Murshidabad, and Travancore almost any article may be obtained in carved ivory.

Agriculture.—As the land tax or land revenue forms the mainstay of the imperial revenue, so the *ryot* constitutes the unit of the social system. The famine commissioner estimated in 1880 that 90 per cent. of the rural population live more or less by the tillage of the soil, and this has been confirmed by the researches of the census commissioner in 1891. The foremost product is probably rice, which in 1880 was consumed by about 67,000,000 people. In the deltas of the great rivers and the coast districts rice is almost an exclusive crop. It is also cultivated on all the hills, either with the sole aid of the rainfall or by an ingenious system of petty canals. Wheat does not thrive where rice grows, and, generally speaking, the great wheat-growing tracts are in the N. The average yield is about 13 bush. per acre in the Punjaub, as compared with an average of 15½ bush. for the whole of France. About 30,000,000 bush. are exported annually. The staple food-grain, however, is millet, either great millet (*Sorghum vulgare*) or spiked millet (*Pennisatum typhoideum*). Other cereals are Indian corn, barley, and pulses of various kinds. Oil-seeds, too, form an important crop, while numerous fruits and vegetables are everywhere cultivated in garden-plots for household use, and on a large scale near the towns. Among spices turmeric and chillies hold the first place, after which come ginger, coriander, aniseed, black cinnamon, fenugreek, pepper, cardamoms, and the areca-palm yielding betel-nut, besides other palms referred to in the section on the flora. Sugar is manufactured both from the sugar-cane and from the bastard date-palm, but the production is not sufficient for local consumption. Cotton is an important product. The principal cotton-growing tracts are the plains of Gujrát and Kathiawar, the highlands of the Deccan, and the deep valleys of the Central Provinces and Berar, and 80 per cent. of the exports come from Bombay. Jute ranks next to cotton as a fiber-crop, after which comes indigo. The opium of commerce is grown and manufactured in (1) the valley of the Ganges round Patna and Benares, and (2) a fertile table-land in Central India, the old kingdom of Malwa. In the former the Government has a monopoly, and in the latter case the opium pays duty as it passes through British territory on its way to the port of Bombay. Tobacco is widely grown, but its quality does not command much favor elsewhere. Coffee continues to be cultivated, but the growth of tea is one of extraordinary expansion. The principal cinchona plantations are at Darjiling and in the Nilgiri Mountains. Among minor agricultural products are silk, shell-lac, dyes, hides and skins, wool, seeds, and timber.

Government, Revenue, and Rent System.—The administrative system may be said to date from 1858, when India was transferred from the East India Company to the crown. Under the former authority the governor-general was an autocrat responsible only to the court of directors in England, who in their turn had been responsible to the shareholders or court of proprietors, and through the board of control to the sovereign and to Parliament. The act of 1858 did away with these intermediary bodies. For the court of directors, the court of proprietors, and the board of control it substituted a secretary of state, aided by a council of experts, appointed by the crown.

The viceroy or governor-general is appointed by the crown and resides in India. He is subject to the control of the Secretary of State, and his ordinary term is five years of office, which is held independently of ministerial changes at home. The governor-general's council is twofold. First, the ordinary or executive council, usually composed of about six official members besides the viceroy. Its members divide among themselves the chief departments of state, such as those of foreign affairs, finance, military matters, public works, etc. Second, the legislative council, made up of the same members as the preceding, with the addition of the governor of the province in which the meeting is held, certain officials selected by the governor-general, and nominated members representative of the non-official native and European communities. The meetings of the legislative council are open to the public, and the right of interpellation has been conceded.

The presidencies of Madras and Bombay are each administered by a governor appointed in London, and an executive and a legislative council, whose functions are analogous to those of the governor-general, though subject to his control. The lower provinces, commonly termed Bengal, have legislative councils of their own, and Assam, Oudh, and the Central Provinces, whether ruled by a lieutenant-governor or chief commissioner, may be regarded from an historical point of view as fragments of the original Bengal Presidency. The unit of administration is the district in charge of a collector-magistrate or deputy commissioner.

Under the Mogul empire, the ruler, whether a great monarch or petty chief, was entitled to a share of the produce of cultivated land, varying from one-third to one-fourth, and in the case of the celebrated settlement of Akbar this demand was based upon a field survey. From the death of Aurungzebe and the break-up of the Mogul empire anarchy and oppression ensued, and on the inauguration of British rule it was found necessary to introduce the more enlightened system of settlements. In Bengal, the northeast districts of Madras, in Oudh, and the Central Provinces the settlement of the Government demand was made with the superior holders (sometimes the descendants or representatives of ancient nobles, sometimes of military chiefs, in other cases of middlemen or farmers of the revenue) as landlords. This is called the *zamindari* settlement. In the greater part of Southern and Western India it was made with the *ryots* or cultivators themselves in the absence of any intermediate class, with permanent rights existing between the actual tiller of the soil and the state. In this case it is called *ryotwari*. A third or intermediate system is common in other parts, especially in the Punjaub and the Northwest Provinces, where the settlement is made with the village community. The proportion of the Government demand to the value of the average yield of the land differs widely, and can hardly be summarized. In Bengal the revenue was fixed in perpetuity by Lord Cornwallis in 1793, and with the enhanced value of the land as well as of commodities it now represents but a mere fraction of its former value. In Madras half the net produce is the revenue rate per acre, or Government cash assessment; in Bombay the ordinary rates vary from 4*s.* 6*d.* an acre on the rich black-soil lands of Gujrát to 10*d.* an acre in the hills of the Konkan.

Finance.—The currency is in silver rupees, which are legal tender to an unlimited amount, though a gold currency has been sanctioned in consequence of the serious depreciation of silver. The rupee is divisible into sixteen annas and the anna into twelve pice. There is also a Government paper currency of about 300,000,000 rupees in value. Formerly the rupee was nominally equivalent to 2*s.* sterling, and this was a matter of convenience in the official accounts, ten rupees being held equivalent to £1 sterling. The fall in the gold value of the rupee, however, has led to the substitution of the expression Rx. (tens of rupees) for the old pound sterling, which had ceased to be applicable.

The following table shows the gross revenue and expenditure (excluding capital expenditure on public works), in tens of rupees, for ten official years:

YEARS.	Revenue, Rx.	Expenditure, Rx.
1883–84	71,841,790	69,962,313
1884–85	70,690,681	71,077,127
1885–86	74,464,197	77,265,923
1886–87	77,337,134	77,158,707
1887–88	78,759,744	80,788,576
1888–89	81,696,678	81,659,660
1889–90	85,085,203	82,473,170
1890–91	85,741,649	82,[illegible]78
1891–92	89,143,283	88,675,748
1892–93	90,172,438	91,005,850
Totals	804,932,797	802,120,552

Trade and Commerce.—The total trade, exclusive of Government transactions, for the five years ending with 1893 is as follows:

1888–89	Rx. [illegible]
1889–90	" [illegible]
1890–91	" [illegible]
1891–92	" [illegible]
1892–93	" [illegible]

Expressed in millions of Rx. the imports of the financial year 1892–93 were as follows: Merchandise, 62.5; gold,

$1\frac{7}{8}$; silver, 15; while with regard to exports the foreign merchandise re-exported was $4\frac{1}{2}$; Indian merchandise, 101; gold, $4\frac{1}{2}$; silver, 24. A study of the trade of 1892–93 shows that the great bulk is interchanged with Great Britain and Ireland, while Hongkong and the treaty-ports of China rank next, after which come France, Germany, the Straits Settlements, Belgium, and the U. S., in the order named. The imports from the last consist chiefly of kerosene oil, cotton piece-goods (gray), tobacco, and clocks and watches, the aggregate being valued at Rx. 1,134,438. The mineral-oil imports are steadily diminishing year by year under the competition of Russian oil. Exports to the U. S., on the other hand, increased largely during the year, rising from Rx. 3,872,593 to Rx. 4,512,988 in value, this improvement being due to higher prices for indigo and jute manufactures, of both of which the U. S. take a large quantity, and to greatly increased exports of cutch, raw skins, raw jute, saltpeter, and cocoanut oil. As to shipping, steamer-tonnage represents 77 per cent. of the whole. The entrances and clearances from and to Great Britain and Ireland are about 35·3 per cent. of the whole, British possessions 32·1 per cent., and foreign countries 32·6 per cent. The ship-building is of small dimensions, and in 1892–93 was confined to sailing vessels.

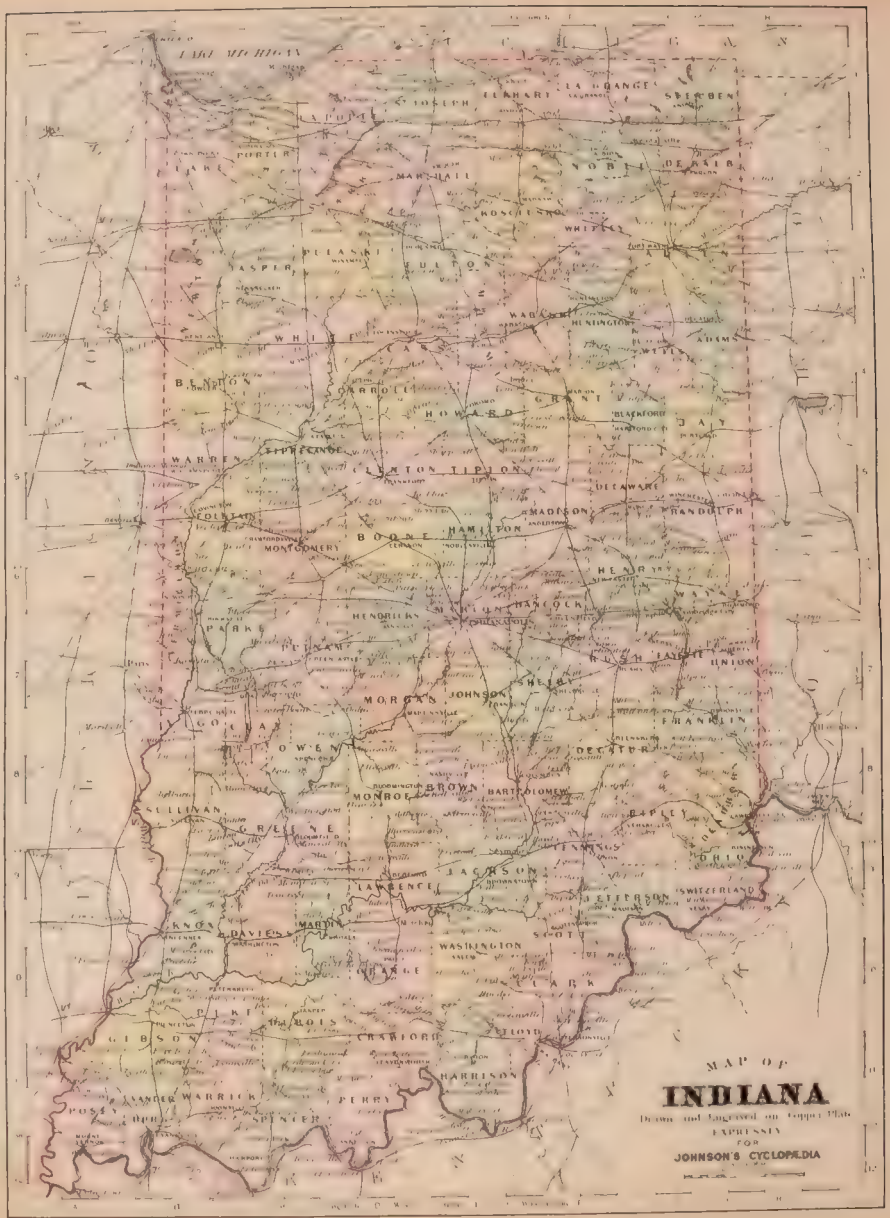
Internal Communications.—(*a*) *Railways.*—The railways have been constructed on three different systems, viz., guaranteed, state, and assisted. The original great trunk lines were all laid down on the first plan, the Government giving the land and guaranteeing interest at 5 per cent. on the share capital raised with its consent. Several of these great railways have been since purchased by the state. The railway mileage open Mar. 31, 1893, was 17,768, of which 1,431 were in native states, while the number of passengers (exclusive of season ticket-holders) conveyed in the year 1892–93 was over 126,000,000, and the amount of goods and minerals 26,000,000 tons. The net earnings of the railways were 12,000,000 Rx.

(*b*) *Canals and Roads.*—The provision of canals has been dictated more from fear of famine and drought than for the conveniences of navigation. The Ganges Canal and its branches, and the irrigation-works in the deltas of the Mahanadi, the Godavari, the Kistna, and the Cavery are among the greatest achievements of their class in the world. There is a valuable network of canals also in the parched Sind desert, and besides these protections against the disasters of famine may be mentioned artificial lakes, tanks, and wells for irrigation scattered throughout the country. The making of roads is prosecuted vigorously, for ordinary use, to serve as feeders to the railways, and also on the frontier for purposes of defense.

Population.—The second general census was taken on the night of Feb. 20, 1891, as nearly as possible ten years after the first, which took place on Feb. 17, 1881. The result shows a total of over 287,000,000 persons, or, including the tracts omitted from the census returns and the French and Portuguese possessions in India, 289,187,316. The density for the whole of India is 184 per mile. The population of the first six cities is as follows: Bombay, 804,470; Calcutta (with suburbs), 840,130; Madras, 452,518; Haidarabad (including the military cantonment of Secunderabad), 415,039; Lucknow, 273,028; and Benares, 222,520.

History.—As already seen, from the Aryan invasion sprang the Hindu or Vedic system, which was reformed by Buddhism some five or six centuries B. C. Then came the invasion under Alexander the Great and some of his successors into the northwestern part of the country. It was followed by other irruptions from Central Asia, some styled Baktrian, others Saka or Scythian, which extended much farther than the northwestern regions. Meanwhile Buddhism had strengthened and spread till it had obtained the sovereignty over the whole country. Thus established as a state religion, it lasted for some centuries after the Christian era, but eventually gave way to the old Hindu system, revived under an elaborated form which should be styled Brahmanism, and which represents the modern Hinduism. After its re-establishment in the sixth century Brahmanism flourished till the eleventh century A. D., when the first Mohammedan invasion took place under Mahmud of Ghazni. Successive invasions followed till the greater part of the country was subdued and parceled out into various Mohammedan kingdoms. Many of these kingdoms were brought into subjection by the Mohammedan dynasty known as the Mogul, a widespreading empire which lasted for two centuries. Its fall was precipitated by the rise of the Mahrattas, who brought about, in its ruin, a revival of Hindu power in the seventeenth century. Meanwhile European influence was beginning to be felt. The Dutch had several settlements, some of which remain in their hands to this day. The Portuguese, after the discoveries of Vasco da Gama, controlled the west coast, excepting Bombay, at that time an insignificant place. Their headquarters were at Goa, still their principal possession in India. In the eighteenth century the power of the French rivaled that of the English; the wars between the two nations were carried into the East, where the contest was waged by sea and land.

The British began to be a dominating influence from Clive's victory, in 1757, over the Mogul at Plassey, which gave to Great Britain the possession of Bengal and Behar. Sixty years later when Poona, under the last of the Peishwas, fell to the British, the East India Company was the master of India as far as the Indus basin, but not in the Punjaub or Sind. The great Mogul, now powerless, was under its protection at Delhi. The company had restored a Hindu sovereign to Mysore, and the two Mohammedan states of Oudh and Haidarabad (Deccan) were its honored though dependent allies, while other native states were maintained in the same position. The dominion founded by Clive was preserved through critical times by Warren Hastings, extended by Cornwallis, and still further advanced by Wellesley and the Marquis of Hastings. The first Burmese war occurred under Lord Amherst, but it was not till Lord Dalhousie's viceroyalty in 1852 that British rule was extended over the important province of Pegu. The first Afghan war in 1838 was undertaken with the object of setting up a native sovereign in Afghanistan under British protection as a means of guarding the northwestern frontier. Through mismanagement disaster ensued, and a whole division of the army was annihilated, this being the first check sustained by the British arms since Plassey. It was amply avenged, however, by the campaign of Gen. Pollock in the same year, after which the British troops evacuated Afghanistan. Sind and the Punjaub were the next acquisitions, to be soon followed by the annexation of Lower Burma. The mutiny of the Bengal army broke out shortly after Dalhousie had handed over the governor-generalship to Canning. A full account of the exciting incidents of this historical event will be found in Sir John Kaye's *History of the Sepoy War* and Col. Malleson's continuation thereof. Limited space permits only the briefest outline. From 80,000 to 90,000 soldiers were in revolt, but the principal native princes set an example of loyalty to the supreme power, and within six months after the outbreak the imperial danger was surmounted and the rebellion soon afterward crushed. The cost increased the public debt by £40,000,000 sterling. Many causes have been assigned for the Indian mutiny, but the greased cartridges served out to some of the Bengal troops, and considered by them as ceremonially unclean, undoubtedly operated as the immediate provocation, while the Cabul catastrophe had seriously shaken the prestige of British authority and power, and the insufficient proportion of only one European soldier to six natives had helped to suggest a sinister opportunity to disaffected minds. This lesson was not thrown away on the authorities, who forthwith increased the European proportion of soldiers and carried out other necessary reforms, thereby augmenting the annual expenditure by about £10,000,000. The readjustment of the finances was intrusted to James Wilson, a political economist of note, and on Nov. 1, 1858, at a solemn durbar at Allahabad, was published a royal proclamation that the Queen had assumed the government of India. The dominion was consolidated by the succeeding viceroys, Elgin, Lawrence, Mayo, and Northbrook. Lord Lytton's term of office was marked in 1877 by the proclamation of the Queen as Empress of India at a durbar held at Delhi. A serious event ensued in 1878, i. e. the war against Sher Ali, Amir of Afghanistan, who had favored Russian intrigues and excluded a friendly British mission. The country fell to the British arms, and a treaty of peace was concluded with Sher Ali's successor. Within a few months, however, the British resident at Cabul, Sir Louis Cavagnari, was treacherously murdered and a second war became necessary. The country was not reconquered without some reverses, but the new amir, Abdur Rahman, proved a wise selection, for, besides establishing a firm rule, he has shown surprising energy and alacrity in introducing Western civilization into his capital. Lords Ripon, Dufferin, and Lansdowne have since contributed to the peaceful development of the empire, for the annexation of Upper Burma in 1886, though carried out by force, was


LAKE MICHIGAN
LAPORTE
PORTER
LAKE
ELKHART
LA GRANGE
STEUBEN
NOBLE
DE KALB
MARSHALL
ROSCIUSKO
WHITLEY
PULASKI
JASPER
FULTON
WABASH
HUNTINGTON
ADAMS
WELLS
WHITE
CASS
BENTON
CARROLL
HOWARD
GRANT
BLACKFORD
JAY
WARREN
TIPPECANOE
CLINTON
TIPTON
DELAWARE
MADISON
RANDOLPH
FOUNTAIN
MONTGOMERY
BOONE
HAMILTON
HENRY
HENDRICKS
MARION
HANCOCK
WAYNE
PARKE
PUTNAM
RUSH
FAYETTE
UNION
MORGAN
JOHNSON
SHELBY
FRANKLIN
OWEN
DECATUR
MONROE
BROWN
BARTHOLOMEW
RIPLEY
SULLIVAN
GREENE
JENNINGS
DEARBORN
JACKSON
LAWRENCE
JEFFERSON
SWITZERLAND
KNOX
DAVIESS
MARTIN
WASHINGTON
SCOTT
ORANGE
CLARK
DUBOIS
PIKE
CRAWFORD
FLOYD
GIBSON
HARRISON
WARRICK
PERRY
POSEY
SPENCER
ALEXANDER
MAP OF
INDIANA
Drawn and Engraved on Copper Plate
EXPRESSLY
FOR
JOHNSON'S CYCLOPÆDIA

a bloodless conquest. Lord Elgin, son of a former viceroy, is the present governor-general (1894).

Antiquities.—These have been classified by Fergusson (*History of Architecture*) under the following heads: 1, Prehistoric; 2, Buddhist; 3, Dravidian; 4, Bengali; 5, Chalukya.

Prehistoric.—These include cairns, cromlechs, and other cognate remains of unknown age, constructed by an unknown people and widely scattered. These are separated by a long interval from the Buddhist remains, for the Aryans built nothing that has endured.

Buddhist.—For five centuries from 250 B. C. nearly all monuments in India are Buddhist and Jaina. (See JAINS.) The Buddhist rock-hewn halls, called *chaityas*, are very imposing pillared interiors. The great hall at Karli, near Bombay, is 126 feet long by 45 wide and more than 50 feet high, divided by pillars into a nave and three aisles, and is lighted by one immense opening at the entrance. The most important monasteries or hermitages (*viharas*) are also cut in the rock, such as those in the island of Salsette in Bombay harbor. The Buddhist *topes* are lofty structures, nearly solid. The oldest are rounded mounds of brickwork faced with cut stone and surmounted by a finial, the whole exactly resembling a dome with its crowning lantern. The largest of these is the famous one at Sanchi, near Bhilsa, in Central India. This is about 120 feet in diameter, and must have been nearly as high as wide. The more architectural topes are called *stupas*; such is the celebrated one at Buddha Gaya, in Bengal, built beside the ancient bo-tree under which Gautama became Buddha. This imposing structure is 160 feet high and about 60 feet square, tapering with a slight *entasis* or curved bounding line, and ornamented by a constant series of square-edged projections of many different forms, which projections are supposed to divide the exterior into nine stories, but are in reality a continued surface-pattern. Nothing in the least like this exists in any European land. Another class of stone monuments is that of the balustrades or "rails," which, though they surround the great topes and form a part of their general plan, are often later, and are far more elaborate, than the topes themselves.

All the above-named monuments are probably of the years from 200 B. C. to 100 A. D., but a great space of time divides them from later structures. Thus the great temple at Bhuvaneswar, in Orissa, is held to be of the sixth or seventh century A. D., and the towers of Khajurao in Central India are thought to be of the tenth or eleventh century. Each of these retains the same general type of nearly pyramidal tower-like structure, with slightly curved sides. The Jaina temples (mostly in Western India) are numerous and elaborate.

Dravidian.—This style extends all over India S. of the Kistna, and the temples and pagodas are vast and magnificent. They are recognizable by their pyramidal form, distinction of stories, and separation into compartments by pilasters. The pagoda of Tanjore in the far south probably is of the same age as that of Khajurao. Here the same tapering form and almost the same richness of detail are seen, but the curved outline has disappeared. The *vimanas* are tower-shaped temples, and the *gopuras* or gate-towers of the southern shrines, such as that of Madura and that of Srirangam, near Trichinopoli, dating from the seventeenth and eighteenth centuries respectively, retain the same characteristics.

Bengali.—The temples of this style have no trace of division into stories, no pilasters, but have a curvilinear outline with polygonal base. The style first appears in the sixth or seventh century, and the best examples are found in Orissa and thence across India. There is a modern temple in this style in Benares.

Chalukya.—This style prevails in Gujrát, Kanara, Mysore, and Rajputana. The temple at Halebid, one of the finest examples, is considered by Fergusson to be among the most marvelous results of patient human labor ever produced.

Mohammedan.—The earliest buildings which show the influence of the Mohammedan conquest are of the twelfth century. They are graceful mosques and tombs, and are scattered over nearly all parts of India except the extreme south. Striking examples are to be seen at Jaunpur, Bijapur, and other places, while the tomb of Akbar and the Taj Mahal, which represent the Mogul architecture, have a world-wide fame. They are richly and artistically ornamented, but are less original than those of the Saracen epoch in Cairo, Damascus, or Cordova. The pointed arch of the Persian mosques was introduced, but only with difficulty, for the earliest and largest attempts at it were mere imitations, arches only in appearance, really built in courses corbelling with horizontal joints.

The ancient sculpture of India has been very little studied. The supposed Grecian influence, of which much has been made, was probably very evanescent and limited to the extreme northwest. Large wall-paintings of great value exist at Ajunta in Central India, N. E. of Bombay; these are supposed to be of the third or fourth century A. D. None others of so early date are known. Some valuable paintings of less expressional than decorative character exist at Madura; these are of the seventeenth century, it is thought—that is, of the native dynasty which succeeded the short-lived Mohammedan rule in this region. See Fergusson, *History of Indian and Eastern Architecture*, and Le Bon, *Les Monuments de l'Inde* (1893).

BIBLIOGRAPHY.—For history, Mill, Thornton, and Marshman's works are all valuable, while Mountstuart Elphinstone, Keene, Grant-Duff, Malleson, Kaye, Trotter, and Maine have dealt with special and successive periods of interest. An important series of separate biographies has been produced (begun in 1890) under the editorship of Sir William Hunter, entitled *The Rulers of India*, while independent biographies of Clive, Warren Hastings, Macaulay, the Lawrence brothers, Mayo, Dalhousie, and Campbell shed further light on the particular times with which they deal. The official literature is probably more important than that of any other country. The annual administration reports for the different provinces form a perfect library of current information on every department of government and for every administrative division of India. These have been annually digested into a parliamentary blue-book. A series of manuals or statistical accounts, some 130 in number, of the different provinces and districts were compressed in 1886 into an admirable *Imperial Gazetteer* by Sir William Hunter and a staff of skilled assistants. *The Indian Empire*, by the same writer, exhibits the same record, still more condensed. The annual statistical abstracts of British India afford a useful *coup d'œil* of the fruits of government, so far as these admit of purely numerical statement. J. A. Baines's *Report of the Census of 1891* is indispensable for a better knowledge of the peoples of India, and Black's *Memoirs of the Indian Surveys, 1875–90*, gives a summary of the multifarious operations usually classed in India under the head of "scientific departments." As already mentioned, J. E. O'Conor's annual reviews of the trade of India are important. Sir H. Rawlinson's *England and Russia in the East* (1875), Sir C. Dilke's *Problems of Great Britain*, and the English translation of Popofsky's work, entitled *The Rival Powers in Central Asia*, deal with the strategic and international aspect of India's policy. A wealth of information on these and other heads may be obtained from *The Journal of the Royal Asiatic Society*, *The Calcutta Review*, and *The Journal of the Asiatic Society of Bengal*, which in 1885 produced a *Centenary Review* (Calcutta), with a complete list of its multifarious papers. C. E. D. BLACK.

India (or **China**) **Ink**: a pigment of two kinds: (1) The dried pigment from certain cuttlefishes. When browned by the action of an alkali it becomes *sepia*. It is prepared in Italy, in Turkey, and in Asia. (2) A mixture of fine lampblack with glue or size and a little camphor. It is prepared in China, and is a very useful pigment. Both kinds are used in Asia as writing-inks, and both are practically indelible. See INK.

Indian'a: one of the U. S. of North America (North Central group); in the upper Mississippi valley; popularly known as the "Hoosier State."

Situation and Area.—It lies between 37° 47′ and 41° 50′ N. lat., and 84° 49′ and 88° 2′ W. lon.; is bounded N. by Lake Michigan and State of Michigan, E. by Ohio, S. E. and S. by Kentucky, and W. by Illinois; and has an area of 36,350 sq. miles (23,264,000 acres).

Topography.—The surface is an undulating plain, sloping gently toward the S. W. The elevation is about 1,100 feet in the N. E., descending to 775 feet at Fort Wayne, rising to 1,250 feet in Randolph County, and descending to about 500 feet in the S. E. In the N. W. the elevation is 590 feet, rising to about 700 feet in Benton County, and descending to about 300 feet in the S. W. In the N. there are a few sandhills; toward the S. the surface is broken by "The Knobs," a range of rocky hills extending from the Ohio in

Floyd and Clarke Counties, N. into Brown County, thence N. W. into Parke County. There is also more or less broken surface along the streams, due to erosion. Ponds, lakes, and marshes and swamps are numerous in the northern part. A portion of the surplus waters flows into the Mississippi through the Kankakee and Iroquois rivers; another portion into Lake Michigan through the Elkhart and St. Joseph; the St. Mary's and St. Joseph also send a small quantity to Lake Erie through the Maumee; but the greater part of the State is drained by the Wabash, White, and White Water rivers into the Ohio. The Tippecanoe and Eel rivers are important branches of the Wabash from the N., while the Salamonie and Mississinewa rivers, and Wild Cat, Sugar, and Big Raccoon creeks are the most important tributaries from the S. E. and E. The White river is made up of two branches (East Fork and West Fork), and the same is true of the White Water. Blue river and several small streams drain a narrow region directly into the Ohio. Broad prairie areas occur in the W. and N. W.

Seal of Indiana.

Geology.—The northern part of the State is so deeply covered with drift that little is known about the rocky substratum, but toward the S. the rocks are freely exposed. Silurian rocks occur at the surface in the E. from the Ohio to Fort Wayne, a narrow belt extending through White, Jasper, and Newton Counties, to Illinois. W. of the Silurian lie the Devonian limestones, whose western boundary extends from New Albany N. into Scott County, thence N. W. to the Silurian in the northwestern part of White County. W. of these there is a belt of sandstones, then a belt of limestones, both Subcarboniferous, then a narrow belt of millstone grit, then the coal measures, all terminating in White, Benton, and Warren Counties. The greater part of Indiana was covered with drift during the glacial period, but a small area in the S. W., bounded by a line extending from Charlestown (Clarke County), N. W. and W. around Martinsville (Morgan County), and thence S. W. to New Harmony (Posey County) was not visited by ice. The mineral products are coal, limestone, sandstone, shale, porcelain, and pottery clays, brick and tile clays, glass sand and clay iron ore, besides petroleum oil and natural gas. The coal area (about 7,000 sq. miles) in 1889 yielded 2,845,057 short tons, mostly of block and bituminous coals, the counties of Clay, Vigo, Parke, and Sullivan producing considerably more than half the amount. The coals in general are valuable for heating purposes, but not for gas or coke. The Silurian and Devonian deposits furnish limestone of excellent quality for building, bridge-work, and lime. The best stone for architectural work and for many other purposes is the oölitic limestone of the Subcarboniferous. It is quarried extensively in Harrison, Crawford, Washington, Lawrence, Monroe, and Owen Counties. Some exceptionally good sandstones are found in the millstone-grit beds below the coal, and are quarried in Perry, Dubois, Orange, Parke, and Warren Counties. Some of the shales accompanying the coal make good fire-brick, some good paving and ornamental brick, while clay-beds in many localities furnish material for common brick and tile. Large deposits of porcelain clays and kaolin occur in Lawrence County, and good potter's clay is common. Petroleum oil is one of the most important products of Indiana. The main oil area is in the east central part, the counties of Jay, Adams, Wells, Blackford, and Grant producing about 6,000,000 barrels in 1892 from about 450 wells. The natural-gas area of the State is about 5,000 sq. miles in extent, including Hancock, Henry, Hamilton, Tipton, Grant, Madison, Delaware, Blackford, and parts of adjacent counties. There are about 1,500 wells, having a daily capacity of about 3,000,000,000 cubic feet.

Soil and Productions.—In the N. the soil is composed entirely of drift materials, but toward the S. the limestones, shales, and sandstones have contributed their quota of material for a rich and varied soil. In some cases the soil consists of disintegrated bowlder clay, but generally the bowlder clay has been broken down and assorted by water into beds of sand and clay, and these mingled with vegetable mould make up the bulk of Indiana soils. The first and second bottoms along the rivers and other streams have soils of exceptional fertility. In the N. W. and W. there are broad areas of fertile prairies, and in the N. there are some areas of nearly barren sand. The driftless area has good soil along the streams and over some of the limestones, but in general the soil is not as good as in other parts of the State. Indiana was originally covered with forests of oak, maple, beech, whitewood, elm, ash, hickory, black walnut, sycamore, and other deciduous trees. The different agricultural products grow well in all parts of the State, but oats, potatoes, and grass do best in the N., and corn in the central portions, while wheat yields best in the N. and S. W.

The following table shows the acreage, yield, and value of the principal crops in 1893:

CROPS.	Acreage.	Yield.	Value.
Corn	3,456,226	85,368,782 bush.	$30,732,762
Wheat	2,523,362	35,579,404 "	18,857,084
Oats	1,166,988	32,092,170 "	8,985,808
Rye	54,675	787,320 "	354,294
Barley	7,420	147,658 "	66,446
Buckwheat	7,263	50,115 "	28,064
Tobacco	6,348	4,532,477 lb.	330,870
Potatoes	101,501	5,176,551 bush.	3,778,882
Hay	2,114,391	2,875,572 tons	26,340,240
Totals	9,438,174		$89,474,450

The farm animals in 1893 comprised 747,014 horses, value $52,470,278; 56,557 mules, value $3,980,497; 663,618 milch cows, value $16,258,641; 1,063,531 oxen and other cattle, value $21,436,952; 1,080,383 sheep, value $4,145,430; and 2,017,376 swine, value $15,493,446: total value, $113,785,244.

Climate.—Indiana has an average annual temperature of 52° F., ranging from 48° in the N. to 56° in the S. The average annual rainfall is about 42 inches, ranging from 36 in the N. to 46 in the S. The prevailing winds are westerly. The following table shows the extreme and average temperature and rainfall by months:

MONTHS.	TEMPERATURE (DEG. F.).			PRECIPITATION (IN INCHES).		
	Average.	Max.	Min.	Average.	Max.	Min.
Nov., 1892	37·9	67	7	3·75	5·10	2·50
Dec., 1892	30·4	70	−11	1·73	3·00	0·75
Jan., 1893	18·3	64	−25	2·54	4·40	0·98
Feb., 1893	29·9	61	−8	4·78	8·31	1·93
Mar., 1893	40·2	79	7	2·83	6·52	1·39
Apr., 1893	52·4	85	25	8·46	16·60	4·16
May, 1893	60·0	94	31	4·46	9·60	1·45
June, 1893	71·9	101	40	3·45	7·15	0·20
July, 1893	77·9	100	45	1·83	4·77	0·03
Aug., 1893	72·3	97	39	1·02	4·25	0·16
Sept., 1893	68·2	98	30	3·31	7·62	1·53
Oct., 1893	54·4	86	17	3·53	9·00	1·57

Divisions.—For administrative purposes the State is divided into ninety-two counties, as follows:

COUNTIES AND COUNTY-TOWNS, WITH POPULATION.

COUNTIES.	* Ref.	Pop. 1890.	Pop. 1880.	COUNTY-TOWNS.	Pop. 1890.
Adams	4-G	15,385	20,181	Decatur	3,142
Allen	3-G	54,763	66,689	Fort Wayne	35,393
Bartholomew	8-E	22,777	23,867	Columbus	6,719
Benton	4-B	11,108	11,903	Fowler	1,285
Blackford	5-G	8,020	10,461	Hartford City	2,287
Boone	6-D	25,922	26,572	Lebanon	3,682
Brown	8-E	10,264	10,308	Nashville	395
Carroll	4-D	18,345	20,021	Delphi	1,923
Cass	4-E	27,611	31,152	Logansport	13,328
Clarke	10-F	28,610	30,259	Jeffersonville	10,666
Clay	8-C	25,854	30,536	Brazil	5,905
Clinton	5-D	23,472	27,370	Frankfort	5,919
Crawford	11-D	12,356	13,941	Leavenworth	592
Daviess	10-C	21,552	26,227	Washington	6,064
Dearborn	8-G	26,671	23,364	Lawrenceburg	4,284
Decatur	8-F	19,779	19,277	Greensburg	3,596
De Kalb	2-G	20,225	24,307	Auburn	2,415
Delaware	5-F	22,926	30,131	Muncie	11,345
Dubois	10-C	15,992	20,253	Jasper	1,281
Elkhart	2-E	33,454	39,201	Goshen	6,033
Fayette	7-G	11,394	12,630	Connersville	4,548
Floyd	11-F	24,590	29,458	New Albany	21,059
Fountain	6-B	20,228	19,558	Covington	1,891
Franklin	8-G	20,092	18,366	Brookville	2,028
Fulton	3-E	14,301	16,746	Rochester	2,467

* Reference for location of counties, see map of Indiana.

COUNTIES AND COUNTY-TOWNS, WITH POPULATION.

COUNTIES.	* Ref.	Pop. 1890.	Pop. 1880.	COUNTY-TOWNS.	Pop. 1890.
Gibson	11 B	22,742	24,920	Princeton	3,056
Grant	4 F	23,518	31,493	Marion	8,769
Greene	9 [illegible]	22,360	24,579	Bloomfield	1,220
Hamilton	6-E	24,801	26,123	Noblesville	3,054
Hancock	6 F	17,123	17,829	Greenfield	3,100
Harrison	11 E	21,326	20,786	Corydon	880
Hendricks	6 D	22,981	21,498	Danville	1,560
Henry	6 F	24,016	23,879	New Castle	2,697
Howard	5 E	19,584	26,186	Kokomo	8,261
Huntington	4 F	21,805	27,644	Huntington	7,328
Jackson	9-E	23,050	24,139	Brownstown	1,422
Jasper	3-C	9,464	11,185	Rensselaer	1,455
Jay	5 G	19,282	23,478	Portland	3,725
Jefferson	9-F	25,977	24,507	Madison	8,936
Jennings	9-F	16,453	14,608	Vernon	613
Johnson	7-E	19,537	19,561	Franklin	3,781
Knox	10 B	26,324	28,044	Vincennes	8,853
Kosciusko	2-E	26,494	28,645	Warsaw	3,574
La Grange	1-F	15,630	15,615	La Grange	1,784
Lake	2-B	15,091	23,886	Crown Point	1,907
La Porte	2-D	30,985	34,445	La Porte	7,126
Lawrence	9-D	18,543	19,792	Bedford	3,351
Madison	6-F	27,527	36,487	Anderson	10,741
Marion	6-E	102,782	141,156	Indianapolis	105,436
Marshall	2-E	23,414	23,818	Plymouth	2,723
Martin	9-C	13,475	13,973	Shoals	738
Miami	4-E	24,083	25,823	Peru	7,028
Monroe	8-D	15,875	17,673	Bloomington	4,018
Montgomery	6-C	27,316	28,025	Crawfordsville	6,089
Morgan	7-D	18,900	18,643	Martinsville	2,680
Newton	3-B	8,167	8,803	Kentland	918
Noble	2-F	22,956	23,359	Albion	1,229
Ohio	9-G	5,563	4,955	Rising Sun	1,689
Orange	10 D	14,363	14,678	Paoli	707
Owen	8-C	15,901	15,040	Spencer	1,868
Parke	7-B	19,460	20,296	Rockville	1,689
Perry	11-D	16,997	18,240	Cannelton	1,991
Pike	10-B	16,383	18,544	Petersburg	1,494
Porter	2-C	17,227	18,052	Valparaiso	5,090
Posey	11-A	20,857	21,529	Mount Vernon	4,705
Pulaski	3-D	9,851	11,233	Winamac	1,215
Putnam	7-C	22,501	22,335	Greencastle	4,390
Randolph	5-G	26,435	28,085	Winchester	3,014
Ripley	8-G	21,627	19,350	Versailles	421
Rush	7-F	19,238	19,034	Rushville	3,475
St. Joseph	2-E	33,178	42,457	South Bend	21,819
Scott	10-F	8,343	7,833	Scottsburg	618
Shelby	7 F	25,257	25,454	Shelbyville	5,451
Spencer	12-C	22,122	22,060	Rockport	2,314
Starke	2-D	5,105	7,339	Knox	790
Steuben	1-G	14,645	14,478	Angola	1,840
Sullivan	9-B	20,336	21,877	Sullivan	2,222
Switzerland	9-G	13,336	12,514	Vevay	1,663
Tippecanoe	5-C	35,966	35,078	La Fayette	16,243
Tipton	5-E	14,407	18,157	Tipton	2,697
Union	7-G	7,673	7,006	Liberty	1,314
Vanderburgh	11-B	42,193	57,809	Evansville	50,756
Vermilion	6-B	12,025	13,154	Newport	551
Vigo	7-B	45,658	50,195	Terre Haute	30,217
Wabash	4-F	25,241	27,126	Wabash	5,105
Warren	5-B	11,497	10,955	Williamsport	1,027
Warrick	11 B	20,162	21,161	Booneville	1,881
Washington	10-E	18,955	18,619	Salem	1,975
Wayne	6-G	38,613	37,628	Richmond	16,608
Wells	4-G	18,142	21,514	Bluffton	3,589
White	4-C	13,795	15,671	Monticello	1,518
Whitley	3-F	16,941	17,768	Columbia City	3,027
Totals		1,978,301	2,192,404		

* Reference for location of counties, see map of Indiana.

Principal Cities and Towns, with Population for 1890.—Indianapolis (capital), 105,436; Evansville, 50,756; Fort Wayne, 35,393; Terre Haute, 30,217; South Bend, 21,819; New Albany, 21,059; Richmond, 16,608; Lafayette, 16,243; Logansport, 13,328; Elkhart, 11,360; Muncie, 11,345; Michigan City, 10,776; Anderson, 10,741; and Jeffersonville, 10,666.

Population and Races.—In 1860, 1,350,428; 1870, 1,680,637; 1880, 1,978,301; 1890, 2,192,404 (native, 2,046,199; foreign, 146,205; males, 1,118,347; females, 1,074,057; white, 2,146,736; colored, 45,215; Chinese, 92; Japanese, 18; civilized Indians, 343).

Industries and Business Interests.—Coal, natural gas, and building-stone represent the largest business factors of the State next to its agricultural interests. The internal revenue collections in the fiscal year ending June 30, 1893, were, distilled spirits, $5,578,782; tobacco, $231,767; fermented liquors, $609,770; oleomargarine, $33,859; penalties, $5,470; total, $6,459,660. The nine leading industries are those engaged in iron, railway-car building, wood, woolens, quarries, encaustic tiles, wagons and carriages, glass, and coal-mining. These in 1892 had an investment in buildings, grounds, and machinery of $13,810,950, and an output of $44,473,312. It is supposed that the statements of money invested in industries represent about half the actual amount, as numerous establishments have never reported. The following table shows the investment and output in each case in 1892 from such establishments as supplied reports to the State statistician:

INDUSTRIES.	Investment.	Cost of material.	Value of product.
Iron	$5,543,573	$9,568,211	$19,265,997
Wood	2,320,245	4,824,096	8,531,743
Railroad-car works	1,251,000	5,484,544	6,750,000
Carriage and wagon factories	1,414,066	2,760,850	4,174,363
Woolen manufactories	814,841	1,115,009	1,903,659
Stone quarries	1,810,225	[illegible]	1,342,275
Encaustic tile works	105,000	80,000	250,000
Coal mines	1,408,831	[illegible]	[illegible]
Glass*	552,000	692,200	2,215,275

* This does not include the great De Pauw works at New Albany, one of the largest in the country, concerning which no statement can be obtained.

Finance.—In 1892 the State debt was $8,830,615; the assessed valuation of taxable property $1,249,807,899; and the tax-rate $1.80 per $1,000.

Banking.—In 1892 there were 109 national banks, with combined capital of $13,722,660, surplus and profits of $6,820,884, and individual deposits of $38,362,861; 85 State banks, with capital of $4,221,625, surplus and profits of $662,659, and deposits of $9,742,789; and 5 savings-banks, with total depositors 16,127, surplus of $364,336, and deposits of $4,073,131.

Post-offices and Periodicals.—On Jan. 1, 1894, there were 2,177 post-offices in the State, of which 6 were first-class, 28 second-class, 91 third-class, 125 presidential, 2,052 fourth-class, 640 money-order offices, 1 money-order station, and 29 postal-note offices. There were 109 daily, 4 semi-weekly, 522 weekly, 3 bi-weekly, 7 semi-monthly, 98 monthly, 2 bi-monthly, and 4 quarterly periodicals: total, 749.

Libraries.—In 1892 there were 105 libraries of 1,000 volumes and over, which had 541,826 volumes and 47,370 unbound pamphlets. They were classified as follows: General, 34; school, 25; college, 18; college society, 7; law, 4; theological, 2; medical, 3; public institution, 3; Y. M. C. A., 2; scientific, 3; historical, 1; special, 1; and society, 2.

Means of Communication.—Aside from the boat traffic of the Ohio river and that of Michigan City, the only lake-port, and the ordinary wagon roads, intercommunication is conducted entirely by railways. Formerly two canals (the Wabash and Erie, from Evansville to Toledo, 379 miles of which were in Indiana, and the White Water from Lawrenceburg to Hagerstown, a distance of 75 miles) did a large traffic, but they are now entirely abandoned, and in many places filled up. In 1892 the railways operating in Indiana had a total main track mileage of 6,030 miles, of which 900 miles were of railways having their terminals within the State, and 5,130 miles belonged to interstate railways.

Churches.—The census of 1890 gave the following statistics of the principal religious bodies:

DENOMINATIONS	Organizations.	Churches and halls	Members.	Value of church property.
Methodist Episcopal	1,618	1,610	162,989	$4,243,180
Roman Catholic	311	319	119,100	3,534,691
Disciples of Christ	733	729	78,942	1,329,370
Baptist	552	554	54,080	1,313,422
United Brethren	569	538	35,824	551,636
Presb. in the U. S. of America	308	326	35,464	2,338,900
Friends, Orthodox	188	189	25,915	325,577
Lutheran Synodical Conference	102	96	24,666	632,260
Christians	214	204	19,832	230,925
Ger. Evang. Synod of N. A.	75	75	15,274	385,000
Dunkards, Conservative	107	143	10,224	179,870
Baptist, Primitive	153	153	7,303	131,350
Methodist Protestant	132	131	7,033	142,875

Schools.—The State provides a complete system of education, from the common school to the university. In 1891 the principal of the common-school fund was $9,856,585; the enrollment of children in the public schools was 521,841; the number of children of school age in the State was 763,247; and the number of enrolled pupils in average daily attendance was 369,060. There were 9,801 public-school buildings. The whole number of teachers was 13,441. The various appropriations for the support of the public schools in the year aggregated $5,636,199. The whole system of secondary and primary education is under the general supervision of the State board of education, an *ex officio* board, composed of the Governor, the superintendent of public instruction, the presidents of the three highest State institutions, and the school superintendents of the three cities having the highest

public school enumeration. The State also maintains a university in Bloomington, a normal school in Terre Haute, and a college of agriculture and the mechanic arts in Lafayette. In 1890 there were in the State 109 high schools; 15 endowed academies, seminary, and private secondary schools; 14 universities and colleges of liberal arts; 3 public and 5 private normal schools; 3 schools of law, 3 of medicine, 2 of theology, and 1 of pharmacy; and 11 commercial and business colleges.

Charitable, Reformatory, and Penal Institutions.—The provision which Indiana has made for the care and control of dependent, defective, and delinquent citizens, includes hospitals for the insane in Indianapolis, Evansville, Richmond, and Logansport; school for feeble-minded youth (including departments for idiotic and epileptic youth) in Fort Wayne; school for the deaf in Indianapolis; school for the blind in Indianapolis; home for the orphans of soldiers and sailors of the civil war in Knightstown; reform school for boys in Plainfield; reform school for girls in Indianapolis; prison for women in Indianapolis; prison for men in Michigan City; and a prison for men in Jeffersonville. Each of these institutions is in charge of a board of control of three members, appointed by the Governor, and each of the schools has an industrial department. In 1889 the General Assembly created a board of State charities, with power of supervision, inspection, and investigation of all the State charitable and correctional institutions. Of this board the Governor of the State is *ex officio* president, and there are in addition six members appointed by the Governor, three from each of the two leading political parties. The terms of appointment are three years. The institutions above mentioned are supported by a tax of six cents on each $100 worth of taxable property in the State. The net expenditure for maintenance and construction of the State's charitable and correctional institutions in 1893 was $963,457.15.

History.—Indiana originally formed a part of the French possessions, and in 1702 a number of immigrants settled at Vincennes and other trading-points. These settlers lived upon excellent terms with the Indians, and in 1763 the territory was ceded to the English. By the treaty of 1783 the whole Northwest Territory was transferred to the U. S. In 1788 an Indian war scourged the Vincennes colonists, but the natives were finally defeated in 1791 by Gen. Wilkinson at the mouth of the Tippecanoe. In 1795 there was another period of colonization, and in 1800 Ohio was cut off on the E., and all the country W. and N. became the Territory of Indiana. In 1805 Michigan Territory was set off, and in 1809 Illinois Territory, leaving Indiana Territory with its present boundaries. In 1811 occurred the fierce war with Tecumseh, incited by his famous prophet-brother, which was brought to a close by the successful battle of Tippecanoe, under command of William Henry Harrison, the first territorial governor. On Dec. 11, 1816, Indiana was admitted to the Union, and entering upon extensive internal improvements, rapid immigration was stimulated. An era of wild speculation began, and in 1837 there was general bankruptcy and an enormous State debt ($14,057,000). In 1846 prosperity began to return, and population rapidly increased. In 1851 a new constitution was adopted, and between 1850 and 1860 the great canal from Lake Erie to the Ohio was completed, railroad facilities were much increased (the first one having been built in 1847), and other public works were entered upon. In 1857 there occurred another financial panic, but less disastrous than that of 1837. The record of Indiana in the civil war was noteworthy, the State government not merely providing its quota in the field, but meeting and suppressing a dangerous conspiracy at home. Since the civil war the development of all the industries has been very rapid, and in 1885 a great stimulus was given to the eastern part of the State by the discovery and development of the natural-gas field. One of the most interesting bits of local history is that of the famous community at New Harmony, settled by the Harmonists or Rappists in 1815, and maintained until 1825, which was distinguished also as the home of such men as William Maclure, Thomas Say, Lesueur, the Owen brothers, and other noted people. Candidates for the offices of governor and lieutenant-governor must be at least thirty years old and citizens of the U. S. and residents of the State for five years. The term of each office is four years. The legislative authority is vested in a General Assembly consisting (1894) of a senate of fifty members, elected for four years, and a house of one hundred representatives, elected for two years. The Legislature meets biennially, and sessions are limited to sixty days.

GOVERNORS OF INDIANA.

Territorial.	
William H. Harrison	1800–11
John Gibson (acting)	1811–13
Thomas Posey	1813–16
State.	
Jonathan Jennings	1816–22
William Hendricks	1822–25
James B. Ray	1825–31
Noah Noble	1831–37
David Wallace	1837–40
Samuel Bigger	1840–43
James Whitcomb	1843–48
Paris C. Dunning	1848–49
Joseph A. Wright	1849–57
Ashbel P. Willard	1857–61
Oliver P. Morton	1861–67
Conrad Baker	1867–73
Thomas A. Hendricks	1873–77
James D. Williams	1877–81
Albert G. Porter	1881–85
Isaac P. Gray	1885–89
Alvin P. Hovey	1889–93
Claude Matthews	1893–97
James A. Mount	1897–

AUTHORITIES.—Important and available works upon Indiana are comparatively few. Dillon's *History of Indiana* is valuable for territorial and early history; Dunn's *Indiana* deals with the period of admission; the series of *Geological Reports* deal with the resources of the State; Boone's *History of Education in Indiana* and Woodburn's *Higher Education in Indiana* deal with the development of the State in educational matters. JOHN M. COULTER.

Indiana: borough; capital of Indiana co., Pa. (for location of county, see map of Pennsylvania, ref. 5–C); on the Penn. Railroad; 72 miles N. E. of Pittsburg. It is in an agricultural region; contains foundries, glass-works, planing-mills, tanneries, machine-shop, and agricultural-implement works; has a large trade in lumber and farm products; is the seat of a State normal school, and has six weekly newspapers. Pop. (1880) 1,907; (1890) 1,963; with borough of West Indiana, 3,717; (1893) both boroughs, estimated, 4,500. EDITOR OF "DEMOCRAT."

Indianap'olis: city (settled 1819, laid out 1821, occupied as the State capital 1825, incorporated 1836, chartered as a city 1847); capital of the State of Indiana and of Marion County (for location, see map of Indiana, ref. 6–E); on the White river, and on the Cin., Ham. and Day., the Cl., Cin., Chi. and St. L., the Ind. and Vincennes, the Ind., Dec. and W., the Lake Erie and W., the Louisv., New Alb. and Chi., the Pitts., Cin., Chi. and St. L., and the Vandalia Line railways; near the geographical center of the State; 110 miles N. by W. of Louisville, Ky., 115 miles N. W. of Cincinnati, O., 194 S. E. of Chicago, Ill., and 240 miles E. by N. of St. Louis, Mo. It is in a region unsurpassed in agricultural and mineral resources; is near the center of a great corn belt, and on the edge of the natural-gas belt discovered in 1885, and is within a few hours' travel by railway of immense forests of timber, coal-fields covering nearly 7,000 sq. miles, and highly productive mines of iron ore. Converging here are trunk lines of railways which, with their branches, extend to every city and town of importance in the country. The city has thus an immense domestic trade, and being also a port of entry it receives direct a large quantity of goods on foreign account. In the calendar year 1893 the direct imports of merchandise aggregated in value $453,260. A belt railway 15½ miles long extends around the city, connects all the trunk lines, and greatly facilitates the movement of freight. The streets of the city are from 60 to 100 feet wide, and cross each other at right angles, excepting four broad diagonal avenues which converge toward a circular park in the center. The Central Canal, cutting a bend of White river, furnishes partial water-power for various manufactories.

The census returns of 1890 showed that 1,056 manufacturing establishments (representing 120 industries) reported. These had a combined capital of $14,510,379, employed 15,967 persons, paid $7,793,899 for wages, $18,316,095 for materials, and $2,010,514 for miscellaneous expenses, and had products valued at $32,023,851. The principal industries according to amount of capital invested were the manufacture of foundry and machine-shop products, which had 31 establishments, $1,961,685 capital, and $2,102,803 in value of products; furniture, 26 establishments, $1,574,012 capital, and $2,252,661 in products; slaughtering and meat-packing, 7 establishments, $967,040 capital, and $5,989,905 products; carriages and wagons, 23 establishments, $669,191 capital, and $1,266,826 products; flour and grist mill products, 11 establishments, $505,663 capital, and $2,970,804 products; and planing-mill products, 10 establishments, $468,955 capital, and $527,400 products. The city contains 6 grain elevators, 8 flour-mills, and 3 pork-packing establishments; the annual receipts of grain are about 6,000,000 bush., prod-

ucts of flour 600,000 barrels, and number of hogs packed 750,000. The annual wholesale trade exceeds $40,000,000. The stock-yards cover more than 100 acres of ground, and receive annually more than 1,000,000 cattle, hogs, and horses. The various business interests of the city are represented in the board of trade, which holds daily meetings, the Commercial Club, which comprises more than 1,000 business men, and has one of the largest and costliest office-buildings in the West, and the clearing-house, which does an annual business of $214,265,101.

State Capitol, Indianapolis, Ind.

Among the notable buildings are the State Capitol, completed in 1888 at a cost of about $2,000,000, which is 492 feet long by 185 feet wide, built of oölitic limestone quarried in the State, with two wings, a dome 234 feet high, and Corinthian columns above the basement; Marion County court-house, cost more than $1,600,000, built of dressed stone and iron, 275 feet long by 130 feet wide, with central tower 200 feet high; union station, of brick, dressed stone, and iron, 900 by 300 feet, with train-sheds 750 feet long by 150 feet wide, cost $500,000; U. S. court-house and post-office, stone and iron, cost $200,000 (a bill has been introduced in Congress providing for a new Federal building to cost $1,500,000); board of trade building, cost $75,000; new public library, completed in 1893; Masonic Temple, Odd Fellows' Hall; the group of four U. S. arsenal buildings in an inclosure of 76 acres; the buildings in the new State fair-grounds a mile N. of the city; and the State institutions for the deaf, the dumb, the blind, and the insane (cost $1,200,000), and the women's prison and reformatory. The city has a system of water-works which cost $1,000,000. Circle Park contains a statue of Gov. Morton and a soldiers' and sailors' monument, 285 feet high, shaft of Indiana limestone, with four bronze figures, cost $300,000.

In 1892 there were 126 churches, of which 29 were Methodist Episcopal, 20 Baptist, 16 Presbyterian, 10 Christian, 8 Protestant Episcopal, 7 Roman Catholic, 5 German, 5 Lutheran, 5 Congregational, 2 Hebrew, and 19 miscellaneous. The public-school system was sustained by local and State taxation and by its share of the State school fund. The system comprised 2 high schools, training-school, and 37 primary and grammar schools; value of all public-school property, $1,561,411. There were also 4 medical colleges, law school, dental college, Roman Catholic theological seminary, 5 German, and 32 select and private schools, 14 classical schools, several commercial colleges, and numerous kindergartens. There were 14 libraries, of which one—the Public Library—had 44,000 volumes and 6,000 pamphlets. In 1893 there were 76 periodicals, of which 6 were daily, 30 weekly, 2 semi-monthly, 37 monthly, and 1 quarterly; and 5 national banks, with aggregate capital of $1,400,000, 2 State banks, with aggregate capital of $400,000, and one private bank. The assessed valuations were, in 1892, real $69,208,900, personal $25,087,095, railway $4,828,700, total $99,124,695; tax rate $15.70 per $1,000. The total bonded debt reported in Sept., 1893, was $1,884,500, and net debt $1,384,500. Pop. (1880) 75,056; (1890) 105,436.

EDITOR OF "NEWS."

Indian Archipelago: same as EASTERN ARCHIPELAGO (*q. v.*).

Indian Bean: in the U. S. a name given to *Catalpa bignonioides*. See CATALPA.

Indian Corn: See MAIZE.

Indian Council: another name for the COUNCIL OF THE INDIES (*q. v.*).

Indian Dye: See PUCCOON.

Indian Hemp: See CANNABIS and HASHISH.

Indian Languages of America: See INDIANS OF NORTH AMERICA, INDIANS OF CENTRAL AMERICA, and INDIANS OF SOUTH AMERICA.

Indian Madder: See CHAY-ROOT.

Indian Millet: See DURRA.

Indian Ocean: the name of the vast sheet of water between Africa, Asia, and Australia. It has no definite southern limit. Generally, however, the parallel (about 38° S.) which stretches from the southernmost point of the African continent to the southernmost point of the Australian continent, passing over the islands of St. Paul and Amsterdam, is considered its southern boundary-line, its bed showing a considerable rise along the line. It is traversed by the equatorial current, flowing from E. to W. with a somewhat varying velocity, and forming a very rapid current along the eastern coast of Africa. In shape it somewhat resembles the continent of Asia, forming in the southern hemisphere an expanse of water corresponding to the expanses of land in the northern. See OCEAN.

Indiano'la: city; capital of Warren co., Ia. (for location of county, see map of Iowa, ref. 6–G); on the Chi., Burl. and Q. and the Chi., Rock Is. and Pac. Railways; 20 miles S. of Des Moines. It is in an agricultural and stock-raising region, has valuable timber, building-stone, and coal near by, manufactures agricultural implements, and has a public library and a monthly and three weekly periodicals. It is the seat of Simpson College (Methodist Episcopal, founded 1867), which in 1890 had 7 professors and instructors, 217 students, $80,000 invested in grounds and buildings, and $30,000 in productive funds. Pop. (1880) 2,146; (1890) 2,254; (1895) State census, 2,825.

EDITOR OF "ADVOCATE-TRIBUNE."

Indianola, Texas: See PORT LAVACA.

Indian River: a narrow tidal channel in Brevard and Volusia Counties, Fla., parallel with the coast and for most of its length only half a mile from it. It extends S. S. E. from a point some 18 miles N. W. of Cape Cañaveral to Indian River Inlet, 100 miles distant, and is continuous southward 50 miles to Jupiter Inlet as St. Lucie's Sound. It is in a beautiful and healthful region, and the river abounds in fish. It is navigable, and the inlet will admit vessels of 5 feet draught. The river is a resort for invalids and sportsmen.

Indians: a name originally applied by Columbus and other early navigators to the aborigines of the West Indies and South America, those regions being mistaken for parts of Asia. After 1600 the name was extended in popular usage to include the aborigines of North America.

Racial Traits.—The American Indians properly constitute the American race. Their physical traits are, in fact, quite different from those of the peoples of Asia, and are such as to place them in a group as separately defined as the Negroes of Africa or the whites of Europe. Indeed, it may correctly be said that no other race shows equally permanent and individual traits; because there is none which shows such little variation over such a wide area, exposed as it is to the extremes of tropical and arctic environment. So true is this that the physical type of the Yahgans of Tierra del Fuego is stated by Darwin to be identical with that of the Botocudos of the forests of Brazil; while, according to a more recent observer, Dr. Popper, the southern Patagonians present the same marked and peculiar traits as the Algonkins and Iroquois of Canada. Such instances could be indefinitely multiplied.

Craniology.—Proceeding to examine in detail the charac-

teristics which make up the physical type of the race, those pertaining to the bones deserve first attention. Early in the history of craniology—that is, about 1840—it was strenuously maintained by Dr. Samuel George Morton that the American Indian throughout the continent presents a peculiar type of skull, easily recognizable, one of the prominent features of which is the flattened occiput. His great work, *Crania Americana*, was written to prove this view; and his large collection of over 600 skulls was supposed to be visible evidence of its correctness. Singular to say, taking this same collection as his material for study, Dr. James Aitkin Meigs effectually disproved Dr. Morton's opinion, and showed conclusively that there is no one type of skull which belongs to the American race. Like the Aryan stock in Europe, and unlike the African race, its cranial characteristic is variability. What are called dolichocephalic and brachycephalic crania (long and broad skulls) are found over the continent in almost equal numbers, and often within the lines of a narrowly circumscribed ethnic area. All attempts to classify tribes by their cranial index—that is, by the relative length or breadth of their skulls—have led to ludicrous contradictions with other traits of nationality.

Facial Bones.—Probably the traits of the face have much greater stability than those of the skull. Their value as ethnic criteria has risen greatly in the opinion of physical anthropologists. In the American race two characteristics are especially noticeable, the width of the facial line below the eyes and the general narrowness of the nasal index, the latter giving the thin and prominent nose seen in so many tribes. In fact, the nasal index of the Algonkins and Iroquois differs scarcely at all from that of the average Parisian of to-day. This is an important fact, as no other physical trait is more closely allied to a comparatively high mental endowment. The malar or cheek bones are usually prominent, the chin well defined and symmetrical, the jaws of medium projection (mesognathic), the orbits of the eyes horizontal and of medium index (mesoseme), and the dental apparatus well developed, and without the extreme prominence of the posterior molar, which is seen in the Australian and some other low types of man.

The Skeleton.—The characteristics of the skeleton assign the American race a position above the African and lower than the white. The obliquity of the pelvis, the disproportionate length of the humerus, and the elongation of the heel-bone, all so frequent in the African, are rare in the American Indian; but the latter not unfrequently possesses a "perforated humerus," and presents a peculiar flattening of the tibia (platycnemism), which indicates incomplete development. Another evidence of the same condition is the presence of what is called the Inca bone, located principally in the occipital suture. Throughout the continent this occurs in about 4 per cent. of the skulls, and in some tribes as often as in 6 or 7 per cent.; while among Europeans it is present in little over 1 per cent.

Brain Capacity.—The cubical contents of the skull indicate the cerebral or brain capacity of the race. In this respect the skull of the American Indian falls below that of the European, and rises above that of the African. Nevertheless there are various examples of Indian skulls from pure-blooded members of the race which show as high cubical contents as the highest on European records.

Color.—The color of the American race is a more or less light brown with a marked undertone of red, caused by a dermic deposit which is ferruginous rather than carbonaceous, as it is in the African. This peculiar tint has been called a cinnamon color, or a burnt-coffee color, or coppery. It is visible in every tribe on the continent, though the depth of the shade on the anthropometric color-scale varies considerably. Singularly enough, this variation appears to have no reference either to climate, or altitude, or other external condition. The Kolosch of the northwest coast of North America are so light in complexion that a blush can be seen on their faces; but they are darker than the Yurucares of Bolivia, residents of a tropical climate, or the Jivaros, who dwell almost under the equator.

Hair.—The hair of the Indian is usually said to be black, but this is only superficially so. When it is examined under the microscope it is seen to be quite dark, with a well-defined undertone of red. In some tribes, as those of the Gran Chaco in the Argentine Republic, this reddish tinge is seen on adults, and in all it is usually recognizable in the hair of young children. Nor is the hair always straight and coarse, as is frequently stated. Instances are not wanting, as the Guarauanos of the mouth of the Orinoco, where it is fine and silky; and elsewhere as among a number of the South American tribes, it is slightly wavy or curly. Its shape in cross-section has a tendency to the circular form, and in the instance of the Aymaras of Peru becomes the nearest to a perfect circle of any yet examined from all races. The hair of the American Indian is thick and strong on the head, and scanty on the body and on the face; but some tribes grow long straight beards covering both chin and cheeks, as the Cashibos and Guarayos of Bolivia, the Mixes of Mexico, and the "bearded Indians" of the Yukon district, British America. The custom of extirpating the hairs on the face, so common with many tribes, gives a deceptive appearance of positive beardlessness. The growth on the head is characteristically vigorous. An Indian very rarely becomes bald, and the hair turns gray late in life.

Eyes.—The eye in color is usually a dark brown, rarely a full black. There are instances, somewhat frequent in South American tribes, where the hue approaches a gray or a dark blue. In size, compared with the features, the eyes incline to be medium or small, and are somewhat sunken. In various tribes scattered over both continents instances of obliquity are found, resembling what are called Mongolian eyes. This slight deformity occurs more or less in all races, and has very little, if any, ethnic value. In certain families among Europeans it is hereditary, and it is far from universal among the Mongolians.

Stature.—In reference to stature there is probably less diversity found among the American Indians than in other races. The early stories about the gigantic height of the Patagonians have proved to be tales of travelers. In fact, there are not many of them over 6 feet high. The Iroquois of New York State and Canada average in height somewhat above the descendants of Europeans who are settled around them, but not sufficiently so to be remarkable. On the other hand, there are no instances of dwarfish size to compare with the Laplanders, the Bushmen of South Africa, or the negritos of the Andaman islands. Among the shortest tribes may be mentioned the Otomis of Mexico, the Warraus of Guiana, and the Yahgans of Tierra del Fuego. All these, however, average above 5 feet.

Muscular Development.—Most of the tribes show astonishing strength and endurance in those portions of the muscular system which their mode of life has led them especially to use. This is generally the lower rather than the upper extremities. In running and walking, the Indian of early days surpassed all the white invaders of his soil; but in tests of strength of the upper extremities, the arms and hands, he was easily overmatched. It is a common error with artists to represent the red man with brawny bare arms and prominent pectoral muscles. In fact, his brachial muscles are usually feebly developed, and now that on the plains his mode of locomotion is on horseback, he has lost also his superiority as a pedestrian.

Viability.—The vital force or viability of a race is measured by its power to resist disease, and by the length of life of its members. In the former respect the American Indian has a sad record. Even before the coming of the whites, periodical pestilences fearfully reduced the number of the population; and since the discovery the epidemic diseases introduced, smallpox, measles, influenza, and others, have proved fatal scourges, sometimes sweeping away whole tribes. The Spanish-Americans have a saying that when an Indian falls sick, he dies; and the expression is scarcely too strong for the facts. Consumption, scrofula, and the constitutional forms of specific diseases are rife on the reservations, and the natives seem little able to resist their onset. As to length of life, instances are not infrequent where centenarians have been mentioned. In most such the data are wanting for ascertaining the exact age; but in the Roman Catholic missions of California there seems to be adequate proof of the presence of an unusual number of very aged people. It is probable that under favoring circumstances the longevity of the Indian equals that of the other races.

AUTHORITIES.—Reports of the Peabody Museum (Boston, serial); *The American Anthropologist* (Washington, serial); Meigs, *Cranial Forms of the American Aborigines* (Philadelphia, 1859); Brinton, *The American Race* (Philadelphia, 1891).

D. G. BRINTON.

Indians of Central America: the aborigines of Central America, an area which extends from the Isthmus of Tehuantepec to the Isthmus of Panama. For this reason it is sometimes called the "interisthmian" portion of America. When discovered it was populated by a number of separate

tribes differing widely in language, culture, and appearance. Most of them retain these characteristics.

The Maya Group.—Much the most important of these groups was that known as the Maya stock. Its members spoke a common language divided into about eighteen different dialects, as nearly allied in character as the Romance tongues of Southern Europe. It is estimated that there are nearly 500,000 persons of more or less pure blood who continue to speak some of these dialects. The most prominent tribe of the stock were the Mayas proper. They occupied the whole area of the Peninsula of Yucatan and the middle and lower valley of the Usumacinta river. Allied to them were the tribes of Guatemala known as Quiches, Cakchiquels, Mams, Chols, Ixils, Kakchis, etc., the two first mentioned being the most numerous. W. of them, in the Mexican states of Chiapas and Tabasco, were the related Tzendals, Chols, and Tzotzils, occupying the Gulf shore and extending inland nearly, but not quite, to the Pacific coast. The only branch of this linguistic stock living without the area here under consideration were the Huastecas, who were found on the shore of the Gulf of Mexico N. of Vera Cruz, in the valley of the river Panuco.

The Chiapanec Group.—Next in importance to the Mayas were the Chiapanecs. One of their strongholds was in the state of Chiapas, which derives its name from their patronymic. A populous branch, estimated by the Spanish explorers at about 40,000 persons, lived on and near Lake Managua in Nicaragua, where they were known as the Mangues. A small band had at one time wandered northward, and formed part of the Mazatecs in the state of Oaxaca.

Other Tribes.—Besides these there were a number of small independent linguistic stocks, whose names and locations when first discovered were as follows: The Zoques and Mixes, possibly related, dwelt in the mountains of Tehuantepec; the Subtiabas were inhabitants of the valley of that name near the modern city of Leon, in Nicaragua; the Lencas were represented by several small tribes in Central Honduras; the Xincas dwelt near the Pacific, in Guatemala, on the Rio de los Esclavos; the Xicaques were on the river Chaloma, in Honduras; the Ulvas in the mountains, and the Mosquitos on the eastern coast of the same state. The Gustusos, or Huatusos, dwelt along the Rio Frio and its branches in Eastern Nicaragua; while in Costa Rica were found the Talamancas, Guaymis, Dorasques, and Chiriqui tribes.

Arts.—The Mayas excelled all other native tribes of the continent in architecture. The remains which still attest this have been described in the article on CENTRAL AMERICAN ANTIQUITIES (*q. v.*). They also were ahead of all others in the art of writing, and this applies to the Guatemalan as well as to the Yucatecan tribes. They made frequent use of tablets, they wrote many books, and covered the walls of their temples with characters inscribed on wood or stone, or painted upon the stuccoed surface. The hieroglyphic alphabet which they used has been appropriately called calculiform, or pebble-shaped, as the signs, probably in part phonetic, are inclosed in an irregular oval, like the cross-section of a pebble. Some five or six native books written in them have been preserved.

These codices, as they are called, were written on a paper manufactured from the leaves of the maguey, paper-making being an art which the Mayas carried to as great perfection as did the Mexicans. They also well understood the cultivation, spinning, dyeing, and weaving of cotton, and their fabrics of it were of such delicacy that the Spaniards at first thought they were of silk. Their work in feathers was similar to that done in Mexico, and not less skillful. Peculiar to themselves was the domestication of bees for their honey and wax, though the latter was not used for purposes of illuminating. The use of metals was confined to ornament, for which purpose gold, silver, and copper were employed, but not in large quantities. Bronze chisels, such as are often found in Mexico, are extremely rare in Yucatan, and it was the known poverty of the Mayas in gold and silver that postponed their conquest for more than a score of years after the fall of the "empire of the Montezumas." Flat pieces of copper were in use as a currency, and cacao beans, shells, and certain precious stones were employed for the same purpose. Trade was active, all the large cities holding fairs at stated times, to which merchants resorted from a distance of many hundred miles by sea and land. The Mayas even maintained a commercial interchange of products with the island of Cuba, and it was there that Columbus first heard of Yucatan and saw some of the wax brought thence. For these voyages they constructed large, well-shaped canoes.

Agriculture.—These Maya tribes did not depend on hunting and fishing for food, but were agricultural. Indian corn or maize, a native plant of that locality, derived from the indigenous *Euchlæna luxurians*, was the principal food-crop. Beans and peppers were also cultivated, and cacao plantations were highly prized. The arable land was chiefly in the possession of the villages, and was let out to individual cultivators under careful regulations. The Chapanecs and Mangues, and a small colony of Aztecs who lived on the shore of Lake Nicaragua, approached the Maya tribes in the development of their arts, but did not equal them. Most of the lesser stocks mentioned above were much ruder, depending chiefly on wild products for a subsistence. An exception may be made for some undetermined people who lived on the Chiriqui lagoon, and who had developed a singular skill in the art of pottery-making and in the working of gold. Their relics are found in the burial-mounds abundant in that region. Their pottery resembles that of the Northern South American tribes, and from similarities of language it is probable that their arts were derived rather from that direction than from the Mayas or Chiapanecs.

Institutions.—The plan of governments of these tribes was not well understood by the early writers, and as it was promptly destroyed its details are not clear. Among the Mayas there was a hereditary chieftaincy in certain families passing from one to the other in the female line, but always retained in a given limit. The totemic system is visible in certain traits, but had evidently in part undergone transformation toward a patrician class. The land, as above stated, was largely held in common by the clan or village, and portioned out to individuals according to their needs. Slavery was customary. The affairs of state were managed by a council, and the duplicate system of chiefhood, one ruler for war and another for peace, is clearly seen in certain incidents. At the time of the conquest the Spaniards found the Peninsula of Yucatan split up into eighteen independent petty states, each governed by its *batab*, or hereditary chieftain, under whom each village of a province was governed by its *halach*, or headman, often a relative of the *batab*. There were clear memories, however, of a period about a hundred years before, when these states had been united in a powerful federation, with a central government situated in the once famous city of Mayapan, whose ruins still attest its former extent and magnificence. Of the social organization of the other tribes mentioned, still fewer particulars have been recorded. Among those still existing in an uncivilized condition in the republic of Honduras the totemic system, with descent in the female line, extensively prevails.

Languages.—The Maya language is still spoken in its purity by 250,000 people, and as the speech of those who were once the most cultivated people on the American continent, it merits special attention. Compared with many or most American native languages, it is simple in construction, though rather guttural and harsh in pronunciation. Most of its roots are monosyllables, and the order of its arrangement of words is very similar to the English. It has few or no long compound words such as abound in the Nahuatl, the Algonkin, and the Iroquois, and as its verbs are nearly all regular, syncopated forms being not more frequent than in English and the construction of the sentence simple, it offers few of the difficulties presented by most Indian languages. Neither nouns nor adjectives undergo any change for gender, number, or case. The conjugations of the verb are regular, and are four in number. There are but three tenses, the present, the aorist, and the future. There is no dual and no "inclusive plural." The passive and neuter voices of all verbs are formed by the termination *l*, and belong to the first conjugation. The particles, however, are numerous, and the proper employment of them to convey delicate shades of meaning can only be learned by long practice. Of the other languages of this area the most carefully studied has been the Chiapanec, of which a clear analysis by L. Adam has been published (Vienna).

Religions.—Only vague and fragmentary accounts have come down of the native religions of most of these tribes. It was the policy of the early missionaries to root out as soon as possible every recollection of the ancient mythology and idol-worship. There are, however, some remarkably interesting remains of the myths and cults of the Maya family. The *Popol Vuh*, or sacred book of the Quiches is

a large body of their mythical legends written in the native tongue by a member of the tribe in the sixteenth century. Of similar purport is the account of the Cakchiquels by Xahila, composed about 1550. The *Chilan Balam*, or prophetic record, of the Mayas contains many hints of their religious life, while the descriptions of the early Spaniards enable us to fill in much of the picture. From these sources it is evident that this group possessed in common a complex and extensive body of mythology, an elaborate ritual, and a priestly class of conspicuous power and intelligence. Probably most of the architectural remains preserved are those of sacred edifices and the statues of men and animals represented deities. The ceremonies were imposing and were shared by thousands of devotees. Pilgrimages to special shrines were made from all parts of the peninsula. Human sacrifices were far less frequent than in Mexico, and were not an essential part of the cult. Astrological forecasts and the decision as to lucky and unlucky days were among the most important functions of the priesthood. To aid them in this they had studied with great accuracy the motions of the heavenly bodies, and had ascertained the length of the year of 365 days. The chief divinity in Yucatan was Itzamna, or Kukulkan, who sometimes appears as a light or solar god, at others as the culture-hero and first ruler of their nation. His analogue among the Tzendals was Votan, among the Quiches Xbalanque. The myths relating to all these place them in the same category as the Quetzalcoatl of the Nahuas, the Michabo of the Algonquins, and similar creations of the religious fancy found among various tribes of the American continent.

Authorities.—Brinton, *The American Race* (Philadelphia, 1891); *id.*, *American Hero Myths* (Philadelphia, 1882); Stoll, *Ethnographie der Republik Guatemala* (Zurich, 1884).

D. G. Brinton.

Indians of North America: the tribes of aboriginal peoples of North America. The term Indians was first applied to those discovered along the coast when North America was discovered by Europeans, and as explorations continued and other tribes were found scattered all over the land, the same term was used as a general designation for them all. Though the tribes were numerous, no one tribe was very large, the average size being from 200 to 500 persons. Sometimes several cognate tribes lived near together, and were organized into confederacies, but between the homes of tribes or confederated tribes were great spaces of unoccupied territory. All of these tribes were practically sedentary, living in villages, from which they wandered at certain seasons of the year for various purposes, as to visit favorite hunting-grounds and fisheries and to gather the fruits of the forest and prairie.

The tribes constituting a confederacy and grouped in adjacent villages usually spoke a common language. In rare cases two or more confederacies spoke the same language. In many cases the difference in language was slight, amounting merely to dialectal variation; in many others it was so great that the people of different tribes could not understand one another; while in still other cases such profound dissimilarities were found as to prove the languages to belong to radically distinct stocks. Between Central America and the Arctic Ocean more than 100 stocks of languages were spoken. In some of these stocks from ten to forty distinct languages were found; so that there were in all many hundreds of well-differentiated languages and many thousands of dialects.

The arts of these tribes differed widely. More than half of them cultivated the soil, and agriculture prevailed in the eastern half of the continent much more than in the western half. In the humid portions of the U. S. the agriculture was in little patches of natural clearings about villages; in the arid portion, the cultivated spots were close to springs and small streams, which were used in irrigation.

North America was settled from various European countries. Each country sought to establish colonies, and this led to wars between the colonies. In these intercolonial wars the Indian tribes were often enlisted and furnished with firearms, and they speedily developed a mode of warfare half savage and half civilized. This method of warfare they soon employed against one another, and their ranks were thus greatly thinned. They turned their arms against the white settlers also, only to have their ranks still further depleted. But the contact with civilized men was not chiefly one of warfare. The Indians everywhere speedily acquired some of the arts of the invader. Many learned to speak a European tongue. Missionaries and teachers were immediately sent among them, and these patient and pious people spread some of the elements of the new religion in the wilderness. Some of the tribes became herdsmen; a few learned to cultivate the soil by civilized methods; and gradually tribe after tribe entered into treaty relations with the civilized peoples, and settled down to peaceful life.

The invaders belonging to the Latin race, especially the French and Spanish, intermarried with the aboriginal peoples. In Canada there is an extensive body of mixed-blood people, French-Indian. In the southeastern portion of the U. S. and southward through Mexico the Spanish immigrants intermarried with the Indians, and the people usually known as "Mexicans" are largely these half-breeds. The English, Irish, Germans, and Scandinavians, however, did not intermarry with the natives, but tried to civilize them by teaching them the industrial arts, inducing them to become agriculturists, and establishing schools among them. On the organization of the Government of the U. S. this policy, begun in colonial times, was definitely formulated into law, and has been continued to the present time with very little change. From time to time, as administrations have changed, the policy has been reformulated, and new vigor has been infused into the administration of Indian affairs. The Indians themselves never looked with favor upon this policy. They desired to remain in possession of their ancestral homes and hunting-grounds, and did not wish to engage in civilized labors, and to a greater or less extent they rejected the teachings of the civilized missionaries and teachers; but valley after valley was occupied by civilized men, and the primeval life of the Indian was inexorably doomed. From the foundation of the Government to the present time the attempt has been made to induce Indians to take land in severalty, and treaty after treaty has been made giving to the tribes reservations. These were at first large enough to afford them hunting and fishing grounds of more or less value, but not sufficient for their complete support. Such reservations were always granted with the purpose, expressed or implied in the treaties or agreements, that the Indians should become herdsmen and agriculturists. In the earlier administration of affairs the attempts to induce the Indians to take land in severalty rarely succeeded, but in later years they have been more successful.

There are two practical impediments in Indian society that must be overcome to secure this desired end. Among these tribal peoples ownership of land in severalty was unknown; only tribal or confederate ownership was recognized. They looked with the same horror upon individual ownership in the land that they would upon ownership of the air or the water; and it was everywhere radically opposed by the dictates of tribal religion. The second difficulty inheres in the system of inheritance existing among the Indian tribes. Property was inherited by the tribe or clan, but personal inheritance from individual to individual was unknown, and the little personal property held by an individual was destroyed at his death, under religious sanction. Under clan organization with descent in the female line the children belong to the mother's clan, father and mother always being of different clans. When an Indian man has acquired a tract of land under the laws of the U. S., at his death his own children fail to claim it and his sister's children demand it. But many tribes have adopted civilized customs and laws, and the new system of inheritance is gaining ground. The Indians realize that in order to secure lands they must own them in severalty, and that hunting-grounds can not be preserved for their exclusive use. In general, the lands reserved for this purpose by the Government are ample to make the Indians a prosperous people, though in a few instances sufficient provision has not been made.

It is interesting to notice that the intermarrying policy of the Latin peoples has in the main been productive of peace, while the civilizing policy of other European settlers has led to many difficulties, often characterized by petty warfare, with cruelties and horrors; but the civilizing policy has saved the white race from a serious degradation.

Population.—A supposition long prevailed that the Indian population of North America at the time of its discovery was very large, some estimates reaching 16,000,000, and others still higher. That their present numbers, as recorded in the census reports, show so great a decrease, has been explained by a theory that the race is afflicted with an innate defect by which its civilization, or even its existence in

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civilized environment, is impossible. The statement and the theory are both erroneous. The pre-Columbian population was astonishingly small as compared with the enormous extent of territory, and during late decades, when the influence of civilization has been strongest, no important decrease has been noted; indeed, some tribes which are most nearly civilized have increased. Some of the reported decrease has occurred, not through extinction, but through absorption, a common event in history. The number of Indians now in the U. S. is somewhat less than 300,000. The number of those in the British possessions is not so accurately known.

Villages.—Every tribe lived in a village, and every village constituted a distinct tribe. In some villages the houses were scattered, yet so near that all the people could be assembled at the sound of the drum. A large communal house for the active clan was usual, and in a few cases a great communal house gave shelter to the whole tribe. A great diversity of dwellings existed. Some of the Eskimo built their houses of blocks of snow; other tribes built of bark and twigs supported on poles; others built of reeds and grasses woven into a rude thatch, or covered their houses in whole or in part with mats; others built with earth supported in mounds over rudely cut poles and logs; others built with the trunks of young trees, which were cut with stone axes and sometimes split into slabs. The latter were more common than any others. In the valleys of the Rio Grande and the Colorado rivers, and extending beyond these limits somewhat to the north and west, the tribes built their houses of stone, and a few of grout. These are now known as *pueblos*. Such houses were two, three, four, and even five stories high, composed of a cluster of small rooms, many in the interior having no light. Often they were terraced, so that the second story did not cover all of the first, the third only a part of the second, and so on. Sometimes there were no entrances from the ground, the general plan being to climb by a ladder to the first terrace and descend by a hatchway into the room below. But above the first terrace there were many openings, so that upper rooms were not entered by hatchways. Tents made of tanned skins stretched over poles in conical form were common, but were chiefly used in journeying to a distance from the permanent village. An essential feature in every village was the *kiva*, or place of assemblage, which was a large chamber or house, with a plaza, where the people assembled for many purposes—for council, for worship, and for amusement. In some places the house or chamber, often called the "temple" in current literature, was a structure made of trees in the form of a huge conical tent and covered with boughs and bark. But many other forms of structure could be observed in various parts of the country. In the pueblo region, where the people built of stone, two classes of kivas are found—round chambers and square chambers; and these kivas are wholly or partly under ground, and are carefully plastered. In the kiva itself only the chiefs and leaders of the council and important persons assembled, and public exercises were usually held in the plaza. In many cases the plaza was arranged with booths on two, three, or four sides, and the sacred council-fire was sometimes kindled in the kiva and sometimes in the plaza. Some tribes provided only a tribal kiva, but large tribes often had in addition a series of clan kivas.

Many of the tribes erected mounds, and these mounds are found scattered over all of North America. Tens of thousands have been mapped. (See MOUNDS.) They were in part domiciliary, as houses were placed upon them; others were used as sites for kivas. In many of the clusters the kiva mound is discernible as one of the most conspicuous. Many of the mounds were used for cemeteries.

Costumes and Adornments.—The variety and quantity of clothing of the Indians are governed largely by their habitat and environment. Clothing may be classified into ordinary and ceremonial. The ordinary wearing apparel of the Alaskan and other northern tribes consists of shirts or tunics and leggings and boots made of the skin of native animals with the hair attached. Suits made of the intestines of the seal are frequently worn over the ordinary dress as a waterproof garment while hunting and fishing by boat. The Athapascans of British America resort to the general use of fur and buckskin clothing. The Chippewayans (*Pointed-shirt-people*) are so named on account of their long shirt-like garments, terminating below both front and back, in a sharp point. Some of the tribes of Nevada and California wore garments of rabbitskin as well as buckskin, though less clothing was worn by them than by their northern neighbors. Among the tribes of the Colorado river in Arizona the women wore serviceable skirts, reaching below the knees, made of the inner bark of the cotton-wood and other indigenous trees, the bottom ends of the strips of bark being often split to resemble fringe. Many of the tribes inhabiting the country between the Rocky Mountains and the Sierra Nevada when first known wore only the simplest form of apparel. The women wore a garment carried over one shoulder, secured under the arm of the opposite side, and reaching down to the hips, and in addition to this a short skirt fastened to the waist by means of a belt or girdle. The garment of the men resembled an inverted sack or bag with an opening for the insertion of the head and the corners cut off for the passage of the arms. Sometimes there were short sleeves. This, with the loin-cloth, and sometimes a pair of moccasins, constituted the entire outfit. Such clothing, as well as small robes and larger ones to serve as bed-covering, was often made of a warp of some ligneous fiber with a woof of strips of rabbitskin wound spirally round a fibrous cord, the two being then woven together by stretching the warp upon the ground and carefully working in the woof. The Mojave women frequently insert under the back of the skirt a roll of soft bark to form a sort of bustle for a seat upon which the babe is placed astride when the mother has any considerable distance to travel. The New Mexican and Arizona Pueblo tribes made excellent woolen and cotton skirts, tunics, belts, and other articles of clothing. The fur of rabbits and hares was also spun into fiber for cloth. Cotton sandals, and some made from the fiber of the yucca, have been found among the effects of the occupants of the now deserted ruins and cliff-houses. Some of the Arizona tribes used sandals of raw hide, secured to the feet with thongs. The Mescalero Apaches have moccasins peculiarly turned up in front, thus guarding the toes against forcible contact with stones and rocks. The Mexican Indians indulged in more elaborate clothing, consisting of cotton and other fibers. Mantles and other forms of apparel also appear to have been in use, while feather robes were not uncommon. These, however, were ceremonial and indicative of rank. Ceremonial clothing usually bears evidence of elaborate decoration in beads, porcupine quills, claws and teeth of animals, shells, and feathers, and is often further ornamented with paintings of a totemic or religious character, or bears the insignia of the wearer's rank and social status. Metal ornaments, such as armlets, bracelets, anklets, earrings, bells, etc., were also worn, the material and quantity being in accordance with the wearer's ability and pecuniary conditions. Upon both social and ceremonial occasions many of the Indian tribes wore elaborate headgear, consisting of eagle feathers and the plumes of other species of birds, tufts of hair dyed in red or other colors, and bird skins and pelts. Necklaces of claws, shells, deer and antelope hoofs, the teeth of various animals, snakeskins, and even human fingers, were brought into requisition. Labrets of walrus ivory and bone are used by the natives of Alaska. The first to be inserted is generally small, but as the tissues become stretched and the orifice enlarged, the size of the labret is increased proportionately. Earrings of brass and copper wire are used by most Indians, sometimes the entire edge of the cartilage of the ear being perforated for this purpose. Silver bracelets, rings, and other ornaments are now extensively manufactured by the Haida, Tshilkat, and Navajo Indians. By some of the tribes of the Great Lakes bags made of beads and secured by a broad baldric were worn in religious dances. The use of bells as rattles appears to be a survival of the employment of deer hoofs or shells, the ready acquisition of the former having no doubt caused their adoption. The loin-cloth is common to nearly all of the North American tribes.

Tattooing and Painting.—Evidences of the practice of tattooing are found among most of the Indian tribes. By far the most elaborate and artistic work was among the Haida, who thus decorated with religious and mythologic figures the breast, back, forearms, and legs. Black pigments were ordinarily used, though vermilion was sometimes employed for certain parts of figures, to accentuate particular and important ideas. The operation was performed by tracing the outlines with a paste of soot, powdered charcoal, or gunpowder, by means of a stick or a small brush made by chewing the end of a twig; the colored part was then pricked with sharp spicules of bone, fish spines, or a small bunch of needles. The operation was

painful and tedious, and could not be completed at one festival or "potlatch." Violent inflammation sometimes resulted, causing ulceration, whereby the color-design was obliterated, leaving only a spot more blanched than the ordinary surface of the person by destruction of the *pigmentum nigrum*. Among some of the California tribes tattooing was practiced to a limited extent. Among several of the northern tribes spots were tattooed upon the foreheads of the women, by which means they might be identified if captured by the enemy, and exchanged or ransomed. The practice prevailed of tattooing short transverse lines at intervals upon the inner surface of the forearm, by means of which the length and value of strings of beads were estimated in barter. Among many of the northern prairie and lake Indians the shamans of both sexes practiced tattooing over a painful or diseased spot to expel the demon which caused the distress. The Indians of Virginia are reported as having tattooed upon their persons various designs to indicate rank and social status, such marks consisting of arrows, crosses, and parallel lines. Many instances of scarification have been discovered, the most important being that practiced by the Cheyenne Indians, who cut gashes across the forearms as a sort of sacrifice when successful in war.

Painting was common to all the Indians, and no one was considered as completely dressed until the proper application of pigments had been made to suit the fancy of the wearer. The pigments, before they could be procured at trading-posts, consisted of ochers of red and yellow tints, powdered charcoal and soot, white clay and infusorial earths, blood, resin or pitch, and the juice of roots, fruits, and plants. The general application of grease and red ocher was practiced by many tribes of the warmer areas for the purpose of preventing the burning effects of the sun; the same method was also pursued by some of the northern tribes to guard against the chapping of the skin from great cold. Mourning customs demanded, as a rule, the application of black colors, which among some Californian tribes consisted in covering the face with soot and pitch, and as long as any of the application remained, the mourner was not permitted to marry again. Numerous tribes had specific methods for distribution of color upon the face when going to war. As a general rule, Indians applied red coloring-matter to the line exposed by parting the hair; and the women and girls frequently colored the cheeks with vermilion, as a mark of beauty. Among the Ojibwa shamans specific lines and spots of color were applied to the face to indicate their rank in the cult societies, so that the status of the individual might be known at a glance. Among the Mandan, Hidatsa, and Arikara marks of various kinds were employed to indicate the performance of brave deeds or other personal exploits. Among the Crows red pigments were applied to small balls of resin attached to the braids of hair, thus furnishing durable ornaments as well as permanently holding the strands of hair in place.

Food.—It is customary to speak of the Indian tribes as subsisting by the chase, but this is true only to a limited extent. The Indian dietary was quite extensive, and it was only in the extreme north and among the prairie tribes that hunting formed their chief dependence. Along the banks of the Mississippi and eastward to the Atlantic, and throughout the whole Gulf region, the tribes depended for subsistence fully as much upon their fields as upon hunting or fishing. About Lake Superior and the heads of the Mississippi, however, where the season was too short to ripen corn, the Ojibwas and others supplied the deficiency from the fish of the lakes with the cranberries and the wild rice (*Zizania aquatica*) of the swamps. The Menominis derive their name of "wild rice" people from the abundance of that grain in their country. The Hurons and other northern tribes, like the western Indians, cultivated sunflowers for their seeds. Throughout the whole region of the Great Lakes and the St. Lawrence and in the Ohio valley large quantities of sugar were obtained from the maple by a process which the whites afterward learned from the natives. Game and fish were of course largely used, and were taken by the usual methods. Along the seacoast elaborate weirs were constructed, and dead fish were used as manure. Clams and oysters were as much used then as now, as is evidenced by the numerous shell-heaps along the coast. Every edible variety of wild fruit was eaten in various ways, as were also different species of fungi and lichens. Peaches, melons, and some other fruits and vegetables introduced by the whites were adopted at an early period and extensively cultivated. The honey-bee of the white man was domesticated, and honey from the domestic or wild swarms soon became an important part of the Indian bill of fare. It is probable that they occasionally obtained honey from the native bee even before the coming of the whites. The southern tribes used several herbs as greens, and occasionally roasted or boiled the root of the lily, and were not averse to eating the roasted larvæ of wasps and hornets. Numerous varieties of marsh bulbs were also gathered and boiled or roasted, and pleasant drinks were prepared from wild grapes and from the sweet pods of the honey locust. The great food staples, however, E. of the Mississippi, especially in the south, were corn, beans, and squashes. Among the Gulf tribes the corn-mortar stood in front of every cabin, and every warrior carried a pouch of parched meal to sustain him on his journey. The Cherokees know probably as many ways of preparing the grain as do any of our civilized cooks. Our names for *hominy*, *pone*, *samp*, and *succotash* are all derived from the eastern tribes.

In every tribe we find certain food taboos, which usually had their origin in a mythologic or medical reasoning. With regard to cannibalism, it may be safely said this practice, in the true sense of the word, did not exist N. of Mexico. Although human flesh was eaten at times by many widely scattered tribes, investigation has shown that in almost every instance this was due primarily to some mythologic motive, as a desire to acquire the qualities of the dead person by partaking of his flesh, or that it was a mere act of savage revenge.

Domestication of Animals.—When the continent was entered by the Spaniards but three beasts of burden were used by the natives—the llama, the paco or alpaca, and the dog. The two former occurred chiefly in Peru and Chili, where they were reared also for their wool, but there is some evidence, not amounting to proof, that an animal of the llama tribe inhabited the mountain districts of Southwestern U. S. and the plateaus of Mexico, and was known to, and perhaps domesticated by, the Pueblo Indians.

The dog appears to have been common to all Indian tribes throughout the continent. By many tribes it was trained into a more or less effective ally for hunting. By a few, as the Eskimo and the tribes bordering on the great plains, it proved serviceable as a beast of burden, sometimes carrying light packs, but more frequently harnessed into the travois. By other tribes dogs were regularly reared to be eaten at feasts of a religious character, and they also served for food in times of scarcity. Dogs' hair was employed by numerous tribes, particularly along the northwest coast, for weaving into blankets and other textures. The Indian dogs, wherever found, were descended from wolfish ancestors, and they retained much of the aspect and disposition of their progenitors.

As was the case also in South America, the Indians were in the habit of capturing various species of birds and animals, such as herons, parrots, deer, monkeys, and guinea-pigs, and taming them for pets, but, as a rule, not for economic purposes. Among birds, the turkey was domesticated by the Aztecs of Mexico and also by some of our Pueblo tribes. To what extent it served for food with the Aztecs is uncertain, but to the Pueblo peoples practically its whole value consisted of its feathers, which were extensively employed in cloth and mantle-making and in religious and ceremonial observances, as also, it may be added, were the feathers of various species of hawks and the golden eagle, which were kept caged and annually plucked. The list of domestic animals includes neither the bison nor the peccary, although it can not be doubted that the Indians unaided would ultimately have domesticated at least the former. It was of immense importance to the Indians even in its wild state, and under domestication it would have proved a powerful factor in their march toward civilization.

Stone Implements.—Of the beginnings of art in stone in America we have little positive knowledge. Rude flaked stones have been found in glacial gravels, but the number of specialized forms is so small that types of implements have not been established, and all deductions as to the art of that time or as to the habits, customs, institutions, and distribution of peoples are without value. The bulk of the evidence, so far as obtained from the gravels and other sedimentary deposits, is rather against than for the existence of a prevalent rude culture in glacial or immediately post-glacial times, a number of widely distributed localities having furnished art remains corresponding closely to the average work of the historic tribes of the same sections.

Stones were in some cases, especially in the earlier periods,

used in the unshaped condition, and artificial forms were developed by use through battering, abrasion, and flaking. When the surface supply of stone became insufficient, quarrying was resorted to, and thus arose one of the foremost industries of a stone-using people, and one lying at the very foundation of human culture. Quarries of flint, chert, novaculite, quartzite, pipestone, obsidian, soapstone, mica, etc., from which implements and utensils were made, and of the various building-stones are scattered over the continent, and are frequently of surprising magnitude. The stone was shaped by means of such processes as flaking, cutting, pecking, grinding, and polishing; the needs and intelligence of the workmen uniting with the peculiarities of the material to direct the course of specialization. Projectile points were necessarily a most important product, and knives and scrapers for dressing game and for preparing the skins for clothing were their natural accompaniment. The same articles served for war and in various arts. They were rough flaked by direct percussion and finished by indirect percussion and by pressure. Of the pecked and polished tools the grooved ax and the celt take first place. Many ornaments, gaming and ceremonial stones, etc., belong to this class. Sculptured figures in relief and in the round, all of primitive type, are common within the limits of the U. S., but the art had a more wonderful development in Mexico.

Use of Metals.—The American nations were still well within the age of stone at the beginning of European contact, but metal was gradually coming into use. Very few tribes were without implements or ornaments of metal, and some of the more advanced peoples had developed so great skill in its manipulation as to win for their handiwork the admiration of the European explorers.

Copper and gold were the metals most easily and most fully and generally utilized. In North America the art of casting was not practiced to any considerable extent beyond the limits of Central Mexico. Copper was obtained mainly from mines situated about the shores of Lake Superior. Here masses of the native copper are distributed through the trappean rocks over an extended area, and lumps of copper from the lake region, transported by glacial ice, are scattered over a vast district to the S. Upon the northern shore of Isle Royal, Lake Superior, there are still to be seen thousands of the ancient mining-pits not yet filled with accumulating *débris*. Excavations made in these pits reveal great numbers of the stone sledges used, and such masses of metal as were too heavy to be removed by the primitive miners. One such mass weighed 12,000 lb. There is no evidence that the copper was made into implements in the quarry. The portable masses were carried away to be distributed by trade, and at the proper time and place hammered or swaged into knives, chisels, axes, needles, arrows and spear-heads, and ornaments. The processes are not yet fully known, but there is little evidence of anything beyond simple hammering within the limits of the U. S. That the smelting of ores was unknown in America is confirmed by the fact that although galena, the ore of lead, was in common use by many of the tribes, lead was not known.

Pottery.—Primarily the art of pottery is devoted to vessel-making, and it is in this field that the highest achievements in American ceramics were attained. Vases were employed in containing, handling, and transporting many substances and articles. In the earlier stages of culture they were confined to these simple uses, but as culture ripened they were devoted to ceremonial and sacred offices, and received especial attention at the hands of the decorator, who supplied them with symbols and representations, in colors and in relief, of the deities to whose service they were assigned. With some tribes large vases were used in burial to contain or cover the dead. Pipes, whistles, rattles, toys, beads, trowels, calendars, masks, and figurines were made by various peoples.

Native clays of varying degrees of purity were used, and these, when properly prepared, were tempered with powdered quartz, shell, or other like materials. The vessels were usually built by coiling. The wheel was not known, although some simple means for supporting and turning the vessel had been devised. The surface was smoothed with the hands or the modeling implements, or was polished with a stone or other smoothing tool. Much attention was given to surface embellishment. The finger-nails and various pointed tools were used to scarify and indent, and elaborate figures and designs were incised. Stamps with elaborately engraved figures were applied to the soft clay. Cords and woven fabrics were also employed to give diversity to the surface. With the more advanced nations, though these simple processes were still resorted to, engraving, modeling in relief and in the round, and painting in colors were employed in the more ambitious pieces. Glazing was unknown, although a high degree of polish was given by a number of processes, and in one group of ware, represented by a dozen pieces from Mexico, the effect of burnished metal is successfully imitated. Baking was done in the open air or in furnaces of very simple construction, and the heat was seldom so intense as to produce even a slight degree of vitrifaction.

Some of the best examples of this art are found in the valley of Mexico, and one superb vase, said to have been obtained on the site of the ancient city of San Juan Teotihuacan and now in the Museo Nacional, stands forth as a masterpiece of American fictile art. Ancient pueblo work, all things considered, stands first within the area of the U. S.; closely approaching this, however, are the attractive and greatly diversified wares of the Mississippi valley and Gulf coast.

Textile Fabrics.—Woven fabrics include the products of wattling, interlacing, plaiting, netting, weaving, sewing, and embroidery. The materials most used by the more primitive Indians were twigs, leaves, roots, canes, rushes, and grasses, and the hair, quills, feathers, and tendons of animals. The more advanced tribes had learned to prepare and use many additional filiform and fibrous elements, including bast, hemp, cotton, and wool. In many cases woven textures buried in caves have been preserved by the agency of preservative salts, and not infrequently bits of fabric wrapped about copper tools, utensils, or ornaments in burial retain a perfectly fresh appearance. Charring has also been a means of preserving cloth, and much has been learned of the weaving of vanished tribes through impressions upon pottery made by applying the texture while the clay was still soft. Wattle-work composed of rods, branches, and vines was employed in constructing inclosures, fish-weirs, cages, and the like. Matting made of rushes, split canes, and twisted strands was in almost universal use for carpets, seats, hangings, bedding, shelter, and the covering of houses. Too much can not be said in praise of the beauty and technical perfection of this work. Of pliable fabrics there was great variety. The weaving appliances were everywhere very simple, but the results in plain and figured textures, in tapestry in lace-like embroideries, and in feather-work, reached by the more advanced peoples, challenge the admiration of the world.

War.—The study of the art of war among the Indians would include their devices for offense and defense. For striking weapons they used clubs and *casse-têtes*, with stone heads, and a kind of flail or slung-shot. The sling was also known in several places. Many of their clubs were armed with jagged teeth of stone. Their slashing weapons were leaf-shaped daggers, with handles of wood or rawhide. A savage battle-ax was fashioned by inserting sharp chips of obsidian or jasper along a handle of wood. Every warrior carried in his belt a scalping-knife of stone. Piercing weapons were javelins, lances, and arrows. The javelin was not a common weapon within the U. S., but in Mexico, and along the west coast to Alaska, and all the way across to Greenland and Labrador, it was in common use. It was hurled with terrible effect by means of the *atlatl*, or "throwing-stick." The spear, or lance, was a hastate or lanciolate blade of hard stone, chipped or ground, and inserted at the end of a shaft from 3 to 10 feet long. But the most ingenious and the most common piercing weapon was the arrow, made of driftwood and walrus ivory in the north, of hard wood in the middle region, and of cane and hard wood in the south. Everywhere the very best productions of each region had been carefully sought for the arrow. With point of obsidian, jasper, or chalcedony, foreshaft of hard wood, shaft of willow, or rhus, or cane, feather from the wing of the eagle, this little instrument of death held its own, even against bullets, down to the middle of the nineteenth century. It was dispatched by means of the bow, in some places made of a single piece of hickory, or ash, or *bois d'arc*. In the extreme north, where no good timber grows, the bow of driftwood was strengthened by a cable of sinew cord, applied to the back in such a manner as to convert a breaking into a columnar strain. Along the Pacific slope and in the interior basin a backing of shredded sinew was laid on the bow, with animal glue, so cleverly as to imitate the bark of the wood. Along the plains of the great west a compound bow was fabricated of buffalo horn.

For defense, the aborigines used the shield as a parrying device. It was made of rawhide, extremely light, and it was handled with great dexterity. Armor was made of closely woven cotton or other fiber in the south, of rods or slats joined together by a weft of sinew or other cord in the north, and of the hide of the male elk, or moose, or buffalo, in the regions where these creatures abounded.

The Indians had no engines of war to be handled by more than one person, but they used fire with great effect. Their fortifications were ramparts surmounted with stockades or simple earthworks, frequently with the ditch inside. Signal mounds and fires, and primitive devices, such as blazing trees, marking rocks, and crossing sticks of wood, conveyed information concerning the movements of war parties. But there were no troops in the higher sense. In the dead stillness of the night, with noiseless tramp, or in canoes propelled by silent paddles, the band of warriors stole upon their victims, and killed them without mercy. Captives were sometimes adopted into the tribe or clan of the conqueror, at other times reserved to grace the triumph of the conquerors, but chiefly they were slain, and their scalps retained as trophies of victory. Sometimes war was declared formally, and at its close treaties were made and recorded, not with pen and ink, but by wampum belts or other mnemonic witnesses of the transaction.

Amusements.—Hunting and war occupied but a small portion of the Indian's time, and left him abundant leisure for amusements. The home life of the Indian was a constant round of dancing, feasting, gaming, and attendance on religious ceremonies, which thus had the character of social reunions and tribal holidays. Besides the religious and other ceremonial dances there were a large number of dances whose only purpose was that of social pleasure. Night was the time usually selected, and various musical instruments were used to accompany the songs. Some of the dances had no special significance, others were of a pantomimic or dramatic character. The games of the Eskimo are chiefly athletic, consisting of racing, tossing up in a walrus skin, throwing of stones or other weights, and wrestling. The ball-game was common to all the eastern tribes from Hudson's Bay to the Gulf, and was found also among the Sioux and other northwestern tribes, as well as among some on the Pacific coast. The Canadian *la crosse* and the Louisiana *raquette* are civilized adaptations of this Indian game, which was played in the north with one racket and in the south with two. Athletic young men were trained for the ball-play, which was frequently an intertribal affair, and it was by using this game as a stratagem that the allied tribes were able to surprise the garrison of Mackinaw in 1763. In this and in almost every other Indian game betting was an important feature, and contestants would sometimes stake their all on the result. The game known as the "snow-snake" among the Iroquois, as *katayûsti* among the Cherokees, and as *chûnki* among the Creeks, probably existed in various forms among many other tribes. As usually played in the east, the game consisted of rolling forward a stone disk or wheel, and sliding after it a stick curved at one end in such a manner that the wheel, when it fell to the ground, would rest within the curve or crook of the stick. The antiquity of this game is proved by the great number of these stone disks found in the mounds. Throwing or shooting at a target with tomahawk, knife, bow and arrow, and later with gun or pistol, was much practiced. Racing on foot was also general. Among the equestrian tribes of the prairie horse-racing is still indulged in almost every afternoon through the warm season, and intertribal matches are of frequent occurrence. There were numerous gambling games, played with bones marked in various patterns, or with sticks or reeds cut and painted with various designs. In most of these chance had more to do with the result than skill. Perhaps the most entertaining of all the Indian games are those of the "hunt-the-button" variety. These are usually played in the long winter nights, and a circle of wild Kiowas or Comanches, in paint and buckskin, seated around the sides of the tepee, with the fire blazing brightly in the center and lighting up their animated faces as they swing their hands in time with the rhythmic chant, is one of the most picturesque scenes in savage life. The Kiowas, and probably other tribes, have sacred games for divination and other purposes, the gaming implements being held in the keeping of a shaman, and produced for use only after the payment of a fee to the medicine-man.

With the exception of the "hunt-the-button" games, which are common to both sexes, all those thus far enumerated are played by men. The women have a game similar to the shinny of our boys, and a football game in which the object is to keep the ball in the air as long as possible by kicking it. They also have several games of dice, played with plum-stones or pieces of bone marked in a distinctive manner. These games are common to the women of all the prairie tribes, and were formerly as well known in the east. Among the Sioux and other northern tribes the women have what is sometimes known as the "deer-foot" game. In this a number of cylindrical bones, usually taken from the foot of the deer and perforated with several holes around their sides, are strung upon a cord, which has at one end several strands of beads and at the other a long needle. The object is to toss the string, with the beads upon it, in such a way as to catch upon the point of the needle, which is retained in the hand, any designated one of the bones or bead strands. The favorite game among the women of the Kiowas and other southern tribes is the "awl game," in which the players sit upon the ground around a blanket, in the center of which is placed a stone, upon which each in turn throws down a bundle of four sticks, flat upon one side and round on the other, and marked in a peculiar manner, one of them being the trump or winning stick. Points are scored according to the sides which turn up or down, and each player keeps her tally by sticking an awl into the blanket at certain lines or dots marked in charcoal around the border.

Among the boys, shooting with the bow, walking upon stilts, throwing stones from slings, and spinning tops, either with the fingers or by means of a whip, are the common amusements. In the southwest the boys had a peculiar kind of kicking race, in which the contestants, running in parallel lines, kicked or threw small pieces of wood with the toes, sometimes keeping up the race for miles at a time. The girls—like little girls the world over—play "house" with their dolls, which with them are of buckskin, and dressed and ornamented like full-grown Indian men or women, and are carried on sticks or in miniature cradles. The Zuñi girls have a game in which a feathered shuttlecock is tossed from the hand and kept in the air.

Social Institutions.—Society was organized on the tribal plan, bodies politic being always groups of kindred, mainly real, but to some extent artificial. Nowhere in North America were there discovered nations organized on a territorial basis. In most of the tribes the fundamental unit of organization was the clan. In this group kinship was reckoned in the female line only, as no one could belong to the clan who was related to it through a male. Husband and wife must always be of different clans; intermarriage in the clan was forbidden. The children of the pair belonged to the clan of the mother, and were under the authority of the chief of the clan, who was usually the eldest male member. Fathers therefore were not responsible for their own children and had no legal authority over them, but exercised authority over the children of their sisters and of their female relatives. A few of the tribes, however, were organized on the gentile plan, and in the gens kinship is reckoned in the male line. Each tribe was composed of a number of clans or gentes, varying from five to thirty. The right of adoption inhered in women, and when a prisoner of war was adopted he was recognized as the child of the woman, and his rank in the tribe was the same as would be that of a child of the woman born at the time of his adoption.

Sometimes several tribes were organized into a confederacy, and in rare cases there was intermarriage between the tribes of the confederacy. The relationship of tribes one to another constituting a confederacy was determined in the grand council of the confederacy, and was always the subject of much discussion. To a large extent a curious artificial kinship was established, as the members of the several tribes recognized one another as brothers and sisters. In such cases it becomes necessary to establish rank, and elder and younger tribes were established in the brotherhood of the confederacy, so that the people of one tribe should be recognized as the first born, those of another as the second, and those of still another as the third. Sometimes the tribes constituting a confederacy had other tribal relations than those of brotherhood. One tribe might be recognized as the grandfather of the confederacy, another as the father, and still another as the son; and the grandfathers, fathers, and sons might severally have brother tribes; so that a group of tribes constituted a rather complex system of artificial kinship. The most fundamental law of authority in tribal society rests upon superior age. The elder brother has authority over the younger, the uncle over the nephew, the

elder sister over the younger sister, and the aunt over the niece; it was therefore necessary to establish relative age. In order to make the enforcement of this law simple and sure, a system of kinship terms was used in which relative age was always expressed, so that if two members of the tribe met, the kinship terms by which they addressed each other expressed relative age. Hence there was never a single term signifying brother, but one signifying elder brother and another signifying younger brother. There was no term signifying uncle, but a term signifying uncle older than myself, and another signifying uncle younger than myself. Everywhere a law was found forbidding people of the same tribe or confederacy to address one another by any other term than the kinship term, so that it was impossible to speak to any member of the clan, tribe, or confederacy without addressing him by a term which would claim or yield authority. Given names abounded in tribal society, but they were always used in the third person to describe some one absent, and when a person was spoken of the clan to which he belonged was expressed. It was an insult and a crime to address a person by his given name. In general these given names were classified, and a system of names was used by each clan as its exclusive property.

These laws of marriage, naming, and authority were fundamental in tribal society, but they were modified in a variety of artificial ways, always under strict rules. In some tribes there was a system of promotion in the clan, so that a person who advanced to the chieftaincy by grades in the civil or religious organization was by such promotion elevated a number of grades in kinship, and then a person actually older than himself would be obliged to address him correctly and yield authority to him. Often the head of the clan was the oldest male member, but naturally he could be deposed for old age or other inefficiency. In some cases, however, the chief of the clan was elected, and in a few cases he was appointed by the tribal council. Among certain Creek tribes the clans were divided into two phratries, called the red and the white people. All executive and military officers were selected from the red phratries, all councilors from the white phratries, white being the emblem of wisdom and red the emblem of prowess. The people of the white phratry promoted from grade to grade in the red phratry and chose all of their officers, and the people of the red phratry promoted and elected in the white phratry. In general, marriage was by appointment. Sometimes a man must marry in a particular clan, that is, every woman of one clan must become the wife of a man in some other particular clan. The sisters of these clansmen are not given to the brothers of their wives, but to the clansmen of a third group. In some cases the man must not only marry a wife from some other clan, but she must also be from some other phratry. Perhaps the most common law was that a man could marry a woman in any clan other than his own; but in none of these cases had the man and the woman themselves any choice in the matter—marriage was always arranged by the elders in clan or tribal council. Three modifications of this system of marriage are found. First, a man and woman not belonging to the same clan, desiring to be married, may elope and escape into the forest; if they succeed in living together unmolested for the prescribed time, they can return to the tribe and the marriage will be recognized as legal. Second, when an appointment has been made for the marriage of a man and a woman, some other man, not belonging to her clan, may wish to have the woman for his wife; with the consent of his own clansmen he may announce this fact, and the right to the woman is settled by wager of battle. Third, if the women of the clan are many and the particular clan into which they may marry have few men, other clansmen may seize one of these marriageable women and carry her away to be the wife of one of their clansmen; this is marriage by capture. Marriage within the clan was everywhere prohibited; the two persons could not live together, and the attempt to consummate it was punished by death. Thus it is seen that marriage was exogamous in the clan and endogamous in the tribe, exogamy and endogamy being correlative regulations in the same transaction. The attempt which has been sometimes made to classify the tribes as exogamous and endogamous has no basis in fact.

Totemism.—It was customary for each clan to adopt a tutelar god. All of the tribes were polytheistic and had a great variety of deities, the most important of which were animal gods. Thus in one tribe the bear might be the tutelar god or totem of the clan, in another the wolf, in another the spider, in another the eagle, in another the heron, and so on. Sometimes there was a corn tutelar deity, a rain tutelar deity, or a sun tutelar deity. But as most tribes were mainly zoötheistic, animal gods were usually selected as tutelar deities or totems. The tutelar god always gave name to the clan. This is totemism.

Patriarchy.—Among many tribes the elder man or oldest male member of a clan or gens was the chief or superior in rank and power. Thus the government within the clan or gens in this unit was often a patriarchy. Among the North American Indians there is no such thing as a matriarchy; that is, there is no case where the elder woman was the chief of the clan or gens. Kinship through males and kinship through females were clearly differentiated; both systems were invariably recognized, but used for different purposes. Women were never promoted in the political organization, but often were in the religious organization; they sometimes became shamans, but never chiefs. And no instance is known of a *tribal* patriarchy. Where clans were found, kinship through females was the clan bond; but the clans themselves were organized into tribes, and the bond of the tribe was kinship through males and by marriage. Where the gentile organization was found, the bond of the gens was kinship through males, but the gentes themselves were organized into tribes by a bond of kinship through females and by marriage. The clan, or the gens, when found is the group within which intermarriage is impossible; these are incest groups, and in such incest groups degree of consanguinity was not considered. A man and woman belonging to the same clan or the same gens could not marry one another, even when the relationship was artificial.

The patriarchy, then, is a group in which the oldest male member is the ruler; a clan is a group in which kinship is reckoned in the female line; and a gens is a group in which kinship is reckoned in the male line, as these words are herein used. Sometimes the clan is a patriarchy, but not always; sometimes the gens is a patriarchy, but not always; the tribe is never a patriarchy, and in the tribe all classes of kinship are recognized—through females, through males, and through marriage.

Mythology.—All the North American Indians were polytheists; that is, they believed in a great variety of mysterious and wonderful beings, whom they worshiped in various ways, and on whom they called for assistance in the exigencies and trials of life, and to whom they attributed all good and evil, and they endeavored by various acts and ceremonies to avert the evil. They did not divide these gods into beneficent and maleficent, though a few were mainly good and others mainly bad. Nor was any clear division made between these mysterious personages and human beings, nor between human beings and the lower animals. For example, the animals were supposed to have languages of their own, to be organized into clans and tribes, and to have chiefs and hold councils. The gods also were organized in the same manner, and had institutions and arts; and all gods, men, and lower animals were endowed with like purposes and passions. The mysterious powers of the gods were, they believed, exhibited in the wonders of nature; and the mysterious powers of men and the lower animals in the practice of sorcery, for they all believed that animals as well as human beings were sorcerers. Men and beasts were only tribes of living beings, and the gods were also tribes of living beings, sometimes having human forms but usually the forms of the lower animals. To a large extent the gods are unseen beings; that is, they habitually conceal themselves from human sight, but by the powers of sorcery they are revealed from time to time to a few persons, the shamans of great lore. Men and animals have the power to render themselves invisible, and they do so sometimes, so that there is no clear demarkation of them even in this respect. The gods live in the main a spiritual life as shades of unseen personages, but they can put on material bodies at will. Men and animals more habitually occupy material bodies, but they can leave these bodies and exist as shades, and at death the habit of living as material bodies is changed to the habit of living as shades.

There were still other personages in the hierarchy of gods that require mention—certain beings whose bodies are inanimate objects, as trees, mountains, and rivers, but who may leave these material bodies and exist as shades. Sometimes a variation from this theory is found, namely, that these dæmon-gods, as they may here be called, use the trees, rocks, mountains, and rivers only as habitations, and have themselves the forms of the lower animals, which they can assume or can appear as shades at will. The general tendency

was to give all the gods animal forms, and such beast-gods greatly outnumbered all others. Very many of the tribes, perhaps all, looked upon the moon, the stars, the rainbow, and other objects and phenomena of nature as gods usually having animal forms, but having the power to present themselves in the forms seen by the Indians. Many of the powers and phenomena observed in nature were attributed to the powers exercised by the gods as sorcerers. Thus the wind is usually the breath of beast-gods, sometimes the fanning from under the wings of bird-gods, while the rain and snow are poured upon the earth by the power of gods living in the skies. All tribes seem to have believed in a number of worlds: worlds above and worlds below, and rarely, too, worlds to the east, west, north, and south. With all tribes there was a tendency to consider certain of their gods as superior to the others. In a few tribes this tendency is well marked. As every clan has a tutelar god, its own was usually exalted above the rest, and thus became for the clan or gens its god of gods.

Among the Natchez, the Iroquois, the Zuñi, and apparently other tribes, especially in the pueblo region and to the south in Mexico, some important modifications of this mythology of the deities are to be observed. The animal-gods and dæmons of animate objects still exist in great numbers, but are of little importance, while the great objects of the heavens, as the sun, moon, and stars, and the great powers and phenomena of nature, together with fire and a small number of beast-gods, constitute an exalted grade in the hierarchy of deities, and they are held to be the creators and rulers of the universe, always with the tendency to exalt some one of them to the chieftaincy. The sky-god, sun-god, or fire-god is usually, though not always, taken as this chief.

Zoötheism.—The writer has designated the lower stage of mythology, described as being general among the North American Indians, as *zoötheism*, because a large majority of the gods have zoic forms. In this stage the tutelar gods of the clans are usually zoic, and the gods themselves are often held to be progenitors or prototypes of the animals bearing the same name, and sometimes, though not always, to be the progenitors of the clan bearing the animal name, though it seems that many clans have been named so late in history that the theory of descent from the tutelar god has not become established.

Physitheism.—This peculiar form of mythic theism, wherein the great objects in the heavens and the mysterious phenomena and powers of the universe are exalted above the other gods, is termed *nature-worship* or *physitheism*, and has been clearly set forth by Max Müller.

Animism.—Everywhere a tendency is observed to attribute life to many inanimate things, and to assign to such inanimate objects powers of mind and occasionally physical activities such as are observed among men and the lower animals. Tylor has discussed this phase of mythology as it has existed in various portions of the world and has called it animism, while the writer has used the term *hecastotheism*. While the North American Indians are mainly in the zoötheistic stage of mythology, everywhere are found survivals from hecastotheism and the beginnings of physitheism, and a few tribes have reached an early stage of nature-worship. In the mythologic stage of hecastotheism the animate and inanimate are not clearly differentiated, everything wonderful or mysterious being deified—trees, rocks, fountains, rivers, mountains, all the lower animals, and the objects, powers, and phenomena of the heavens. In zoötheism a distinction is made between the animate and inanimate, but a few dæmons of inanimate objects are found, while the phenomena of the heavens are more exalted; yet animal life occupies the chief attention in this stage. In physitheism dæmons and zoic deities are many but inferior, and chief attention is given to the deities of the skies. All of these forms of mythology have representation among the North American Indians, but the principal form is zoötheism.

Wherever a new language is found a new system of mythology is discovered. Not only do the personages have different names, but they perform different *rôles* in the drama of creation, change, and life which constitute the web and woof of the stories that recount the doings of the gods. Tribes speaking languages of a common stock have much of their mythology in common, though a small change of language is always accompanied by some material change in mythology. Some myths also have been borrowed by one linguistic stock from another, but in passing have been more or less diversified. Yet the same phenomena are usually explained in a somewhat similar manner in all mythologies, and it is difficult if not impossible to separate those myths which go back to some common center, from those whose likeness is due to interpretations based on analogies common to the savage mind; that is, it is difficult to distinguish between autogenous and syngenous myths. Through the instruction of missionaries and teachers and by association with white men, especially trappers and hunters, the Indian tribes rapidly acquired some of the ideas of the Christian religion and readily adopted the belief in a Supreme God, whom they usually called by some term signifying Great Spirit. They have listened to many Bible stories and have adopted some, and thus their own mythology is now strangely mixed with Bible history.

Folk-lore.—Every tribe has, besides its living mythology, a great body of folk-lore stories of ghosts, giants, pygmies, fairies, and wonderful adventures of various kinds. It is in these stories that animism chiefly appears. Folk-lore is a phase in general mythology, believed by some, not believed by all; and in general the sanctions for customs and institutions are not found therein. These folk-lore tales are told about the camp-fire, and constitute a great body of oral romance.

Religion.—The term religion is here used for a concept including the rites, ceremonies, services, and observances performed by a people in worship and in honor of their deities, and to secure their good will, in order that good may be done to them and evil averted. In every tribe there is a body of men, usually called "medicine-men" or "shamans," who are the custodians of mythologic lore, and these shamans recount to the people the tales of their mythology, their creation-myths, and the doings of the gods in general. They are also the leaders and chief performers in all religious rites. Many seasons of worship and festival were observed, mainly controlled by the phases of the moon, and extending over periods varying from a few hours to several days. Four-day periods were most common, the number four usually being the sacred number, symbolic of east, west, north, and south. On such occasions the people listened to the stories of the shaman, and from time to time performed many ceremonies, accompanied by music and dance; in fact, the worship of the North American Indians may be characterized as terpsichorean. The green-corn dance, the new-moon dance, the hunting-dance, the fishing-dance, and many others were observed. Such festivals were often continued until the people became half crazed with excitement and the more pious devotees lapsed into trance. Sometimes there were wild orgies, beginning with fasting and ending with feasting. On such occasions the shamans and their neophytes used emetics and various intoxicants and narcotics, all of which aided in producing a state of trance, which is everywhere held to be of prime importance as a condition of divination. These terpsichorean ceremonies are largely invocations for abundant harvests, rain, snow, successful hunting and fishing, and for health and prosperity generally, and on special occasions for success in war. It is difficult to conceive of a more impressive scene than the closing exercises of a war-dance which has been continued for four days, when the hell of passions seems to be open and there pours forth a stream of weird song, ululation and imprecation, accompanied with symbolic mimicry of the horrors of war. Among the more advanced tribes the relation of mythology, terpsichorean ceremonies, and many strange rites is more thoroughly systematized into dramatic performances. In these religious plays the shaman class are the chief performers, though all the people take part in the chorus, dancing and singing. It is thus that in savage religion we have the beginnings of the drama. The paraphernalia of this religious drama is very elaborate. The masks found everywhere throughout North and South America were used as the character costumes of the shaman actors in these religious dramas. In this stage well-defined sacrifices were found, exhibited in the burning of food, the sprinkling of meal, and the pouring of libations. Sacrifice had its beginning in zoötheism, but is not well defined until nature-worship is reached.

Cult societies have been found among very many of the tribes. The purpose of these societies seems to be the systematic performance of religious rites. The shamans, who are the leading personages, are the custodians and teachers of the tribal lore. They are sorcerers, and perform many thaumaturgic feats, to the wonder of the people. In their dramatic performances an elaborate system of religious paraphernalia is used. Such performances are symbolic of the myths of creation, and the shaman actors personify the

gods of the Indian cosmogony. These societies do not run parallel with the clans and gentes, but constitute an independent congeries of organic bodies. Yet the religious organization is usually curiously and intimately interwoven with the tribal or civil organization. Military functions are relegated to both religious and civil authorities. To a large extent the cult societies under the control of the shamans decide whether war or peace shall prevail, and forecast results, and by divination decide upon the wisdom of measures; but the execution of war is more often a civil function. Usually, though not always, the great captains are shamans.

Ceremonial smoking was a universal rite, and had a deep religious significance. Smoke was considered an incense to the gods, and the act of smoking was the universal form of oath. The white man soon learned this form of attestation, and, in making treaties with the Indians, joined in the calumet ceremony.

Languages.—In the study of the languages of mankind it has been found that the lower the grade of culture is the greater is the number of distinct languages. In savagery, generally, a very small body of people speak the same tongue. It has always astonished scholars that so many distinct languages are spoken by the American Indians. In some cases a tribe having but a few score of people speak a language unrelated to that of any other people in the world, so far as can be discovered by philologic research. In other cases several languages are found to be related, so that a stock may be composed of many languages—e. g. the Algonquian. Where many languages and dialects belong to the same stock, it is usually found that the differentiation thus exhibited is due to the absorption of materials from other languages, which are often otherwise extinct. In this manner evidence is afforded that a greater number of languages existed among the tribes of the continent in some remote past time than at the present time. Such extinction of languages in historic times is a phenomenon well attested, and the same process of diminution seems to have gone on in prehistoric times.

In the year 1836 Albert Gallatin published the first attempt to classify these languages. Since that time much has been done in the field of research, and various scholars have added to the work begun by him, so that a fair account can now be given of the families or stocks of languages spoken in North America by the aboriginal tribes.

The terms "family" and "stock" are here applied interchangeably to a group of languages that are believed to be cognate. A single language is called a stock or family when it is not found to be cognate with any other language. Languages are said to be cognate when such relations between them are found that they are believed to have descended from a common ancestral speech. The evidence of cognation is derived exclusively from the vocabulary. Grammatic similarities are not supposed to furnish evidence of cognation, but to be phenomena in part relating to stage of culture and in part adventitious; for no extreme peculiarities of grammar, like the vowel mutations of the Hebrew or the monosyllabic separation of the Chinese, have been discovered among Indian tongues. In the growth of languages new words are formed by combination, and these new words change by attrition to secure economy of utterance, and also by assimilation (analogy) for economy of thought. In the comparison of languages for the purpose of systematic philology, it often becomes necessary to dismember compounded words, in order to compare the more primitive forms thus obtained. The paradigmatic words considered in grammatic treatises may often be the very words which should be dissected to discover in their elements primary affinities, but the comparison is still lexical, not grammatic. A lexical comparison is between vocal elements; a grammatic comparison is between grammatic methods, such, for example, as gender systems.

With terms thus defined, languages are supposed to be cognate when fundamental similarities are discovered in their lexical elements. When the members of a family of languages are to be classed in subdivisions and the history of such languages investigated, grammatic characteristics become of primary importance. The words of a language change by the methods described, but the fundamental elements or roots are more enduring. Grammatic methods also change, perhaps even more rapidly than words, and the changes may go on to such an extent that primitive methods are entirely lost, there being no radical grammatic elements to be preserved. Grammatic structure is but a phase or accident of growth, and not a primordial element of language. The roots of a language are its most permanent characteristics, and while the words which are formed from them may change so as to obscure these elements, or in some cases even to lose them, they are never all lost, but can be recovered in large part. The grammatic structure or plan of a language is forever changing, and in this respect the language may become entirely transformed.

The following is a table of the stocks found in whole or in part N. of Mexico extending to the Arctic Sea. The accompanying map exhibits the distribution of these stocks. For a more detailed account of each family, the reader is referred to the several articles in this cyclopædia given under the stock names here listed. See also INDIANS OF CENTRAL AMERICA and INDIANS OF SOUTH AMERICA.

Algonquian,	Keresan,	Shoshonean,
Athapascan,	Kiowan,	Siouan,
Attacapan,	Kitunahan,	Skittagetan,
Beothukan,	Koluschan,	Takilman,
Caddoan,	Kulanapan,	Tañoan,
Chimakuan,	Kusan,	Timuquanan,
Chimarikan,	Lutuamian,	Tonikan,
Chimmesyan,	Mariposan,	Tonkawan,
Chinookan,	Moquelumnan,	Uchean,
Chitimachan,	Muskhogean,	Waiilatpuan,
Chumashan,	Natchesan,	Wakashan,
Coahuiltecan,	Palaihnihan,	Washoan,
Copehan,	Piman,	Weitspekan,
Costanoan,	Pujunan,	Wishoskan,
Eskimauan,	Quoratean,	Yakonan,
Esselenian,	Salinan,	Yanan,
Iroquoian,	Salishan,	Yukian,
Kalapooian,	Sastean,	Yuman,
Karankawan,	Shahaptian,	Zuñian.

BIBLIOGRAPHY.—There is much material in existence, both printed and in manuscript, relating to the languages of America, especially to those of the eastern portion of the U. S. and of the whole of Mexico. In the latter country the printing of works for the use and instruction of the natives began almost with the introduction of the printing-press. One of the earliest, if not the first issues therefrom, was a *Doctrina Cristiana* in the Nahuatl language. The enthusiastic missionaries have left us grammars, dictionaries, and religious books of almost every one of the languages spoken in that region, and of some of them, notably the Nahuatl, a number of each have appeared. The earlier editions of most of these books are now scarce, but many of them have been reprinted in later times.

As in Mexico, so in the more northern latitudes; hardly had the press in what is now New England been set in motion before the printing of books in the native languages was begun. The first Bible printed in North America was the well-known Eliot Bible in the Massachusetts language, which was issued at Cambridge in 1661–63, and a second edition in 1685. This is now one of the most sought-after and highest-priced pieces of Americana. A full account of this work, with genealogies of all known copies, has appeared in one of the bulletins of the bureau of ethnology, *Bibliography of the Algonquian Languages*, also issued separately under the title *Bibliographic Notes on Eliot's Indian Bible*. Zeisberger, Heckewelder, Duponceau, Pickering, and later Trumbull, Brinton, and others, have done much to make known the details of the linguistic connection of the peoples of this east coast region.

Concerning the languages of the peoples occupying the interior of the northern half of the continent much has been printed also, the principal contributors to the literature of the various families being the missionaries Riggs and Williamson among the Siouan, Baraga and Lacombe among the Algonquian, Petitot and Morice among the Athapascan, Giorda among the Salishan, etc. West of the Rocky Mountains many vocabularies have been collected and published, but a much smaller proportion of grammars, dictionaries, and texts than among the more eastern peoples. Still, the first book of any kind printed on the western side of the continent was an Indian book entitled *Nez Perces First Book*, prepared by H. H. Spalding and printed at Clearwater, in what is now Idaho, in 1839.

The following is a brief list of the more important and better known publications of material relating to North American languages generally:

Gallatin, *A Synopsis of the Indian Tribes within the United States East of the Rocky Mountains and in the British and Russian Possessions in North America*, in the American Antiquarian Society's *Proceedings* (vol. ii., pp.

1-422, Cambridge, 1836); Hale, *Ethnography and Philology*, forms vol. vi. of Wilkes's U. S. Exploring Expedition, Philadelphia, 1846; Latham, a number of books and articles in the scientific periodicals from 1846 to 1862; Gallatin, *Hale's Indians of Northwest America, and Vocabularies of North America*, in the American Ethnological Society's *Transactions* (vol. ii., pp. xxiii.–clxxxviii., 1–130, New York, 1848); Schoolcraft, *Historical and Statistical Information Respecting the Indian Tribes of the United States* (6 vols., Philadelphia, 1851–1857); Buschmann, a number of articles in the Königliche Akademie der Wissenschaften zu Berlin, *Abhandlungen* from 1853 to 1870; Shea, *Library of American Linguistics* (vols. i.–xiii., and second series vols. i.–ii., New York, 1860–74); Pimentel, *Cuádros descriptivo y comparativo de las lénguas indígenas de Mexico* (3 vols., Mexico, 1874–75); Bancroft, *Native Races of the Pacific States of North America* (5 vols., New York, 1874–76); Powell, *Contributions to North American Ethnology* (vols. i.–vii., Washington, 1877–90); Brinton, *Library of Aboriginal American Literature* (vols. i.–viii., Philadelphia, 1882–90).

Various publications relating to the methods of studying Indian languages have been published, one by Gibbs, one by Trumbull, one by Matthews, and one by the national bureau of ethnology—Powell's *Introduction to the Study of Indian Languages*, the first edition of which was issued in 1877, the second in 1880.

The principal bibliographies of this subject are: Vater, *Linguarum totius orbis* (Berlin, 1815); Vater and Jülg, *Litteratur der Grammatiken, Lexika, und Wörtersammlungen aller Sprachen der Erde* (Berlin, 1847); Ludewig, *Literature of American Aboriginal Languages* (London, 1858); Pilling *Proof sheets of a Bibliography of North American Languages* (Washington, 1885). The bureau of ethnology is (1894) publishing a series of linguistic bibliographies, each treating of a single family of speech. Those so far issued are the Eskimauan, Siouan, Iroquoian, Muskhogean, Algonquian, Athapascan, Chinookan, Salishan, and Wakashan.

J. W. Powell.

Indians of South America: *Groups and Locations.*—The native tribes of South America have been less closely studied than those of the northern continent. This has been owing partly to the inaccessible character of large portions of the tropical regions, partly to the lax and inefficient governments which have had control in many parts. There are areas as large as the whole of the New England States about which no positive information has been obtained, and there are doubtless many linguistic stocks concerning which nothing is known. The classification which is most in accord with the several results of historic, geographic, and linguistic research divides the South American tribes into the following groups, regions, and members:

I. The South Pacific group, including—1, the Colombian region, occupied by the tribes of the Isthmus of Panama and the adjacent coast, as the Cunas, Chocos, Timotes, Changuinas, and others; the Chibchas, an important nation on the upper waters of the river Magdalena; the Paniquitas and Paezes, their neighbors; and the Coconucos, Andoas, Barbacoas, Caucas, and other small bands in the mountains of Southern Colombia.

2. The Peruvian region, including the Pacific coast from a few degrees N. of the equator to about 25° S. latitude. This western slope of the Andes, 2,000 miles long by a few hundred wide, was the home of the Kechuas or Inca nation, the Aymaras in Bolivia, the Yuncas on the coast to the N., and the Atacameños to the S.

II. The South Atlantic group. This embraced—1, the Amazonian region. This includes the vast hydrographic basin of the Amazon and Orinoco and the eastern slope of the Andes. Among the tribes inhabiting the former are the Tupis, who dwelt along the Atlantic shore of Brazil and extended far up the Amazon; the Tapuyas, who dwelt in the forests; the Caribs, whose scattered tribes extended from Southern Brazil to the coast of Guiana and the islands of the West Indies; the Arawaks, who roamed over quite as wide an area, though found principally in Guiana and on the West India islands and the Bahamas; and numerous others.

2. The Pampean region, in which are included the wide plains of the Argentine Republic called the pampas, the Gran Chaco, and the arid steppes of Patagonia, as well as the lower portions of Chili. These localities were inhabited by many different tribes, the most prominent members of which were the Araucanians of the pampas and of Chili, the Tobas and Matacas on the Grand Chaco, the Tzonecas of Patagonia, and the Yahgans of Tierra del Fuego.

History.—Although there has not been that complete disappearance of the native population in any part of South America which is seen in the U. S., the tendency has been to a gradual but certain extinction of the race. This was partly owing to merciless slave-hunting in early times, and later to the introduction of epidemic diseases which have in many instances completely annihilated whole tribes. The same system of distributing the Indians into *repartimientos* which prevailed in Spanish North America was introduced under the governors and viceroys of this portion of the continent, and led to the same disastrous results. The missionaries did their best to collect the savage bands into the mission stations, called *reductions*, and those of the Jesuits in Paraguay have always been regarded by historians as the most successful efforts ever made to Christianize and in a measure civilize the American natives. They failed through the hostility of Europeans, Spaniards, and Portuguese, and finally through the expulsion from Spanish soil of the order of the Jesuits. At present in all parts of South America the Indians have the same civil rights as the descendants of the Europeans, but, owing to their ignorance and to their long custom of subserviency, they rarely make the best use of their advantages. Their education is generally extremely defective, and they are easily imposed on by the unscrupulous among their white neighbors. For this reason they are inclined to avoid the whites and to resort to secluded valleys or the forests for their abodes.

Arts.—A few South American nations were found by the first explorers in a high state of culture. All of them lived in the valleys of the Andes or on its western slope, near the coast of the Pacific. In the north, about the head-waters of the Magdalena, were the Chibchas of Cundinamarca, whose antiquities have been elsewhere described. (See Chibchas and Chibchan Antiquities.) They were an inoffensive, agricultural people. Ignorant of the use of metals as a material for utensils or weapons, they manufactured both out of stone and wood. In this respect they were much behind the Kechuas. This nation was the most powerful and the most highly cultivated of any on the southern continent. Its language was spoken by adjoining tribes uninterruptedly from the vicinity of Quito on the N. down to the river Maule in Chili—a distance of 1,500 miles, or more. With few exceptions all these tribes were under the government of the Incas, whose capital was at Cuzco, and nearly all of them enjoyed a comparatively high state of the arts. Agriculture was cultivated with assiduity. The soil was artificially enriched with manure and guano brought from the sea islands; extensive systems of irrigation were carried out, and implements of bronze, as spades and hoes, took the place of the ruder implements of stone and wood. The crops were maize, potatoes, both white and sweet, yucca, peppers, tobacco, and cotton. Some domestic animals were reared, as the llama and the paco, which were bred for their hair, for sacrifices, and for beasts of burden, but not for draft, for riding, nor for milking. The herds often numbered many thousands. They had also a species of dog which had been bred from the native wolf; and monkeys, birds, and guinea-pigs were tamed for pets.

The hair of the various species of llama and cotton was spun and woven into a large variety of fabrics, often beautifully dyed and ornamented with geometric designs in lines and colors. Pottery-making was a favorite industry, and characteristic specimens from Peru are common in most public and private collections of this art. It is singularly varied in forms, natural objects being imitated in clay with fidelity and expression. The native potter was also an adept in molding curious trick-jars that do not empty their contents in the expected direction, or will emit a strange sound caused by the gurgling of the water, or may be used as whistles, flutes, and the like. In metal-work the native artists were remarkably adroit, and the early travelers expressed astonishment that these artificers could turn out ornamental work in gold and silver equal to that of the most famous goldsmiths of Spain. Specimens which have been preserved of this native work, while revealing a high degree of skill in technique and dexterous manipulation, do not indicate a developed sense of the beautiful, or an appreciation of the loftier motives of art. Bronze, although freely employed for tools and utensils, probably was not an artificial product, but a natural alloy, no mines of tin and no specimens of it in a pure form having been found in Peru.

Methods of Recording Ideas.—The Kechuas had not advanced in the direction of recording ideas as far as the Nahuas or Mayas of the northern continent. They had a crude form of picture-writing, and certain figures worked into their woven stuffs or carved on their public edifices apparently were intended to perpetuate the memory of events; but the method which they preferred, and which they had considerably developed, was one by means of knotted and colored strings, called quipus. In these, the length, the color, and the knotting of the strings, each bore a certain significance which could be interpreted by one versed in this system of records. Its use, however, must have been restricted, and we must regard as exaggerated the statements of some writers that the quipus contained the philosophy, the history, or the poetry of the nation, and could be translated by simply learning the key of the combinations. In regard to the architecture and sculpture of the Incas and Kechuas, see INCAN ANTIQUITIES.

The artistic development of the Aymaras and Yuncas, both neighbors and finally subjects of the Incas, was inferior to that of the Kechuas, but much above that of most of the South American tribes. They were agricultural, they built houses of sun-dried brick or stone, they were skilled potters, and they had some knowledge of the metallurgy of the precious metals. It has been questioned whether they learned these arts of the Kechuas or whether they developed them independently; but the differences in technique as well as the traditions of the Kechuas themselves render it probable that in great part they had spontaneously advanced this far on the road to civilization. The character of the Yunca architecture will be spoken of in the article on YUNCAN ANTIQUITIES.

The numerous nations in the Amazonian and Pampean regions had made comparatively little progress, except where they had been influenced by some reflex light of Kechuan culture. Such were the Omaguas, a Tupi tribe on the upper Amazon, who were sedentary and agricultural, and the Calchaquis of the Western Chaco, who were also city-builders. Generally they had no fixed homes, and depended on natural products for a subsistence. They were usually scantily clothed or went wholly naked. Some, as the Caribs of the northern shores, made excellent canoes and were skilled in their management; but others, as the Botocudos of Brazil, knew nothing about navigating the streams which flowed through the regions they inhabited. The latter, indeed, are often instanced as on the very lowest stage of savagery, not even possessed of some of the simplest arts. The same has been averred of the Yaghans of Tierra del Fuego, but these make seaworthy canoes which they manage with skill. The tribes of the pampas and the Chaco resemble in their arts the Indians of the great plains of the U. S. as they were before contact with civilization. The Araucanians of Chili were somewhat higher in culture, but had no knowledge of metals, did not construct permanent villages, and depended but partly or not at all on agriculture for their food-supply.

Institutions.—The government of the more savage hordes was of the simplest. The system of totems was, as a rule, less developed than in the northern continent. The chief was usually elected, but had to make good his claim to his place by constantly exercising greater skill or strength. Separation of tribes into small bands or even single families was very common among the Brazilian natives. In the more civilized nations, especially among the Kechuas, the family and tribal systems were well defined and intricate. They were based on the totemic theory of relationship, and in many features bear a striking analogy to those of the tribes of the northern continent. The statements so frequently made that the Inca was an autocratic hereditary ruler, comparable to the Czar of Russia, and that the family to which he belonged constituted a separate caste, speaking a secret language of its own, are false. The country was really governed by a council composed of the representatives of the different *ayllu*, or totems, and the language of the court, if we may call it such, was unquestionably the Kechua. Many of the members of the nation were conquered tribes who were little more than slaves, and these were moved to various parts of the realm and maintained in a condition of servitude. The policy of the rulers was to oblige all to speak the Kechua language, and to renounce their independent tribal traditions as soon as possible.

Languages.—For a long time it was supposed that South America had more independent linguistic stocks than North America. The researches of modern linguists have proved, however, that many languages believed by the missionaries and early interpreters to have no relationship are in fact derived from common sources. A few widely extended families seem to occupy most of the area of the Amazon and Orinoco regions. The Tupi, the Arawack, the Carib and the Tapuya, or Gren, cover at least four-fifths of this area. The Araucanian stretched from the Atlantic to the Pacific over most of Buenos Ayres and Chili. The extension of the Kechua has already been referred to. All these present the characteristic traits of native American languages. In their phonetics they differ greatly, the Araucanian and Tupi being agreeable to the ear and not difficult for the European to pronounce, while some dialects of the Aymara are described as most rough and with sounds almost impossible for a foreigner to imitate; the sound of the Onas tongue of the Fuegians has been likened to that of a person who is gargling, and is meeting difficulties in his throat. The Kechua is the richest in literature and has been the most thoroughly studied. It contains many songs by native writers, a remarkable drama called *Ollanta*, and various historical and theological works. It has been made the subject of special study by several European writers, as Markham, Tschudi, and Middendorf. The Chibcha language is now extinct, and all are yielding to the pressure of European tongues.

Religions.—Little need be said of the religion of the more savage tribes. It was usually a crude animism, and its teachers were the native priests or shamans, whose influence was generally most potent. They strengthened their position by claiming to have the power not merely to foretell events, but to influence the future for weal or woe, and were in frequent demand for both purposes. Among the Kechuas and generally during the rule of the Incas the official religion was a worship of the sun, but along with it were carried the myths of Viracocha, the national hero-god, whom it is not difficult to identify with the personifications of light, so common in the religions of tribes all over the continent. The ceremonies of the cult were elaborate, and were not associated with those bloody rites so common in Mexico and Yucatan. The mythology was rich, and many legends were current of this white and bearded Viracocha, who was reported to have come from the "house of the dawn" at some early day and to have brought them their civilization. The whites are still called *viracochas* in Peru, because they have the light color and beard of the mythical hero-god. A variety of ancestor-worship also prevailed, and a firm faith in the life after death connected with the resurrection of the body. The Kechuas therefore took great pains to mummify and preserve the corpses of the deceased, hiding them in underground vaults or in caves in the mountains. Even the hairs which dropped from the head during life and the parings of the nails were preserved, that nothing should be wanting to the completion of the body on the day of resurrection. In spite of their great attention to religious matters, the morality of the ancient Peruvians stood low, as is proved by their art relics, which abound in obscene devices, and prove them to have been a nation of debased habits, much inferior in this respect to the Mayas or Nahuas. It is not inconsistent with this that in some individual examples they seem to have risen above object-worship, and to have recognized the existence of a single supreme and spiritual ruler of the universe. Apparently authentic statements to this effect are found in some of the earliest writers.

AUTHORITIES.—Von Martius, *Ethnographie und Sprachenkunde Amerikas* (Leipzig, 1867); Ehrenreich, *Die Völkerstämme Brasiliens* (Berlin, 1892); von Tschudi, *Der Organismus der Kechua Sprache*; Brühl, *Die Culturvölker Amerikas* (Cincinnati, 1889); Brinton, *The American Race* (Philadelphia, 1891).

D. G. BRINTON.

Indian Shot: See CANNA.

Indian Summer: an expression applied in North America to a short season of pleasant weather which commonly occurs in November or the latter part of October. During this period the atmosphere is hazy and dry, the sky is red, the temperature mild, and rain is absent for an unusual length of time. The true cause of this phenomenon is not well understood. By the early colonists the haze, with its blueness or smoke color, was supposed to be real smoke from the burning over of the Western prairies at this period by the aborigines. Hence the name "Indian summer." In Canada it is called St. Martin's summer.

Revised by M. W. HARRINGTON.

Indian Territory: a territory of the U. S. of America (Western group); originally set apart by the Federal Government as a permanent home for the Indian tribes living on reservations E. of the Mississippi river. It is the only unorganized Territory in the U. S., being without the form of government prescribed by Congress for the Territories, and its inhabitants are governed by principal chiefs, by national legislatures, and by ancient tribal usages, under Federal supervision by officers of the bureau of Indian affairs.

Situation and Area.—It is situated between 33° 35′ and 37° N. lat., and 94° 30′ and (on the northern part) 96° and (on the southern part) 98° W. lon.; is bounded N. by Kansas and Oklahoma, E. by Missouri and Arkansas, S. by Texas, and W. by Oklahoma; and has an area of 31,400 sq. miles (20,096,000 acres).

Topography.—The surface in general is flat, with a gentle trend toward the S. E. Between the Red and the Canadian rivers are the Washita, Poteau, and San Blois Mountains. The highest elevation is 2,500 feet. The Red river forms the southern boundary of the territory. The Arkansas river enters it at the center of the northern line of the first western projection, where that river is joined by the Cimarron, and flows S. E. through the center of its eastern boundary. The north fork of the Canadian river enters N. of the Seminole reservation, the second western projection and the south fork forms the northern boundary of the southern projection, the forks uniting near Eufaula and entering the Arkansas river midway between Fort Gibson and the eastern boundary. The southern projection is drained chiefly by the Washita river, which flows S. E., empties into the Red river below Harney, and receives several large creeks on the W. E. of the Washita are the Blue, the Clear, Muddy, North Boggy, and the Black Fork rivers (emptying into the Arkansas), the Little river, emptying into the Red river in Arkansas, and the Buffalo and other creeks.

Geology.—Some Azoic rocks are found in the territory of the Cherokee and Creek Nations, but the principal formation of the Territory is Carboniferous, which contains valuable semi-bituminous coal measures. Mining is confined chiefly to the reservation of the Choctaw Nation in the southeast part of the Territory, where the census of 1890 reported a yield of 869,229 short tons, value $1,579,188. Valuable deposits of gold and silver are known to exist in the Arbuckle, Washita, and Rainy Mountains. For years the Indians have obtained all the gold and silver they needed for their trinkets from this locality, and have guarded the secret as best they could from white men. The inability of the Indians to undertake a survey and their peculiar treaty relations with the Federal Government have prevented any systematic study of the geology of the Territory.

Soil and Productions.—The eastern part has much rich and fertile land, and in some of the national reservations agriculture is carried on with success. The total area under cultivation is estimated at about 320,000 acres, and the products comprise corn, 3,724,093 bush.; wheat, 148,980 bush.; oats, 204,684 bush.; potatoes, 54,600 bush.; and sweet potatoes, 47,900 bush. Cotton-planting yields nearly 25,000 bales per annum, and small fruits thrive well. The live stock on the reservations comprise about 72,355 horses; 585,767 cattle; 36,673 sheep; and 309,860 swine. The largest tracts of woodland are situated in the S. and E. Among native trees are the oak, cottonwood, elm, yellow pine, and pecan.

Climate.—The climate is warm and inclined to dryness. In the southeast it is more moist, the average rainfall being 52 inches, but it is also hot, the mean annual temperature exceeding 60° F. In the central portion the mean annual temperature ranges from 57° to 59°, and the rainfall is 35 inches. At Fort Gibson the temperature in winter averages from 35° to 48°, in summer from 77° to 82°; and the annual rainfall, 36 inches.

Divisions.—The Territory is divided into reservation allotments for the Cherokee, the Chickasaw, the Choctaw, the Creek, and the Seminole Nations, the Cherokees occupying the northern part, the Chickasaws the southwest, the Choctaws the southeast, and the Creeks and Seminoles the central west. Representatives of other and smaller tribes have variously defined reservations, though the largest tribes, after the five civilized nations, have reservations in what has been Oklahoma Territory since 1890. Owing to tribal usages the population is a mixed one. Freedmen and other Negroes may become citizens of any of the Five Nations under local laws, and white men marrying Indian women are counted as citizens and can hold property. The following table shows approximately the area of the five national reservations and the population of each by the census of 1890:

NATIONS	Area in sq. miles.	Population.
Cherokee	7,861	56,775
Chickasaw	7,267	57,793
Choctaw	10,450	42,645
Creek	5,024	17,912
Seminole	312½	2,657
Totals	30,914½	177,782

Principal Towns.—Okmulgee, capital of the Creek Nation; Tahlequah, capital of the Cherokee Nation; Atoka, capital of the Choctaw Nation; Tishomingo, capital of the Chickasaw Nation; We-wo-ka, capital of the Seminole Nation; and Muscogee, chief commercial town and seat of the U. S. court for the Territory.

Population and Races.—The following table shows the constituents of the population according to the census of 1890:

NATIONS.	Indians.	Whites.	Colored.	Total.
Cherokee	25,357	27,176	4,242	56,775
Chickasaw	3,464	49,444	3,718	56,626
Choctaw	9,996	27,991	4,401	42,388
Creek	9,291	3,280	5,341	17,912
Seminole	2,539	96	22	2,657
Totals	50,647	107,987	17,724	176,358

Besides these there were in the Chickasaw Nation 1,167, and in the Choctaw Nation 257, Chinese and Indians of other tribes.

Industries.—The principal industries of the Indians are agriculture, stock-raising, wool-growing, and shawl and blanket manufacturing. Mining of various kinds is done by whites who have married into the nations.

Finances.—The following table shows the funds held by the U. S. Government for the nations, and the annual interest paid thereon:

NATIONS.	Trust funds.	Annual interest.
Cherokee	$2,616,829 35	$136,818 62
Chickasaw	1,306,695 65	68,221 44
Choctaw	585,000 99	33,750 04
Seminole	1,500,000 00	75,000 00
Creek	2,000,000 00	100,000 00
Totals	$8,008,525 99	$413,790 10

The interest on these funds is placed semi-annually with the U. S. assistant treasurer in St. Louis to the credit of the treasurer of each nation, and its expenditure is entirely under the control of the nation and its council.

Banking.—In 1893 there were 6 national, a commercial, and 2 private banks in the Territory. The national banks, which were in Ardmore and Purcell, Chickasaw Nation, Muscogee, Creek nation, and Vinita, Cherokee Nation, had combined capital of $360,000, and individual deposits of $36,427. The private banks were in Minco, Chickasaw Nation, and Tahlequah, Cherokee Nation, and the Bank of Commerce in Purcell.

Means of Communication.—The following shows the railway development of Indian and Oklahoma Territories combined, in miles: 1880, 289; 1888, 975; 1890, 1,260.65; 1892, 1,375. In 1893 Congress granted to several companies the right to extend their lines in and through the Territory.

Churches.—The census of 1890 gave the following statistics of the principal religious bodies:

DENOMINATIONS.	Organizations.	Churches and halls.	Members.	Value of church property.
Methodist Episcopal South	275	261	9,693	$59,600
Baptist South	181	166	9,147	35,765
Disciples of Christ	82	50	1,977	3,550
Presb. in the U. S. of America	70	68	1,803	39,763
Roman Catholic	17	17	1,240	5,850
Cumberland Presbyterians	53	52	1,229	11,645
Methodist Episcopal	32	32	838	9,750
Church of God	16	16	811	1,200

Schools.—The educational institutions are conducted by the several nations and the churches. According to the latest available reports, the Cherokee Nation had 110 primary schools, an orphan asylum, and male and female seminaries; the Choctaw, 170 primary schools, 2 orphan

MAP OF
INDIAN TERRITORY
Drawn and Engraved on Copper Plate
EXPRESSLY
FOR
JOHNSON'S CYCLOPÆDIA
WOODWARD
CHEROKEE OUTLET
GRANT
KAY
OSAGE
NATION
CHEROKEE
NATION
WOODS
GARFIELD
NOBLE
PERRY
PAWNEE
OSAGE
PAWNEE
KAY
GRANT
NEWKIRK
KANSAS
Arkansas City
Winfield
Independence
QUAPAWS
Vinita
Fort Supply
WOODWARD
ALVA
ENID
PONDCREEK
BEAVER
DAY
TALOGA
KINGFISHER
BLAINE
WATONGA
GUTHRIE
LOGAN
PAYNE
STILLWATER
LINCOLN
CREEK
CHANDLER
Muscogee
Gibson
TAHLEQUAH
CHEYENNE
ROGER
MILLS
ARAPAHOE
CANADIAN
OKLAHOMA
OKMULGEE
ELRENO
OKLAHOMA
NORMAN
WASHITA
CLOUD CHIEF
WICHITA
NATION
TECUMSEH
POTTA
WATOMIE
WEWOKA
SEMINOLE
NATION
CLEVELAND
GREER
KIOWA
AND
COMANCHE
NATIONS
APACHES
FT SILL
CHICKASAW
NATION
ATOKA
TISHOMINGO
Caddo
Denison
Sherman
Bells
Gainesville
Pilot Point
Decatur
Jacksboro
Weatherford
Fort Worth
Dallas
Waxahachie
Corsicana
Palestine
Henderson
Marshall
Jefferson
Clarksville
Texarkana
Paris
Bonham
Sherman
Honey Grove
Ladonia
Greenville
Commerce
Sulphur Springs
Mount Vernon
Pittsburg
Daingerfield
Mount Pleasant
Clarksville
Red River
Longitude West from Greenwich
Longitude West from Washington

asylums, a seminary, and an academy; the Chickasaw, 15 primary schools and 4 institutions of higher grade; and the Creek and Seminole together, 36 day-schools and several superior ones. The denominational institutions are the Baptist Academy, in Atoka; Indian University (Baptist), in Bacone; Harrell International Institute (Methodist-Episcopal South), in Muscogee; Spencer Academy (Presbyterian), in Nelson; New Hope Female Seminary (Methodist-Episcopal), in Oak Lodge; and Worcester Academy (Congregational), in Vinita.

Post-offices and Periodicals.—On Jan. 1, 1894, there were 313 post-offices, of which 5 were third-class, 5 presidential, 308 fourth-class, 78 money-order offices, and 3 postal-note offices. There were 1 daily, 28 weekly, 1 semi-monthly, and 2 monthly periodicals—total, 32.

History.—The Territory was included in the Louisiana purchase of 1803, and was selected by the U. S. Government in 1832 as a permanent home for the various Indian tribes then living E. of the Mississippi river. In 1834 Congress first set aside definite reservations for the largest tribes, and under treaty the Cherokees, Chickasaws, Choctaws, and Creeks removed thither, and at various intervals were followed by the Seminoles, Sacs and Foxes, Comanches, Modocs, Nez Perces, and other tribes. During the civil war a large part of the Indians of the Five Nations served in the Confederate army. The first partitioning of the Territory was in 1866, when the Creeks ceded to the U. S. Government the western half of their reservation, and the Seminoles all of theirs, and these lands, aggregating nearly 5,500,000 acres, became known as "the Oklahoma country." On Apr. 22, 1889, 3,000,000 acres of the Oklahoma country were thrown open to settlement by act of Congress, and by act approved May 2, 1890, the western half of Indian Territory, including the Oklahoma country and "the public land" strip, was erected into Oklahoma Territory. In Apr., 1892, the country of the Cheyennes and Arapahoes, containing 6,500 sq. miles, having been acquired from the Indians by treaty, was thrown open to settlement; and in 1893, the Cherokee Outlet, containing 9,110 sq. miles, was similarly opened and was incorporated with Oklahoma (*q. v.*). In 1892–93 bills were introduced into Congress providing (1) for the formation of constitutions and State governments in Oklahoma and Indian Territories, and (2) for negotiations preliminary to creating Indian Territory a regularly organized Territory, with a view to its admission into the Union as a State. Neither bill became a law, and the agitation for statehood was renewed in both Territories in 1894.

Revised by C. K. Adams.

Indian Tobacco: See Lobelia.

Indian University, The: was founded in 1880 by Prof. A. C. Bacone, who is president. The school was opened at Tahlequah, Indian Territory, in the mission-house of the American Baptist Home Mission Society. It was removed to Bacone, near Muscogee, Indian Territory, in 1885. Its object is to furnish a Christian education for the Indian young people, and to prepare teachers and preachers for evangelistic work. The institution occupies a commodious brick building, which with other property is worth $30,000.

Indian Yellow: See Purree.

India-rubber [so called from being first produced in India], **Caoutchouc**, or **Gum Elastic**: a peculiar substance composed of carbon and hydrogen, obtained from the juice of many different families of plants. Not all milky vegetable juices produce it; on the contrary, many of these juices yield gum resins free from caoutchouc.

History.—Although known at a very early date to the Peruvians and the Chinese, it was not introduced into Europe till the beginning of the eighteenth century. The first scientific notice with regard to it appeared in the *Transactions* of the French Academy of Sciences in 1735 from the pen of M. de la Condamine, who had noticed it, under the name of *cachuchu*, on his voyage down the Amazon. He describes it as in constant use among the natives in the form of bottles, boots, etc., and for making cloth water-proof. In 1751 he again called attention to "the elastic resin" of Cayenne (*Mém. de l'Acad. Royale*, 1751, pp. 17, 319), his friend M. Fresneau having reported its occurrence in the French colony of Cayenne. Herissant and Macquer (*Mém. de l'Acad. Roy.*, 1763, p. 49) published their chemical investigations on "solution of caoutchouc," and Macquer in 1768 "on means of dissolving the resin caoutchouc." Priestley (1770) mentioned the use of the gum for erasing lead-pencil marks, its cost being three shillings for "a cubical piece of about half an inch." Berniard published investigations in 1781; Fourcroy, on the sap in 1790; Grossart, "on the means of making instruments of gum elastic" in 1791. Important contributions to the chemistry of caoutchouc have been made by Faraday, Nees von Eisenbach and Marquart, Adriani, Himly, Payen, Bouchardat, and others, while the practical applications have been made by Mackintosh, Handcock, Goodyear, A. G. Day, and other inventors. The first use made of caoutchouc in Europe was for erasing pencil-marks; then it was used in solution in oil of turpentine and alcohol and in coal-tar naphtha for water-proofing cloth, the most important industry of this kind having been founded in 1823 by Mackintosh at Glasgow. Rubber overshoes, made by the natives of pure gum, were imported from Pará in 1825, and formed an important article of commerce till the increased price of the gum made it necessary to limit its use to a minimum in the manufacture of the cloth overshoes covered with rubber much diluted with litharge, whiting, etc., and vulcanized with sulphur, which are now in use. In 1826 Rattier and Guibal introduced machinery for cutting threads of rubber for the manufacture of elastic fabrics, which have since been extensively produced. The most important invention in regard to rubber was made by Charles Goodyear, of Massachusetts, in 1839, and patented June 15, 1844. It consisted in mixing with the rubber a small quantity of sulphur, fashioning the articles from the plastic material, and curing or vulcanizing the mixture by exposure to a temperature of 265° to 270° F. The product known as vulcanized rubber, possessed all the desirable properties of rubber with few of its objectionable qualities, and soon found a thousand important applications. The next great step in the rubber industry was the invention of hard rubber or vulcanite. The invention is claimed for Nelson Goodyear, but it is probable that the real inventor of flexible "whalebone" rubber was Austin G. Day, of Connecticut. Nelson Goodyear's caveat, filed Dec. 31, 1849, and his patent, granted May 6, 1851, are for a hard, stiff, inflexible compound, which he says is best obtained by heating a mixture of rubber, sulphur, magnesia, etc. Day patented Aug. 10, 1858, a mixture of 2 parts of rubber and 1 of sulphur, heated to 275° to 300° F., which he describes as flexible and elastic. This product, correctly described by Day, is the vulcanite or hard rubber which is so extensively manufactured for combs, penholders, jewelry, etc. Goodyear's brittle compound has never been an article of commerce, though his representatives monopolized Day's invention under the plea that it was covered by Goodyear's patent. See *Am. Chemist*, ii., 329.

Botany.—Caoutchouc is produced by numerous trees and shrubs of the families *Euphorbiaceæ*, *Urticaceæ*, *Artocarpaceæ*, *Asclepiadeæ*, and *Cinchonaceæ*. The best rubber, which is brought from Pará, South America, is obtained from the *Siphonia elastica* of Persoon, *Siphonia cachuchu* of Rich, *Jatropha elastica* of Linnæus, and *Hevea guianensis* of Aublet. Six or seven other species of *Siphonia* furnish caoutchouc in Central and South America. In India the most abundant rubber-tree is the *Ficus elastica*. It occurs on the coast of Coromandel, and is abundant over more than 10,000 sq. miles in Assam; grows solitary or in twofold or threefold groups. The main trunk of one tree measured 74 feet in circumference, while the girth of the main trunk with the supports immediately around it was 120 feet. The area covered by the expanded branches was 610 sq. feet, and the height of the central tree was 100 feet. It was computed that 43,340 of these trees grew within a length of 30 miles and a breadth of 8 miles in the forest near Ferozepur, in the district of Chardwar, in Assam. The same tree was said to be equally abundant in the district of Naudwar. The geographical range in Assam seemed to be between 25° 10 and 27° 20′ N. lat., and 90° 40′ and 95° 30′ E. lon. It grows on the slopes of hills up to an elevation of probably 2,250 feet. The *Urceola elastica* abounds in the islands of the Indian Archipelago, at Sumatra and Penang; produces the gintawan of the Malays. It is described as a creeper of growth so rapid that in five years it extends 200 feet, and is from 20 to 30 inches in girth; can yield by tapping, without being injured, 50 to 60 lb. of caoutchouc in one season. The families of plants yielding caoutchouc thrive in tropical parts of the world where high temperature is combined with moisture. The belt of land around the globe 500 miles N. and 500 miles S. of the equator abounds in trees producing the gum of India-rubber. Accordingly, caoutchouc is imported from Pará and other places in South America, from Central America, India, Singapore, Vera Cruz, Sierra Leone, Java, Sumatra, and Penang. The caoutchouc of Pará, South

America, is produced by *Siphonia elastica*; Central America, *Siphonia cautchouc*, *Castilloa elastica*; Penang, *Urceola elastica*; Sumatra, *Urceola elastica*; Java, a species of *Ficus*; India, *Ficus elastica*; Sierra Leone, a species of *Siphonia*. The industrial demands for India-rubber are so important that experiments have been made in Brazil with a view to cultivate the trees, as the cinchonas have been grown in the Himalayas. Caoutchouc occurs in opium to the extent of 4 or 5 per cent.; also in the juice of the milk-weed (*Asclepias*), which grows abundantly in the U. S. and Canada.

Sources of Supply.—Most of the rubber of commerce is derived from South America, from Pará, Central America, Mexico, Cartagena, etc.; smaller quantities from Java, Penang, Singapore, Assam, and Natal.

Collecting the Juice.—The juice is obtained by tapping, that drawn from old trees in the cold season being preferred, and the flow being greater the higher the incisions are made in the tree. When the bleeding is confined to the cold months, and not repeated too often, the trees do not appear to suffer in consequence.

Properties and Composition of the Juice.—Caoutchouc juice or sap has been exported from time to time to England in considerable quantities, but it is found more economical to prepare the crude rubber where the juice is collected. It resembles ordinary cow's milk in color and consistence. Its sp. gr. varies from 1·012 to 1·041. Several circumstances may conduce to give the commercial juice a grayish-brown, milky-gray, or pale-yellow color, but the pure juice, as it issues from the tree, is white. Dr. Adriani, who made some valuable (*Chem. News*, ii., 277, 289) experiments upon the fresh juice of the *Ficus elastica*, tapped by himself, says that as the general result of his experiments the quantity of solid matter contained in the milky juice decreases according to its being collected from incisions made in the higher and consequently younger parts of the plant.

If the juice be left at rest for a few hours the globules of the gum rise to the surface and float like cream on milk. Heat and agitation also cause the juice to coagulate.

Preparation of the Crude Caoutchouc.—The juice when dried over a fire becomes blackened by smoke, but when dried in the sun is very light-colored. Molds of clay and paddles are employed for this purpose. Lasts imported from the U. S. were formerly used in making overshoes. The last, on the end of a stick, was dipped into the milk, and held over the smoke to dry; it was then redipped, and the process repeated till the shoe was of sufficient thickness. When clay molds are used, they are subsequently broken and shaken out of the rubber bottles produced upon them. The juice is sometimes evaporated by solar heat, a pellicle of rubber forming on the surface, and being renewed as fast as it is removed until all the rubber is removed. These sheets are rolled into balls and combined into masses. In Nicaragua the juice is coagulated by an application of the juice of the bejuca vine. The coagulated mass is pressed into cakes by hand, and rolled out into a sheet on a board with a wooden roller. These sheets are called tortillas; they are about 2 feet in diameter and 2 inches thick. Faraday's advice for the purification of caoutchouc is to dilute the natural juice with four times its weight of water, and leave it at rest for twenty-four hours. The caoutchouc then separates and rises to the surface in the form of a cream. This is removed, diffused through a fresh quantity of water, and again left to rise to the surface. By repeating this operation till the wash-water is perfectly limpid, the caoutchouc may be obtained very nearly pure. It is then to be spread upon a plate of unglazed earthenware to absorb the water, and afterward pressed. The crude rubber of commerce presents different shapes and structure according to the method and care employed in its preparation. The purest from Pará is much more valuable than that from other localities. It appears in large bottles and thick plates, often entirely free from impurities, and very light-colored within. The Cartagena gum comes in very large lumps, often weighing 100 lb., and evidently formed by pressing thin sheets together. It is black within as well as without. The East Indian gum appears as a conglomerate of light and dark reddish-brown masses, often mixed with much wood, bark, leaves, gravel, etc. Crude impure rubber often undergoes a very injurious change, especially when exposed to the direct rays of the sun. It softens, becomes smeary and semi-fluid like tar. African gum is said to be more liable to suffer in this way than any other. In the interior of many of the balls which come from Brazil and the East Indies spots are often found of a viscid, tarry matter, which, when exposed to the air, seems to act like a ferment and decomposes the whole mass into a viscid, semi-fluid substance, which is good for nothing.

Physical Properties of Caoutchouc.—Pure caoutchouc freshly prepared is colorless and transparent. The dark color which it generally exhibits is attributed to soot and to aloëtic and other impurities, and to the action of sunlight and oxygen. It is a bad conductor of heat and a non-conductor of electricity. It develops electricity by friction. Its specific gravity varies from 0·920 to 0·962. "Its texture is not fibrous, but under the microscope it is seen to contain pores, irregularly rounded and very numerous, which communicate with each other, and become distended by capillary attraction in those liquids in which caoutchouc is not soluble. Thin sections of different qualities of gum, immersed in water during thirty days, absorbed from 18·7 to 26·4 per cent. Their volumes were increased from $\frac{1}{100}$ to $\frac{18}{100}$, and their tenacity and adhesiveness were impaired. It takes a very long time to eliminate water from thick masses of gum, since the exterior pores contract in drying, and thus retard the desiccation of the interior. Anhydrous alcohol, especially when warm, easily penetrates thin sections of caoutchouc. Immersed during eight days and warmed at intervals, the sections became opaque and more adhesive, even in the midst of the liquid; their volume was increased 9·4 per cent., and the weight 18 per cent., although the alcohol had dissolved $\frac{2}{100}$ of an oily, yellowish, fatty matter. After evaporation of the absorbed alcohol, the caoutchouc was less tenacious, more translucent and adhesive than before treatment." (*Payen.*) Freshly cut surfaces adhere easily and firmly when pressed together—a property which is made available in forming tubes and vessels out of sheet caoutchouc. By cold or long quiescence it becomes hard and stiff, but not brittle. It is capable of condensation under compression. A cube of 2½ inches was compressed $\frac{1}{10}$ under a pressure of 200 tons. It is perfectly elastic, becoming turbid and fibrous when strongly stretched. Gerard observed that fibers which may be extended to six times their length might again be extended six times after exposure to a temperature of 212° F., and that the original length could thus be extended from 1 to 16,625. The diameter being of course at the same time diminished, fibers of remarkable fineness are obtained in this way. Rubber may be temporarily deprived of its elasticity. If a strip be forcibly stretched, and while in this condition be quickly cooled, it will lose its elasticity, and may be left for an indefinite time without regaining it. A simple way of cooling the strip is to wet it and evaporate the water by vibrating it rapidly in the air. In the above condition the caoutchouc resembles frozen rubber, though it is not quite so rigid as it might be in such a state. It soon regains its elasticity on being subjected to an atmosphere of 70° F., or even much below this; but rubber deprived of its latent heat by compression has been kept several weeks in an atmosphere of 80° F. without returning to its normal condition. If the heat be raised much above 80°, or if the rubber be placed in contact with a good conductor at 80°, it gradually recovers its latent heat, and in a few minutes is restored to its original dimensions. If successive portions of the inelastic strip be pinched between the fingers, it contracts powerfully in these parts, leaving the others unaffected, thereby preserving the appearance of a string of knots or beads, which may be preserved in this state for any length of time if not handled and if kept at a moderate temperature. The junctions of the different portions continue abrupt and well defined, showing that there is no tendency to distribution or equilibrium of the latent heat. When the inelastic strip is inclosed in the hand a slight degree of coolness is felt from the rapid absorption of heat. The above peculiarity is stated to belong to the native gum, and to be hardly perceptible in the rubber prepared in either of the following methods: (1) solution in turpentine and subsequent drying, and (2) merely grinding the crude material to a pasty mass and reducing to thin sheets between heated rollers. Another method of rendering caoutchouc inelastic was employed in 1840 in the manufacture of "elastic tissues," to prepare the threads for receiving a sheath upon the braiding-machine. The threads were stretched by hand, in the act of winding upon the reel, to seven or eight times their natural length, and left two or three weeks in a state of tension. The elasticity in this case also may be restored by warming the rubber—rubbing it between the palms of the hands, for instance. Considerable heat is developed in the sudden extension of

caoutchouc. Mr. Brockedon states that he raised the temperature of an ounce of water two degrees in fifteen minutes, by collecting the heat evolved by the extension of caoutchouc thread. (*Blossom.*) An apparent paradox has been announced in the fact that India-rubber, when stretched and exposed to the heat, contracts instead of expanding—a fact very contrary to common experience as the result of the application of heat. This is explained, however, by the fact that the rubber is very porous and filled with air-cells, which, when the rubber is stretched, assume an elongated shape. When heat is applied it of course expands the rubber to a certain degree, but at the same time it expands the air-cells, which, by shortening their longitudinal axes, produces a virtual contraction of the rubber.

Effect of Heat on Caoutchouc.—"Below 0° C. it becomes hard and rigid. When heated it gradually softens, and at 120° C. (248° F.) begins to melt; when it is fused it remains greasy and semi-fluid after cooling, but if exposed to the air in thin layers gradually dries up and recovers its original properties, provided it has not been heated much above its melting-point. If, however, it be heated to 200° C. (398° F.), it begins to fume, and is converted into a viscid mass which no longer dries up. If mixed in this state with half its weight of lime slaked to powder, it forms a tenacious non-drying cement, which serves admirably for attaching glass plates to vessels with ground lips, such as are used for preserving anatomical preparations, as it forms an air-tight but easily loosened joint; if a drying cement be required, a quantity of red lead may be added equal in weight to the lime." (*Watts.*) By destructive distillation caoutchouc yields an empyreumatic oil called oil of caoutchouc, which is a mixture of a considerable number of hydrocarbons. The following compounds have been recognized by Bouchardat, Himly, and G. Williams:

SUBSTANCES.	Composition.	Boiling-point.
Tetrylene	C_4H_8	32° F.
Caoutchene	C_4H_8	58° F.
Isoprene	C_5H_8	100° F.
Caoutchin	$C_{10}H_{16}$	320°–356° F.
Heveene	C_nH_{2n}	599° F.

The residue left in the retort forms, when dissolved in oil, a varnish impervious to moisture and very elastic. Exposed at once to a red heat, caoutchouc yields 30,000 cubic feet of extremely rich gas to the ton, which is free from ammonia and sulphur compounds. Ignited in contact with the air, it burns with a sooty flame.

Effect of Water on Caoutchouc.—Water, whether hot or cold, has no solvent action upon it, but by long boiling in this liquid it swells to some extent, in which state it is affected by some solvents with greater facility than in its ordinary condition. Exposed to the air, the caoutchouc resumes after a time its original form, though the desiccation proceeds very slowly. The absorption of water by thin sheets has been already referred to. W. A. Miller noticed that when a sheet of the best masticated rubber was exposed in water, open to the air, to diffused light, it finally absorbed 87 per cent. of water, becoming white, opaque, slimy, and sticky. In this condition water could be squeezed out of it. In sea-water, under like conditions, it absorbed only 5 per cent.

Solubility of Caoutchouc.—In alcohol it swells and softens, but does not dissolve. Alcohol precipitates it from its solutions. It sometimes extracts a fatty, fusible yellow matter, which is probably an oxidation product. Ether, freed from alcohol by washing with water, dissolves caoutchouc in moderate quantity, leaving it on evaporation with its original properties, except that it adheres firmly like a sheet newly cut. "No solvent appears to make a complete solution of caoutchouc, but a mixture formed by the interposition of the dissolved portion between the pores of the insoluble substance, which is considerably swelled up, and has thus become easy to disintegrate. By employing a sufficient quantity of these solvents, renewed from time to time, without agitation, so as not to break the tumefied portion, the caoutchouc may be completely separated into two parts—viz., a substance perfectly soluble, ductile, and adhering strongly to the surface of bodies to which it is applied; and another substance, elastic, tenacious, and sparingly soluble. The proportions of these two principles vary with the quantity of the caoutchouc and the nature of the solvent employed. Anhydrous ether extracts from amber-colored caoutchouc 60 per cent. of white soluble matter; oil of turpentine separates from common caoutchouc 49 per cent. of soluble matter having a yellow color." (*Watts.*) Chloroform, oil of caoutchouc, oil of turpentine, oil of lavender, and many other essential oils are solvents for caoutchouc. A mixture of 1 part of caoutchouc with 11 of oil of turpentine, worked up to a thin paste, to which is then added ½ part of a hot concentrated solution of sulphide of potassium (K_2S_5), leaves the caoutchouc on evaporation perfectly elastic and without viscosity. Bisulphide of carbon is one of the best solvents, particularly when mixed with 6 to 8 per cent. of absolute alcohol. "If the alcohol be mixed with a little water, a dough is obtained, from which the caoutchouc may be drawn out into threads and spun. By Gerard's process gutta-percha is also soluble in the above mixtures of sulphuret of carbon and alcohol." (*Ure.*) Coal-tar naphtha, benzene, coal and shale oil naphthas, and petroleum naphtha are all solvents for caoutchouc. The naphtha solution or varnish was used in preparing the waterproof cloth of Mackintosh, being placed between two thicknesses of the cloth. A mixture of 50 parts of benzene and 70 parts of rectified turpentine has been recommended as a solvent for 26 parts of caoutchouc. The crude gum must first be boiled in water to remove dirt, etc., cut under water into sheets about one-third of an inch thick, rolled out into thin strips, and thoroughly dried in a heated room. The mixture of gum, etc., must be passed through a mill. The benzene and turpentine must be free from fat.

Action of Reagents on Caoutchouc.—Acids and alkalies have no effect on it when dilute, and little when concentrated unless heated. Sulphuric acid carbonizes it slightly on the surface when cold, but entirely decomposes it when hot, with the formation of carbonic and sulphurous acids. Strong nitric acid decomposes it, especially when heated, forming carbonic and oxalic acids, and evolving nitric oxide. The strongest potash lye does not attack it at a boiling heat. Gases, such as chlorine, sulphurous acid, and hydrofluoric acid, have no action upon it, but nitrous acid vapor readily attacks it. Ammonia, after a contact prolonged several months, seems to exert the curious influence of bringing it back to the state of an emulsion, and in this form it may be used as a varnish, as it recovers its peculiar qualities on drying. A thorough kneading with sulphur and exposure to heat for several hours converts it into vulcanized rubber, which, with less than 1 of sulphur to 4 of gum, is soft and pliable; with half its weight of sulphur, after exposure to a temperature above 280° F., it is hard and flexible, like whalebone—vulcanite. W. A. Miller has shown (*Journal London Chemical Society*, 1865, p. 273), in an investigation on the *Decay of Gutta-percha and Caoutchouc*, that caoutchouc is liable to deterioration by exposure to the action of oxygen in the presence of solar light, but the gum is less rapidly injured by their influence when in the native state than when it has been previously masticated. When subjected to the action of air, excluded from light, it does not experience any marked change, even during very long periods. It is, however, important to observe that the masticated rubber is much more porous than the unmanufactured caoutchouc. A sample of the best Pará rubber after nine months' exposure had gained 2·8 per cent., had become brown and sticky, and yielded to alcohol 11·81 per cent. of a resin containing C. 67·23, H. 9·54, O. 23·23.

Chemical Composition of Caoutchouc.—According to the experiments of Ure (*Philosophical Transactions*, 1822), confirmed by those of Faraday (*Quarterly Journal of Science, Literature and Art*, xi., 19), caoutchouc is composed wholly of carbon and hydrogen, containing 87·5 per cent. of carbon and 12·5 hydrogen. It is not, however, a simple proximate principle, but chiefly a mixture of two substances, one much more soluble in ether, benzene, and other liquids than the other. The following analyses have been published (Ure, *Philosophical Transactions*, 1822; Faraday, *Q. J. Sci.*, 1826, xxi., 19; G. Williams, *Journal of the Chemical Society*, xv., 123):

PARTS.	Ure.	Faraday.	G. Williams.	
			Brown.	Yellow.
Carbon	90·00	87·2	86·1	87·2
Hydrogen	9·12	12·8	12·3	12·8
Oxygen	0·88	[illegible]	[illegible]	
Nitrogen		[illegible]	0·7	
Loss		[illegible]	[illegible]	
Ash			0·9	
Totals	100·00	100·0	100·0	100·0

The following are the results of W. A. Miller's analyses of pure manufactured Pará rubber, compared with a sample of good sheet masticated or manufactured rubber (*Journal of the Chemical Society*, 1865, iii., 273):

PARTS.	Virgin.	Masticated.
Pure caoutchouc	96·60	96·64
Resin	1·80	2·06
Moisture	1·30	0·82
Ash	0·30	0·48
Totals	100·00	100·00

Deducting moisture and ash, the elementary composition gave—

PARTS.	Virgin.	Masticated
Carbon	85·82	85·53
Hydrogen	11·11	12·06
Oxygen	3·07	2·41
Totals	100·00	100·00

Adriani (*Chem. News*, ii., 1860, 314) found the following composition for a sample of caoutchouc which had been dried for months over sulphuric acid. The specimen was in part readily reduced to powder, and contained C. 87·25, H. 10·34, O. 11·40; total, 99·99. This sample also contained nitrogen, but its quantity was not determined. Several chemists report the presence of nitrogen in commercial caoutchouc. Adriani found that a sample of the above caoutchouc, after having been confined in very dry air for some weeks, lost its most prominent physical properties, and that a change set in which Payen compares with the growing rancid of fats and oils. "Perhaps," Adriani says, "the decomposition starts from that constituent portion which contains nitrogen, although this element is present in only minute quantity."

Caoutchouc manufactures have acquired enormous importance, and are found in every department of the industrial arts. The caoutchouc is used (1) in blocks, cakes, sheets, etc.; (2) in tapes or threads in woven fabrics for the production of elastic tissues; (3) as a varnish between two surfaces of cloth or on one surface, for the production of waterproof fabrics; (4) in solution alone or combined with other substances as a cement; (5) combined with a small quantity of sulphur and mixed with other substances, as soft vulcanized rubber, for the manufacture of overshoes, boots, gloves, waterproof clothing, and other goods, life-preservers, gas-bags, steam and water packing, belting, fire-hose, tubing, springs, artificial sponge, etc.; (6) combined with a larger proportion of sulphur and cured at a higher temperature, as hard vulcanized rubber, or vulcanite, for the manufacture of combs, pen and pencil holders, rulers, inkstands, buttons, canes, syringes, jewelry, and colored with vermilion for mountings for artificial teeth, etc.; (7) combined with asphalts, oils, sulphur, etc., and vulcanized, as the *kerite* of A. G. Day, for covering telegraph wire—a most valuable substitute for gutta-percha for air-lines, as it is not affected by atmospheric influences, which so quickly destroy the latter substance.

Purification of the Crude Gum.—The crude gum is soaked in hot water, to which is frequently added some soda lye in order to soften and to cleanse it. It is then masticated between most powerful rolls made of chilled iron, under streams of cold water. By this operation it is torn into shreds and cleansed of its impurities, and finally appears as a loose mat composed of shreds. These mats are placed in drying-rooms heated by steam for several weeks, to remove the moisture. When ready for use they are kneaded between smooth rolls, which are hollow and warmed by steam, one of which revolves much faster than the other. Here the gum is thoroughly mixed and reduced to a homogeneous mass, ready for cutting into any desired form, or for mixture with the materials necessary to convert it into soft or hard vulcanized rubber.

Cutting into sheets is performed by a self-acting machine, in which a straight steel blade, kept cool with water, vibrates in a horizontal position. Strips or bands are cut from disks by circular shears, like those used in paper-works. Threads of India-rubber, for weaving into elastic fabrics, are either natural or vulcanized; they are cut from ribbons or bands by circular cutting edges. "They are stretched, and kept extended till nearly deprived of their elasticity, and till they form a thread of moderate fineness. This thread is put into a braid-machine and covered with a sheath of cotton, silk, linen, or worsted. The clothed caoutchouc is then laid as warp in a loom and woven into a ribbon. When woven, it is exposed to the action of a hot smoothing-iron, which restores to the caoutchouc all its primitive elasticity, the ribbon retracts considerably in length, and the braiding corrugates equally upon the caoutchouc cores. Such bands possess a remarkable elasticity, combined with any desired degree of softness. Sometimes cloth is made of these braided strands of caoutchouc, used both as warp and as weft, which is therefore elastic in all directions. When a light fabric is required, the strands of caoutchouc, either naked or braided, are alternated with common warp yarns." (*Ure.*) *Round threads* are made from a mixture of India-rubber and bisulphide of carbon, with a little absolute alcohol. This paste is put into a vertical cylinder, somewhat similar to those which are used by the vermicelli-makers. The elastic matter, forced through by the piston, comes out in threads through small holes placed in a single row, in order that they may not overlie each other. The threads are received on an endless web of velvet in motion, and traverse in this way a course of 13 feet; they are then taken up by a web of common cloth, which passes over a space of 500 to 660 feet in about ten minutes. At the end of this journey they are sufficiently dried; the solvent is in great measure separated; the threads then quit the web, and are received into channels or grooves, which conduct them into small cups disposed in seven rows, in such manner that each one has its own particular cup. When the cups are full the filament is taken out, and is left for some days exposed to the action of the air. The threads produced by pressure have any required thickness, and this may be made to vary at pleasure. Experience has shown that a thickness of ·0394 of an inch is preferable for regular work, but these do not suffice for all kinds of fabrics; in a great number of cases finer threads are needed. For this purpose annealing is resorted to. The caoutchouc, being drawn out and exposed to a temperature of 239° F., no longer shrinks, but retains the length it has acquired, and moreover may even be drawn out anew. By thus stretching and annealing it successively a thread of caoutchouc may be brought to a degree of fineness limited only by the dexterity of the workman, and may, for example, be represented by a length of 98,400 feet to 2,205 lb. The thread thus obtained is of common caoutchouc, but nothing is simpler than to make, in the same manner, thread of vulcanized caoutchouc; for this purpose it is only necessary to incorporate the caoutchouc into a paste with flowers of sulphur, and to heat it to the temperature of 266° or 284°. Let it be noted in passing that at the temperature of 239°, necessary for the annealing of the stretched thread, no vulcanization takes place. (*Muspratt.*)

Waterproof fabrics are made by placing a varnish or paste of caoutchouc dissolved in any of its solvents, between two layers of cloth (double-texture fabrics) or on one side of the cloth (single-texture fabrics). The poorest kind of rubber may be used for this purpose. An objection existed to the single-texture fabrics, as the rubber surface was liable to become sticky and adhere when exposed to the sun, closely packed, or brought in contact with perspiration, hot surfaces, grease, etc. This was prevented by the sincalor process (*sine calore*, without heat), the nature of which was kept secret. It is also prevented by using vulcanized rubber, the mixture of rubber, sulphur, etc., being applied to the cloth by means of calender rolls, and vulcanized afterward.

Rubber cements, possessing astonishing adhesive properties, are made by combining solutions of caoutchouc in naphtha or other suitable solvent with other materials of a resinous character. Jeffrey's marine glue is made by dissolving 1 lb. of caoutchouc in 1 gal. coal-tar naphtha, and adding 20 lb. shell-lac. The mixture is gently heated till uniform, and is then poured out upon plates of iron to solidify. For use it is melted at a temperature of about 250° F. It is insoluble in water, and wood joined by it breaks sooner across the fibers than at the joint. A cheaper marine glue is made by substituting asphalt for the shell-lac. A liquid marine glue is made by increasing the quantity of the solvent.

Soft vulcanized caoutchouc was invented by Charles Goodyear, of Massachusetts. In the early introduction of India-rubber goods it was found that the articles were not only liable to serious injury from various causes, but they were often found to deteriorate and become almost useless after a few years of the most careful use. The following are some of the most serious disadvantages of the unvulcanized gum:

(1) It becomes rigid and inflexible in cold weather. (2) It is softened and decomposed in the sun and hot weather. (3) It is very soluble, and quickly dissolved when brought in contact with any kind of grease, essential or fatty oils, and, though more slowly, yet as surely, dissolved by perspiration. (4) It is, in its native state, so very adhesive that when any two surfaces are brought in contact they become, by slight pressure, one mass that can not be separated. (5) It loses its elasticity by continued tension or constant use. (6) It has a very unpleasant odor. The Mackintosh goods, in which a solvent was used, were less liable to damage and decomposition, because the gum was protected by being spread between two cloths. Even in these goods, however, the gum was found to melt and penetrate through the meshes of the cloth in a warm climate, or when much worn by those who perspire freely, and purchasers were cautioned against approaching too near the fire with the goods. In the summer of 1838 Goodyear became acquainted with Nathaniel Hayward, who had been employed as foreman of the Eagle Company at Woburn, where he had made use of sulphur by impregnating the solvent with it. It was through him that Goodyear received his first knowledge of the use of sulphur as a drier of gum-elastic. Goodyear purchased the claim for combining sulphur with India-rubber, for which a patent was taken out Feb. 24, 1839. It should be remarked that this claim was for the use of sulphur, and not for the heating or vulcanizing process, which Goodyear subsequently discovered. He manufactured a large lot of goods, containing sulphur, but they all decomposed in a short time. While experimenting upon some of the material, after the failure of the compound, to ascertain the effect of heat upon it, he was surprised to find that the specimen, being carelessly brought in contact with a hot stove, charred like leather. He inferred directly that if the process of charring could be stopped at the right point, it might divest the gum of its native adhesiveness throughout. Upon further trial he was convinced of the correctness of this inference by finding that India-rubber could not be melted in boiling sulphur at a heat never so great, but always charred. On heating one of his specimens before an open fire, he noticed upon the edge of the charred portions of the fabric a line or border that was not charred, but perfectly cured. His discovery was now established; it remained only to complete it in detail. In speaking previously of the obstacles that stood in his way, Goodyear says: "No one who had any knowledge of the nature of the gum would be likely to apply a high degree of heat to it from design, when it was so well known that it would melt at a low temperature." The process of treating caoutchouc which Goodyear thus discovered is known as vulcanization. The product of his manufacture is known as soft rubber. Since there are other processes for treating caoutchouc different from that of Charles Goodyear, which in some instances yield an entirely different product, but all of which pass under the same general designation of "vulcanization," the latter term must be understood as embracing the treatment of caoutchouc with some form of sulphur to effect certain changes in its properties, and to yield a soft or a hard product.

The following valuable properties of the soft vulcanized rubber are enumerated by Goodyear: (1) *Elasticity.*—Improved and increased as regards strength and continuance, and also made available in all climates and in all circumstances. (2) *Pliability.*—Pliable in the highest degree, not being affected or made rigid by the greatest cold. (3) *Durability.*—Unchanged by time, whether kept in a wet or dry state. (4) *Insolubility.*—Not absolutely insoluble, because it can be softened, and even dissolved, by powerful solvents of the gum when heated and boiled. Its power of resistance to solvents and other destructive chemical agents is, however, very great. In a few words, it is either improved or remains uninjured when exposed to agents that destroy other fabrics and even wood, leather, and the metals, such as iron, copper, and brass. (5) *Unalterability by Climate and Artificial Heat.*—Endurance of artificial heat very great; when compounded with particular reference to this quality, and with a larger proportion of sulphur than is ordinarily used, it will bear a heat of 300° F. Above this it chars, but does not melt. (6) *Inadhesiveness.*—Entirely free from this objection, no way being yet found to unite it firmly, even when it is desired. (7) *Impermeability to Air, Gases, and Liquids.*—Improved for retaining water and other liquids, as it is not softened by them, but it can not be stated that it is more impervious to air and gases. (8) *Plasticity.*—The facility with which it is formed into any shape before being heated in the oven is not surpassed by wax or by lead, or any other material. (9) *Non-electric Property.*—One of the best non-conductors of electricity. (10) *Odor.*—According to Goodyear, vulcanized India-rubber is to a very great extent freed from the natural offensive odor of the native gum.

Theory of Vulcanization.—The sulphur appears to combine directly with the rubber; the total change in properties and insolubility in the ordinary solvents for rubber makes the theory of mere mechanical mixture untenable, while the fact that no appreciable quantity of sulphuretted hydrogen is evolved during the operation makes it improbable that a substitution of sulphur for hydrogen occurs. In experiments conducted by Prof. Silliman and the writer it was found that mixtures of sulphur, even when vulcanized into hard vulcanite, lost only 2 to 3 per cent. in weight, of which much was moisture; in two cases the sulphuretted hydrogen produced amounted to 0·36–0·59 per cent. of the weight of the mixture.

The manufacture of soft vulcanite goods is effected by simple mechanical means. The purified and masticated gum is kneaded on the warm rolls with the proper proportion of sulphur; less than one-fourth the weight of the gum, Goodyear's patent states, generally 5 to 6 per cent. in practice. Various other substances are added to increase the volume of the product and make the caoutchouc, which is the most expensive material, go further. The following is a mixture in common use: rubber 16, sulphur 1, whiting 14, white lead 2½, litharge 2. Lead compounds blacken the goods by forming black sulphide of lead; oxide of zinc is sometimes used in its place. Refuse vulcanized rubber and fabrics composed of rubber and cloth are torn up on the masticating rolls and incorporated with the mass for some goods. After the mass is kneaded into a uniform mixture, it is taken from the rolls in the form of a thick sheet and rolled into smooth sheets between calender rolls. From these plastic sheets articles of any desired shape are readily formed by simple mechanical means. The mixture may also be applied on the calender rolls to one or both sides of cloth or canvas. As the mixture is in this condition very adhesive, the coated cloth can be cut and fashioned into overshoes, boots, fire-hose, etc., each article consisting practically of one single piece after vulcanization. The combination with the rubber of cloth or canvas gives great strength to the manufactured articles, while the rubber gives the waterproof properties. Fire-hose made of several layers of rubber-coated cotton duck was found by Prof. Henry Morton and the writer to withstand an internal water-pressure of from 375 to 435 lb. to the square inch. Sheets built up of successive layers of canvas and rubber are extensively employed for valves and for packing.

The heating or vulcanizing is conducted in very strong horizontal cast-iron cylinders (the heaters), one end of which is movable and serves as a door. The goods to be vulcanized are loaded upon a car and run in on a railway which extends along the bottom of the heater. To prevent adhesion of the different articles, powdered soapstone (steatite) is freely used, the goods being often packed in boxes filled with this substance. When the heater is charged the door is securely fastened, and steam from a high-pressure boiler let in till the desired temperature is secured. The temperature employed and the time of exposure vary somewhat according to the character of the articles; five hours at 240° F. is stated to be the temperature employed for fire-hose. The following four and a half hour "heat" is used in some of the factories where smaller articles are made: 1 hour at 255° F.; 1 hour at 260°; 1 hour at 265°; 1 hour at 270°; ½ hour at 275°. The temperature should never exceed 280° F.

Parkes's cold vulcanizing process was patented by Alexander Parkes, of Birmingham, and has been used to a limited extent, and, owing to the fact that the sulphurization of the caoutchouc is more or less superficial, the manufactured articles are inferior to those vulcanized by Goodyear's process; in fact, they are sometimes almost worthless. The caoutchouc articles are simply immersed in a mixture of 40 parts of sulphide of carbon and 1 part of chloride of sulphur; they are next placed in a room heated to 70° F., and when all the sulphide of carbon has been volatilized the process is so far complete that it is only requisite to boil them in a solution of 1 lb. of caustic potassa to 3 gal. of water, the vulcanized caoutchouc being next washed to remove excess of alkali. Humphrey in 1870 introduced the use of gasolene from petroleum, instead of sulphide of carbon, as the former fluid dissolves chloride of sulphur readily.

Other methods of vulcanization have been tried, but with little success: (1) By immersing the sheet caoutchouc in sulphur heated to 233° F. till it has absorbed about one-fifteenth of its weight, and then heating it for a short time to 302° F., or by immersing the caoutchouc in sulphur heated to 302° F., and keeping up that temperature till the sulphuration is complete. (2) Handcock: exposing the rubber in sheets to vapors of sulphur. (3) H. Gaultier de Claubry (1860) vulcanizes caoutchouc by the aid of bleaching-powder and flowers of sulphur. This mixture produces chloride of sulphur, and the caoutchouc treated by it contains some chloride of calcium. (4) Gérard: by immersing articles of caoutchouc in a solution of polysulphide of calcium or potassium, marking 25 Baumé, keeping them in it for three hours at a temperature of 300° F. under a pressure of 5 atmospheres or 75 lb. to the square inch. The goods are finally washed with an alkaline lye of 60° B. (5) Burke: mixing the rubber with 5 to 15 per cent. of orange sulphide of antimony (*kermes*), and heating the articles fashioned from it to 250°–280° F.

Hard vulcanized caoutchouc, vulcanite, ebonite, hard rubber, is prepared by kneading together 16 parts of rubber and 8 of sulphur in the manner already described for soft rubber, rolling the plastic mixture into sheets, rods, tubes, and other forms, and vulcanizing in a steam-tight heater. To secure a smooth, polished surface each article may be enveloped in thick tin-foil, which is stripped off after vulcanization. The articles are placed in the heater in trays filled with powdered soapstone or water. The product is very hard, and possesses a spring-like elasticity, like that of whalebone. It may be sawed, filed, and worked in a lathe like ivory, and admits a very high polish. Its color is dark brown, nearly black. It may be colored jet black by the addition of a little litharge, red by vermilion. A mixture of 16 parts of rubber, 6 of sulphur, and 12 of vermilion is bright red, and is much used. When properly made vulcanite is not brittle; an elastic shred may be cut with a penknife from its edge. The careful regulation of the temperature of the heater during its vulcanization is necessary to secure the best product. The following heat gives excellent results: 1 hour at 275° F.; 3 hours at 300°; 3 hours at 305°. Vulcanite differs from soft rubber in the proportion of sulphur used, in the high heats used in curing it, and in its hardness. The turnings and borings of vulcanite are reduced to a fine powder and pressed in hot iron molds for the manufacture of buttons, strips for knife-handles, etc. The vulcanite is not attacked by solvents, neither those which dissolve the pure caoutchouc nor the mineral acids and alkalies. On this account it is used in place of glass for cups for galvanic batteries. It is also especially distinguished by the large quantity of electricity which it evolves when rubbed; hence it makes an excellent material for the plates of electrical machines. It will be impossible to enumerate the various applications of this material; some of them have been already mentioned. An important application is for the manufacture of emery-wheels and hones for sharpening scythes, sickles, etc. For this purpose it is mixed before vulcanizing with emery or quartz. The following proportions give excellent results: rubber, 11 parts; sulphur, 5 parts; emery, 160 parts.

Dental vulcanite, consisting of rubber 16, sulphur 6 to 8, vermilion 12 to 16, was mixed and sold to the dentists, who used it for plates for mounting artificial teeth. This is one of the most important applications of hard rubber ever made, as it greatly reduced the cost of artificial teeth. The dentist makes a mold of the mouth in plaster-of-Paris, sets a plate of the plastic-rubber mixture in it, arranges the porcelain teeth in proper position, and heats the whole in a small vulcanizer over a gas-burner, thus converting the whole into a light plate of teeth which fits the mouth of the patient. The high charges of the patentees of this application of vulcanite drove the dentists to seek to evade the patents. The greatest success attended the efforts of J. B. Newbrough and E. Fagan, of New York, who obtained patents for hardening rubber by means of iodine and bromine. Considerable litigation resulted, which finally terminated in a compromise. It was found that rubber could be hardened by iodine and colored with oxide of iron without the aid of any sulphur, but when colored with vermilion a certain addition of sulphur was required—less, however, than the minimum of the hard-rubber patents. (See *Am. Chemist*, ii., 373.) Newbrough also succeeded in hardening rubber with a product obtained by treating oil of turpentine with oil of vitriol.

Compounds of coal-tar, asphalt, etc., with caoutchouc have been frequently tested, but they can be used only for inferior goods.

Kerite is a compound containing coal-tar and asphalt, with several other substances, the exact nature of which is a secret. It was invented by Austin G. Day, and is extensively used for covering telegraph wire. It is cheaper than gutta-percha, and possesses the additional advantage of resisting the atmospheric influences which destroy this substance.

Kamptulicon is the name given to a mixture of India-rubber, gutta-percha, and cork or wood sawdust. It is rolled into sheets, vulcanized by contact with sulphur, and used for floor-cloth, which is usually of a uniform dark-gray color, but is sometimes varied with colored figures. It is also called cork-carpet.

Artificial caoutchouc has been made from oil, chloride of sulphur, and collodion (*Parksene*), and from the resinous body produced by the oxidation of linseed oil (*Campticon*).

In the year 1890 16,500,000 kilog. of rubber were exported from Brazil.

Literature.—*Gum-elastic and its Varieties, with a Detailed Account of its Applications and Uses, and of the Discovery of Vulcanization by Charles Goodyear* (New Haven, Conn., 1853); Desormeaux, *Nouveau manuel complet du Fabricant d'objets en Caoutchouc, en Gutta-percha et en Gomme factice* (Manuel Roret, Paris, 1855); Handcock, *The Caoutchouc or India-rubber Manufacture in England* (London, 1857); Richard, *The Boot and Shoe Manufacturer's Guide* (including a history of India-rubber and gutta-percha, Boston, 1858); Clouth, *Die Kautschukindustrie* (1879); Hoffer, *Kautschuk und Gutta-percha* (1880); *id.*, *Caoutchouc and Gutta-percha* (1883); Heinzerling, *Die Fabrikation der Kautschuk u. Gutta-percha Waaren* (1883); Blossom, *Caoutchouc and Gutta-percha considered chiefly in their Chemical Relations* (a most valuable series of papers, written largely from notes collected by the writer of this article, and extensively quoted here); *Am. Chemist*, ii., 81, 137, 173, 225, 287, 329, 373. See also Ure's *Dict.*, Payen's *Précis de Chimie Industrielle*, *Handw. d. Chemie*, Muspratt's *Chemistry*, especially the last German edition; Thorpe, *Dictionary of Applied Chemistry* (1891).

Revised by Ira Remsen.

Indican: See Indigo.

Indictment [for *inditement* with *c* in imitation of Latin; deriv. of *indict*, *indite*, from O. Fr. *inditer*, *enditer* < Lat. *indictare*, frequentative of *indicere*, *indictum*, declare; *in*, in, against + *dicere*, say]: a written accusation of one or more persons of an indictable offense, consisting of a felony or misdemeanor, preferred to, and presented upon oath by, a grand jury. It is distinguished from a Presentment (*q. v.*), which is an accusation made by the grand jury of its own motion without a bill of indictment laid before it, and from an Information (*q. v.*), which is made by the prosecuting officer without the grand jury.

The use of indictments is the principal method by which criminal prosecutions have been carried on from the earliest period of the common law, although this was not the only method employed. When the draft of an indictment, prepared by the attorney-general, district attorney, or other proper officer representing the government, and duly laid before a grand jury, has been found "a true bill" upon the basis of the charges therein contained, the prisoner is placed on trial at a regular session of the proper court, before a petit jury. (See Grand Jury and Jury.) When a presentment is made by the grand jury, an indictment containing the charges presented is drawn up subsequently, and upon this the party accused is tried.

The common-law rules governing the drawing of indictments are in outline as follows: An indictment consists of the caption, the statement or body of the indictment, and the conclusion.

The *caption* is a formal preliminary statement and no part of the indictment proper. Its purpose is to show an observance of such forms and rules of law as must be complied with before the finding of the indictment, in order that the court may acquire jurisdiction in the particular instance. It states the name and term of the court in which the indictment was found, the names of the justices, and the fact that the grand jury was lawfully convened and duly sworn and charged. Changes may be made in it without a resubmission to the grand jury. (*State* vs. *Jones*, 9 N. J. L. 357; also 17 Am. Dec. 483.) The *statement* or *body*

of the indictment is a narrative of the offense charged, and must contain a full and particular description of the alleged crime, and have such a degree of certainty and precision in the accusation that it may be seen by the court that the act charged, if true, would constitute a crime. Its purpose is to apprise the accused exactly of what offense he is charged, so that he can make his defense, and can be sufficiently protected against a second prosecution for the same offense; and to enable the court to determine as a matter of law whether a conviction would be valid if one should be had.

The name of the prisoner must be stated, or if that is not known a description from which he could be adequately identified, the time and place at which the offense was committed (though it is not generally necessary that allegations on these particular points should be proved exactly as charged), and, as a general rule, an explicit charge of everything necessary to constitute the offense, embracing every material circumstance included in the definition of the alleged crime.

The time stated must show that the offense was committed within the period prescribed by law for the prosecution of the particular crime alleged, when there is such a limitation; and in certain classes of cases the time must be specified correctly, and any variance between the allegation and the proof will be fatal. Thus, in the indictment for perjury, the day on which the perjury was committed must be truly stated. The place named must be within the jurisdiction of the court. Whenever an indictment charges an offense created or declared by statute, it must be accurately framed in accordance with the provisions of the statute. Various rules of law must be observed, to prevent the allegations of an indictment from being absurd, inconsistent, or repugnant. Particular technical averments are sometimes necessary to be employed. Thus, in a charge of felony, the word "feloniously" must be used; in a case of burglary, the word "burglariously." So larceny is alleged by the words "took and carried away." It is an allowable and frequent practice to describe the same offense in the indictment in several different ways, the successive statements being termed "counts;" and the object of this is to prevent the possibility of a variance or failure of proof.

The *conclusion* of the indictment is a formal statement with which the law requires that it should end. The usual phraseology is, "against the peace and dignity" of the king or commonwealth. In indictments for a statutory offense it is customary to use also the phrase "contrary to the form of the statute in such case made and provided." Since in the U. S. crimes are generally defined by statute, this mode of concluding the indictment is commonly employed. The mode of framing the body of the indictment is also sometimes modified by statutory provisions. The body of an indictment can not be amended without a resubmission to the grand jury. *Ex parte* Bain, 121 U. S. 1.

At common law the defendant was not, in cases of treason and felony, entitled to a copy of the indictment. In prosecutions for high treason the rule was changed in England by statute, and it was provided that a copy should be given to him ten days before the trial. But in other cases of felony the rule remained unaltered. The court at the time of the arraignment would order the indictment to be read over slowly to the prisoner, but would grant no further privilege in this respect. This harsh rule has been abolished by statute in several of the U. S.

Revised by F. Sturges Allen.

Indies, East: See East Indies.

Indies, West: See Antilles and West Indies.

Indigestion: See Dyspepsia.

Indighir'ka, or **Zapadnaia Kolima**, zăă-păăd-nī'ăă-kō-lee'măă: a river of Eastern Siberia. It rises in the Yablonoi Mountains, in the government of Jakutsk, and enters the Arctic Ocean in lon. 150° E., after a course of 1,000 miles, mostly through deserts and frozen marshes. A few villages are scattered along its banks, whose inhabitants live exclusively by hunting. Revised by M. W. Harrington.

Indigo [from Span. *indigo* < Lat. *in'dicum* = Gr. *ἰνδικόν*, indigo, liter., the Indian stuff, neut. of *Ἰνδικός*, Indian. See India]: the most important blue dye known. It is obtained from several species of the genus *Indigofera* which grow principally in warm climates. It has also been noticed in morbid urine, and Dr. Schunck has shown that it may be obtained from the urine of healthy men and animals by the action of strong acids. It has also been observed in the milk of cows.

History.—This most valuable dyeing substance was used as a dyestuff in India and Egypt long before the Christian era, and the Romans were acquainted with it, although they used it only as a pigment, not knowing how to render it soluble, and so available for dyeing. It is only since the sixteenth century, or from the time of the discovery of the passage to India round the Cape of Good Hope, that it has become generally known in Europe; and its employment as a dye was greatly retarded by the opposition it met with from the large vested interests of the woad-cultivators, who induced the British, French, and German Governments to promulgate several enactments against its use. So severe were some of them that Henry IV. of France issued an edict condemning to death any one who used that pernicious drug called the "devil's food." It is only since the year 1737 that the French dyers have had the right of using indigo without restriction. It was urged against this dye that it was fugitive, and even prejudicial to the wool. The Dutch were the first to introduce it.

Botany.—This coloring-matter is furnished by the leaves of several species of plants belonging to very different genera and orders—from *Indigofera tinctoria*, *I. anil*, *I.*

Indigofera.

disperma, and *I. pseudotinctoria*, cultivated especially in the East and West Indies; also from *Nerium tinctorium* and *Calanthe veratrifolia*, natives of Hindustan, and *Wrightia tinctoria* of South India; *Asclepias tinctoria* and *Marsdenia tinctoria* of Sumatra; *Polygonum tinctorium*, *Isatis indigotica*, *Justicia tinctoria*, and *Bletia Tankervilliæ* of China; and *Amorpha fruticosa* of South Carolina. The only European plant which yields true indigo-blue is *Isatis tinctoria*, Woad (*q. v.*). This plant was much used in Europe before the introduction of indigo, but it is inferior in quality and small in quantity, and is now used only as an addition to the indigo-vat. Many other European plants yield blue coloring-matters, but they are not believed to be identical with indigo.

Cultivation.—The indigo-plants require a warm climate, with not too much rain. The seeds are sown about Apr. 1, and in the latter part of June the flower-buds burst and the plants will bear cutting. Two months later a second inferior cutting is taken, and a third and fourth of diminished value may be made. The cultivation of indigo-plants in the U. S., although frequently tried, has never proved very successful commercially.

Indican.—The plants do not contain the indigo when they are gathered, but a peculiar substance, indican, which is a yellow, transparent, glutinous solid, soluble in alcohol,

ether, and water. Indican is a glucoside, and is converted by fermentation or by boiling with sulphuric or hydrochloric acid into indigo-blue, indigo-red, and a peculiar glucose-like body, indiglucin:

$$\underset{\text{Indican.}}{C_{26}H_{31}NO_{17}} + 2H_2O = \underset{\text{Indigo-blue.}}{C_8H_5NO} + 3\underset{\text{Indiglucin.}}{C_6H_{10}O_6}.$$

Fermentation does not appear to be essential, as a mere infusion of the plant in hot water deposits indigo on standing in the air. Indican yields by decomposition, besides indigo-blue and indigo-red, a variety of bodies, as oxindicanine, oxindicasin, indicasin, indicanin, indifulvin, indihumin, etc. (See *Watts's Dict.*, article *Indigo.*) Indican has been found in human blood and urine.

The extraction of the indigo in Bengal is effected either from fresh or dry leaves. (1) *From the Fresh Leaves.*—Two large stone cisterns are provided—the steeper, or fermenting-vat, about 20 feet square and 3 feet deep, and the beater, standing lower, of the same width, but a third longer. The fresh plants, tied in bundles, are stratified in the steeper and fastened down by beams. They are then covered with water, when fermentation begins at once, and is completed in fourteen or fifteen hours. The liquid is at first yellow, but becomes dark green, and exhibits a blue scum. It is drawn off into the beater and then beaten with oars or shovels called busquets. Paddle-wheels or dashers have been used. After being beaten for an hour and a half, if the previous fermentation has been satisfactory the indigo agglomerates into flocks and settles as a precipitate. The object of the beating is to introduce oxygen. The precipitation may be hastened by the addition of lime-water, but this throws down extractive matter and makes the indigo hard and red. The precipitate is allowed to subside, the supernatant water is drawn off, and the moist precipitate is strained through a coarse bag. It is then boiled to separate a yellow extractive matter and increase the density and intensity of its color. It is then sent to the dripping or filtering vat, which contains a perforated false bottom covered with cotton cloth. The drained magma is placed in a strong bag and squeezed in a press, and the moist mass is cut with a brass wire into cubes about 3 inches each way. The cubes are dried in the air, a white efflorescence which appears during the drying being removed with a brush: 1,000 parts of the liquor from the steeping-vat yield 0·50 to 0·75 indigo. (2) *From Dried Leaves.*—The cuttings are dried in the sun, the leaves separated from the stems by threshing, and stored away for convenient treatment. To obtain the indigo they are macerated for two hours with six times their bulk of water. The solution is treated as when obtained from wet leaves. As the use of dry leaves makes it possible to select the most suitable weather for macerating, the indigo produced is more uniform, and the fermentation, capricious in its course, is superseded by simple maceration.

In the hilly regions of India the leaves of the *Nerium tinctorium*, a small tree, are treated for the extraction of indigo. It is necessary to use hot water for steeping; 250 lb. of fresh leaves yield 1 lb. of indigo. Dr. Schunck has explained why if the manufacturer of indigo does not manage the fermentation with great care the indigo will be poor in quality and small in quantity, and even in some cases entirely lose the coloring-matter. The indiglucin produced by the decomposition of the indican is liable to pass by fermentation into alcohol and acetic acid, and these bodies unite with the indigo and form a body which resists oxidation, and consequently fails to furnish indigo:

$$\underset{\text{Indigo.}}{C_8H_5NO} + 8\underset{\text{Alcohol.}}{C_2H_6O} + 3\underset{\text{Acetic acid.}}{C_2H_4O_2} + CO_2$$

$$= \underset{\text{New compound.}}{C_{31}H_{39}NO_4} + \underset{\text{Water.}}{13H_2O}.$$

The commercial varieties of indigo are very numerous. The Bengal indigo ranks first in quality. Some merchants recognize sixteen distinct grades. Besides the Bengal, there occurs in commerce the Java, twenty-one grades. The Bengal and Java range from 40 to 80 per cent. of indigo-blue; the remaining varieties vary from 10 to 37 per cent.: they are Coromandel, Oudh, Madras, Manila, Egyptian, Guatemala, Caraccas, and Mexican.

Properties of the Crude Indigo.—The color is deep blue, with a shade more or less purple or violet. It is devoid of smell and taste. It may be dry or moist, hard or soft, compact or porous. Being always more or less porous, it adheres slightly to the tongue. Its fracture is dull and earthy. The streak produced by the nail is glossy and purplish red in the best qualities; when it is dull, and the indigo furrows on each side of the streak, the quality is poor. The best indigo floats upon water.

Composition of Crude Indigo.—Besides indigo-blue (indigotine), which is the characteristic constituent of indigo, and which varies in quantity from 10 to 80 per cent., a variety of other bodies are present, either derived from the plant or added intentionally. Among these are (1) indigo-gluten, a nitrogenous body resembling ordinary vegetable gluten. It is extracted by treating the indigo with acid and then boiling with water. (2) Indigo-brown, extracted by alkalies. The indigo-green of some authors is supposed to be a mixture of indigo-brown and a little indigo-blue. (3) Indigo-red, extracted by boiling alcohol. (4) Brown resinous bodies. (5) Mineral matters (ash), usually from 6 to 12 per cent., but sometimes 30 to 40 per cent. in Madras indigo. They are composed of carbonate and phosphate of lime, oxide of iron, alumina, soda-salts, clay, sand, and sometimes a trace of copper and lead. (6) Water, from 3 to 10 per cent. Chevreul gives the following analysis of a fair sample of Guatemala indigo:

Indigotine	45
Soluble in water: gum, etc., deoxidized indigo, a green matter combined with ammonia, etc.	12
Soluble in alcohol: resin, green matters, a trace of indigo-blue	30
A red resin, soluble in hydrochloric acid	6
Carbonate of lime	2
Oxide of iron and alumina	2
Silica (sand) and clay	3
Total	100

The adulterants are starch (most common), rosin, Prussian-blue, smalt, ground dyewoods, etc.

The purification of indigo is affected by boiling it successively with dilute acid, water, and alcohol. The pure indigotine may be extracted by changing it to soluble white indigo by reducing agents, as explained further on, and subsequently reoxidizing it.

Indigo-blue, indigotine, oxidized indigo ($C_{16}H_{10}N_2O_2$), may be obtained nearly pure by exhausting indigo by solvents as above mentioned. It may also be obtained (1) by sublimation, in crystals, mixing the powdered indigo with plaster-of-Paris and water, spreading it on an iron plate to harden, and carefully heating the dry cake; (2) by solution in boiling aniline, which deposits it in crystals on cooling; (3) by reducing it to soluble white indigo by contact with grape-sugar, soda-lye, water, and alcohol, or by contact with slaked lime, copperas, and water. The yellow solution obtained deposits indigotine as a blue powder when exposed to the air. Indigotine appears as blue crystals with a coppery luster, or as a dark-blue powder, acquiring this luster when rubbed with a hard body. It has neither taste nor smell, acid nor basic properties; sp. gr. 1·500. Heated in the open air, it melts, boils, and burns with a smoky flame. Heated in a current of air at about 550° F., it volatilizes without decomposition as a purple vapor. It is insoluble in water, in dilute hydrochloric and sulphuric acids, and in alkaline lyes, in cold ether, alcohol, oil of turpentine, and fatty oils. Its best solvent is boiling aniline. It is soluble to a greater or less extent in hot creosote, phenol, benzene, chloroform, alcohol, ether, essential oils, fatty oils, petroleum, amylic alcohol; in the acetates, chlorides, etc., of aniline, morphine, etc., beeswax, Japan wax, Canauba wax, paraffin, spermaceti, and stearic acid. It is soluble in anhydrous acetic acid to which a very small quantity of sulphuric acid has been added, and is precipitated from the solution by the addition of water. This is the only process known by which indigotine can be reproduced in its primitive state on fabrics, without previous reduction to soluble white indigo.

The action of sulphuric acid on indigo gives rise to three distinct compounds, the production of which depends upon the strength and ratio of the acid, the temperature, and the duration of the contact; it is difficult to conduct the reaction so as to prevent the formation of at least a small portion of each. If powdered indigo is digested with oil of vitriol, and the deep-blue liquid poured into 40 or 50 parts of cold water, a purple powder remains undissolved which is (1) sulphophœnicic acid, while the deep-blue solution contains (2) sulphindigotic and (3) hyposulphindigotic acid. By forming the ammonium salts of the last two acids, evaporating to dryness, and digesting with alcohol, the hyposulphindigotate only is dissolved.

Sulphophœnicic Acid ($C_{16}H_{10}N_2O_2.SO_3$), *Sulphopurpuric Acid*, *Indigo-purple*, *Phœnicin*.—This acid is best prepared by adding 1 part of indigo to 4 parts of oil of vitriol, and heating from thirty minutes to an hour, or until a drop gives a deep purple color with a large quantity of cold water. Too high a temperature or too long digestion causes the formation of much sulphindigotic acid. The acid mixture is thrown into 40 to 50 parts cold water, and the beautiful purple precipitate is collected on a filter and washed with weak hydrochloric acid. It forms a blue mass or a purple-red powder. It is soluble in water, and soluble in strong sulphuric acid, especially in the fuming acid; both gradually change it into sulphindigotic acid, more rapidly if heated. It is insoluble in dilute acids. The salts of this acid are prepared by adding its solution to an aqueous solution of any salt. They appear as purple flocks, which are but slightly soluble in water. When dry they are red. Their solutions are blue; are reduced to yellow liquids by sulphydric acid, copperas, and lime, or by caustic alkalies, but become blue again on exposure to the air. Wool may be dyed with this acid by immersing it in an aqueous solution and adding a little hydrochloric acid. By passing the wool so dyed through a weak bath of carbonate of soda various shades of purple may be produced, a small quantity of sulphindigotic, which is always present, being removed, and the sulphophœnicate of soda being formed, which is a faster dye than the acid. A peculiar purple blue, consisting probably of the soda-salt of this acid, has been invented by L. and E. Boilley (*Dingl. pol. J.*, clix., 318), and patented in England by Johnson. It is made by dropping powdered indigo into twenty times its weight of fused acid sulphate of soda, pouring the product into a large quantity of water, and adding common salt. It separates as a precipitate of silky crystals, possessing a beautiful coppery luster when dry.

Sulphindigotic Acid ($C_{16}H_{10}N_2O_2(SO_3)_2$), *Sulphate of Indigo*, *Soluble Blue Indigo*, *Sulphindylic Acid*, *Sulphocœrulic Acid*.—This acid is prepared by dissolving 1 part of indigo in 10 or 12 parts of concentrated sulphuric acid (6 parts of fuming acid answer the same purpose), and heating the whole for several hours at 120° F. The operation is complete when a portion dissolves completely in cold water. The product is a mixture of this acid with hyposulphindigotic acid. To free it from this, and the impurities derived from the indigo, well-washed wool is allowed to absorb the dyes from the solution. This is washed in water and digested in a dilute solution of carbonate of ammonia, which dissolves both acids. On evaporating to dryness the two ammonia salts may be separated by alcohol (83 per cent.) in which the sulphindigotate is insoluble. This separation is not resorted to in practice, the mixture of the two acids being used directly. The sulphindigotic acid may be freed from the excess of sulphuric acid by adding an excess of a solution of common salt. It is then obtained as a blue precipitate which may be drained on a filter. Sulphindigotic acid is very soluble in water, and in alcohol, but not in strong saline solutions. Charcoal, especially that from blood, removes it completely from its aqueous solution, but yields it to alkaline carbonates. It is decomposed by an excess of caustic alkali, and the color can not be restored. Reducing agents, as stannous and ferrous salts, sulphydric acid, nascent hydrogen, etc., decolorize it, the color being restored by exposure to the air. Sulphindigotates are formed by neutralizing the free acid or by double decomposition. They do not crystallize, are dark blue with a coppery luster, and taste feebly saline and decidedly of indigo. The alkaline sulphindigotates are slightly soluble in cold water (requiring 100 to 150 parts), more so in hot water. The lime, magnesia, and alumina salts are freely soluble. The solution is blue by reflected light, red by transmitted light.

Alkaline sulphindigotates, *indigo-carmine*, *blue-carmine*, *soluble indigo*, and *precipitated indigo* are prepared by adding alkaline carbonates to the diluted solution of the acid. They appear as precipitates, being insoluble in saline solutions; the alkaline sulphates formed at the same time are sufficient for the purpose. The potassium salt dissolves in 140 parts of cold water, and in much less boiling water; 1 part of salt gives a blue color to 500,000 parts of water, about $\frac{1}{10}$ grain per gallon. Water containing 1 per cent. of acetate of sodium does not dissolve it in the cold. It is soluble in sulphuric acid, insoluble in concentrated hydrochloric and in alcohol of sp. gr. 0·800. The sodium salt resembles the potassium salt, and is used for similar purposes, much more extensively. It is more soluble in saline solutions. Besides being useful as a dye, the indigo-carmine is used as a water-color pigment, and made into balls with starch and a little gum-water it is used as washing-blue.

Hyposulphindigotic Acid, *Hyposulphocœrulic Acid*.—This acid, the composition of which is not known, has been already mentioned as always occurring in the solution obtained by treating indigo with sulphuric acid. The acid differs little from sulphindigotic acid, and the salts are distinguished chiefly by their solubility in alcohol of 84 per cent.

Commercial preparations of indigo and sulphuric acid are mixtures of the three acids above mentioned or their salts. There are three distinct kinds of preparation: (1) The simple solution of the acids in water, known as *Saxon blue* (having been first introduced by Barth at Grossenhayn in Saxony in 1745), *chemic*, *chemic blue*, *sour extract of indigo*, *sulphate of indigo*, etc. Numerous receipts are given for its preparation. Persoz says, mix 1 lb. each of indigo, fuming sulphuric acid, and oil of vitriol. After the mixture has stood forty-eight hours, heat it over a water-bath till it gives no precipitate in cold water. Dilute to 1·134 or 18° B. Haussmann uses indigo 1, fuming acid 6·5. Another adds gradually 1 part indigo to 5 or 6 fuming acid or 10 to 12 common acid, allows it to stand twenty-four to forty-eight hours, pours into cold water, and filters. Another: 1 lb. indigo in 15 lb. common acid; keep at 120–140° F. for three days. (2) The precipitated acids, *paste*, *sweet extract*, made by adding a strong solution of salt to the diluted and filtered solution of indigo in sulphuric acid. *Receipts.*—1 lb. indigo, 5 acid, ten to twelve hours at 100° F., diluted with 3 gal. water, filtered, concentrated to 3 gal., treated with 4 lb. of common salt, drained on a filter. Another: 10 lb. indigo, 80 acid, twenty-four hours at 80° F., diluted with 5 gal. of water, treated with solution of 80 lb. salt in smallest quantity of water. (3) Neutral soda-salts, *indigo-carmine*, *soluble indigo*, *solid blue*, *chemic*, *cerulein*, *ceruleo-sulphate*, *extract of indigo*. This is made by neutralizing the solution of indigo in sulphuric acid by carbonate of soda; being insoluble in saline solutions, it appears as a precipitate, which is washed on a filter with solution of salt, and sold as a paste or as a dry powder. The washing with salt-solution removes green matters (chlorophyll) and improves the shades. *Receipts.*—Add 37 lb. acid to 4 lb. indigo, keep at 60°–70° F. for eight days. Pour into it a solution of 40 lb. salt, then a solution of 60 lb. carbonate-of-soda crystals; add 2 lb. precipitated carbonate of lime; filter, wash with salt-solution. The yield is 120 lb. Adding acid to indigo secures a richer and purer color. An inferior quality is made with 8 lb. indigo, 74 acid, 144 salt, 112 carbonate-of-soda crystals, and 4 chalk, in the same manner. A fair sample of carmine of indigo gave water 85, indigo 10·2, saline residue 4·8.

Dyeing with Sulphuric-acid Compounds of Indigo.—(1) Cotton has no affinity for these compounds, and they are never used except for a faint bluing for market, as in washing clothes. For this purpose the free sulphuric acid is removed by acetate of lead, or neutralized by acetate of soda, the product being erroneously called "acetate of indigo." (2) Wool is dyed only in the acids or in carmines acidulated, as alkalies, and even soap, are liable to remove the color. Saxon blue (acid) was formerly used with alum and cream of tartar. Carmine is now preferred with alum and cream of tartar, used warm. For printing, so-called "acetate of indigo" is used. These colors are fugitive, and are now generally replaced by Prussian blue, etc., except for compound colors, as green, olive, gray, black, etc. (3) Silk is dyed in the same manner as wool, but is generally first alumed. Carmine is generally used, as it is easily fixed, and is free from the green tinge of the acids. For printing, a solution of carmine, with oxalic acid and gum, with sometimes a little alum, is used.

Indigo-white ($C_{16}H_{12}N_2O_2$), *Indigogen*, *White Indigo*, *Reduced or Deoxidized Indigo*.—The sulphuric-acid compounds of indigo already described are not suitable for dyeing cotton, and as they do not give colors on wool and silk that can be considered fast, indigo would have but a limited application in dyeing and calico-printing were it not for the indigo-white. This compound is produced by the action of reducing agents on indigo:

$$\underset{\text{Indigotine}}{C_{16}H_{10}N_2O_2} + H_2 = \underset{\text{Indigogen}}{C_{16}H_{12}N_2O_2}.$$

Chevreul supposed that indigogen existed ready formed in the indigo-plants, but this was shown by Schunck to be erroneous. This indigogen being soluble in alkalies, the

dyer has only to impregnate his yarns and fabrics with the solution and expose them to the atmosphere, when the insoluble blue indigotine is formed throughout their substance, and they are uniformly dyed with the most permanent and insoluble blue.

$$\underset{\text{Indigogen}}{C_{16}H_{12}N_2O_2} + \underset{\text{Oxygen.}}{O_2} = \underset{\text{Indigotine.}}{C_{16}H_{10}N_2O_2} + \underset{\text{Water.}}{H_2O}.$$

Indigogen may be prepared from indigo purified by hydrochloric acid by mixing it with slaked lime, ferrous sulphate, and water in vessels so arranged that air is excluded. The clear yellow solution produced is transferred to another vessel, and the indigogen precipitated by hydrochloric acid. The precipitate is filtered in an atmosphere of carbonic acid, and washed with dilute sulphurous acid. It is a grayish-white, lustrous body, insoluble in water and acids, soluble in alkalies, alcohol, and ether. Its solutions are yellow, and turn blue and deposit indigotine when exposed to the air. Indigogen forms with lime a neutral compound readily soluble in water, and a basic compound almost insoluble. The latter is precipitated from a solution of the neutral compound by digestion with an excess of lime. It is also formed when indigo is digested with copperas and an excess of lime in making the solution of indigogen. It is a lemon-yellow compound, which in the air becomes first green, then blue. Most metallic salts produce in solutions of indigogen precipitates which are generally white, but become blue in the air. Berzelius supposed from these properties of the lime compounds that an excess of lime should be carefully avoided, but Schlumberger has shown that in practice other conditions occur which not only prevent any injurious results from such excess, but make its presence very desirable.

Application of Indigogen in Dyeing and Calico-printing.—This form of indigo being soluble, can be made to penetrate textile fibers, and when by oxidation the indigogen is converted into insoluble blue indigotine, the color is fixed in the pores of the fibers, so as to adhere firmly and resist the action of washing and soap. Indigogen is employed as follows:

(1) *Ordinary Vat-dyeing.*—The indigo is reduced and dissolved, and the yarn or cloth is immersed and then exposed to the air. Figures in white are produced by printing on resists beforehand, which prevent the penetration of the dye, or discharges after dyeing, which remove the color.

(2) *Pencil Blue.*—The solution of reduced indigo is printed or painted on certain portions only of the cloth with a "pencil," a small flat blunt-pointed piece of wood.

(3) *Precipitated or Fast Blue.*—Indigogen is precipitated as a paste in combination with strongly reducing metallic oxides, as hydrated stannous oxide, to prevent too rapid oxidation. This paste, properly thickened, is printed on the goods, and the cloth is then passed through lime-water or soda lye to replace the stannous oxide and form a soluble compound of indigogen, which penetrates the fiber and is fixed by subsequent exposure.

(4) *China Blue.*—Pulverized indigo is printed on the cloth, and then so treated, by passing it successively through milk of lime, copperas, soda lye, and sulphuric acid, as to fix the color by causing local reduction and solution, and subsequent oxidation.

The *indigo vats* or solutions employed by dyers and calico-printers are varied according to the character of the goods.

Cold vats are produced by reducing agents of a mineral origin, while *warm vats* are produced by organic matters which undergo fermentation, and thus develop indigogen.

(1) *The Copperas Vat.*—To 2,000 gal. of water are added 60 lb. indigo, 180 slaked lime, 120 ferrous sulphate (copperas), which must be free from every trace of copper salt. This vat is used for calico, linen yarn, linen thread, and hemp yarn and thread. After exposure to the air the color of the goods can be improved by passing them through hot milk of lime or caustic alkali, by which some yellow matters are eliminated.

(2) *The Tin Vat*, commonly used for calico-printing.—The indigo is reduced by a solution of stannous oxide in soda lye. By adding to this an acid solution of tin, a precipitate is obtained consisting of indigogen and stannous oxide, which is used in printing.

(3) *The orpiment vat* is made by mixing indigo, sulphide of arsenic, and potash. It is chiefly used in calico-printing.

(4) *The zinc vat* is free from the bulky precipitate of oxide of iron, and avoids the loss of indigo due to its combination with this oxide. It is composed of 2,000 gal. of water, 20 lb. indigo, 30 iron borings, 30 of powdered zinc, 35 quicklime. The zinc furnishes hydrogen by decomposing water.

(5) *The Hyposulphite Vat.*—A solution of sodium hyposulphite is used as the reducing agent for the indigo. A solution of sodium bisulphite of 30° to 35° B. is agitated with pieces of sheet or granulated zinc in a closed vessel. The quantity of zinc should fill about one-fourth of the internal space of the vessel. After about an hour the solution is mixed with milk of lime in excess, which precipitates the zinc salt. After agitation and the addition of water, the liquid is filtered or the clear solution decanted, the whole operation being conducted with as complete exclusion of air as possible. The hyposulphite solution so obtained is added to the indigo, together with the necessary amount of lime and soda. The yellow solution obtained contains, as insoluble constituents, only the earthy matters in the indigo. From 1 kilog. indigo a very concentrated vat of from 10 to 15 liters can be prepared. The dyeing of cotton takes place in the cold, that of woolens with gentle warmth. The excess of sodium hyposulphite is said to reduce the froth which forms on the surface of the bath. By adopting the foregoing method in the case of woolens, clearer and fresher tints are obtainable. A new method of printing with a concentrated and thickened alkaline solution of indigo, reduced with great excess of sodium hyposulphite, gives universal satisfaction, and is certain to supersede the older costly and troublesome process in which tin and tin salts are employed. For oxidation, the printed pieces are hung out in the air twelve to fourteen hours, and then washed and soaped. In comparison with the older method, 50 to 60 per cent. of indigo is economized, the shades are finer and more permanent, and the definition sharper.

(6) *The Woad or Pastel Vat.*—In former times woad was the only material known to the dyers of Europe for producing the blue color of indigo. For this purpose it was previously submitted to a peculiar process of fermentation, and the product was named *pastel* in France. For most purposes indigo has taken the place of woad in the dye-house, and for cotton goods it is now used alone. In the dyeing of woolen goods, however, the use of woad has been retained for the purpose rather of exciting fermentation, and thus reducing the indigo which is employed at the same time, than of imparting any color to the material to be dyed. Indeed, the woad used by woolen-dyers in the U. S. contains no trace of coloring-matter. Various substitutes, such as rhubarb-leaves, turnip-tops, weld, and other vegetable matters, have accordingly been tried, but without success, since the fermentation is more steadily maintained by means of woad than by any other material. Pastel, which does contain a little blue coloring-matter, is preferred to woad by many of the French dyers. The materials employed in the ordinary woad or pastel vat, in addition to woad and indigo, are madder, bran, and lime. The chemical action which takes place in the woad vat is not difficult to understand. The nitrogenous matters of the woad begin, when the temperature is raised, to enter into a state of fermentation, which is kept up by means of the sugar, starch, extractive matter, etc., of the madder and bran. In consequence of the fermentation, the indigo-blue becomes reduced, and is then dissolved by the lime, thus rendering the liquid fit for dyeing. Great care is necessary in order to prevent the process of fermentation from passing into one of putrefaction, which if allowed to proceed would lead to the entire destruction of the indigo-blue in the liquor. If any tendency to do so is observed, it is arrested by the addition of lime, which combines with the acetic, lactic, and other organic acids, that begin to form when putrefaction sets in. On the other hand, an excess of lime must also be avoided, since the reduced indigo-blue is thereby rendered insoluble, and unfit to combine with the material. In setting a vat the following materials are used: 5 cwt. woad, 30 lb. indigo, 56 bran, 7 madder, and 10 quarts lime. The vat is first filled with water heated to 140° F.; the materials are then added and well mixed. The whole is covered, and allowed to stand over night. At 6 o'clock the next morning 5 quarts more lime are added; at 10 o'clock, 5 pints more; at 12, the vat is heated to 120° F.; and at 3, another quart of lime is added. The vat is now ready for use. (*Ure.*)

(7) *The Potash or Indian Vat.*—Eight pounds of powdered indigo are added to a bath containing 3½ lb. bran, 3½ lb. madder, and 12 lb. potash, which is maintained for several hours at a temperature of 200° F. It is then allowed

to cool to 100° F., when fermentation ensues. After about forty-eight hours the indigo is rendered soluble, being reduced by the decomposition of the sugar and other products contained in the bran and the madder-root during the process of fermentation. The bath should have a greenish-yellow appearance, having a frothy scum of a blue coppery hue. (*Calvert.*)

(8) *The German Vat.*—Improvements have been made in this class of vats, by which the expense of using madder is avoided. They are now prepared by adding to water, at a temperature of 200° F., 20 buckets of bran, 26 lb. soda crystals, 12 lb. indigo, and 5 lb. slaked lime. After five hours the bath is allowed to cool to 100° F., when fermentation ensues and the indigo is dissolved in the alkali. (*Calvert.*)

(9) *The urine vat* is employed only in small dye-houses and in certain localities, as at Verviers, for the dyeing of wool. The putrefying urine furnishes at once the reducing agents to convert the blue into white indigo, and the ammonia necessary to dissolve the latter. (*Watts's Dict.*)

Resists for printing on cloth to prevent the dyeing of certain portions, and thus produce figures on a blue ground, act either mechanically, as wax, pipeclay, etc., or chemically, by oxidizing the indigogen before it can penetrate the fiber, as salts of copper, mercuric chloride, etc. The following are receipts for different results (Crooks, p. 474): (1) *For Deep Blue.*—Water, 4 liters; sulphate of copper, 1·25 kilog.; acetate of copper, 500 grammes; nitrate of copper, 875 grammes; alum, 240 grammes; pipeclay, 2·125 kilog.; dextrin, 1·25 kilog. (2) *For Medium Blue.*—Water, 4 liters; sulphate of copper, 500 grammes; acetate of copper, 250 grammes; nitrate of copper, 500 grammes; alum, 240 grammes; pipeclay, 2 kilog.; dextrin, 1 kilog. (3) *Red Resist, so-called Lapis.*—Red liquor (acetate of alumina), specific gravity 1·07, 12 liters; gum senegal, 2 to 3 kilog.; pipeclay, 4 to 6 kilog.; olive oil, 1 kilog.; sulphate of copper, 1 kilog.; nitrate of copper, 500 grammes; sal-ammoniac, 1·5 kilog. (4) *White Lapis, No. 1.*—Lime-juice, specific gravity, 1·109, 5 liters; thickened lime-juice, thickened with 1·5 kilog. of gum upon 2 liters, 1·5 liters; sulphate of copper, 1 kilog.; pipeclay, 3 kilog. *No. 2.*—Water, 2 liters; sulphate of zinc, 1 kilog.; pipeclay, 725 grammes; gum senegal, 500 grammes; solution of nitrate of copper, specific gravity 1·52, 0·12 liter. (5) *For White Under-mordants and for Blue Contours.*—Caustic soda solution, sp. gr. 1·070, 8 liters; arseniate of potassa, 3·5 kilog.; corrosive sublimate, 500 grammes; pipeclay, 3 kilog.; gum senegal, 1·5 kilog.

Discharge patterns are produced by dyeing the cotton cloth of a uniform blue in the copperas vat, and then printing upon it the desired figures with some powerful oxidizing agent, which will destroy the blue indigotine by converting it into soluble isatin, leaving the figure in white. The most useful discharge is chromic acid, but as it would be exhausted by the thickener before it reached the cloth, a circuitous process must be resorted to in order to secure its action. On the blue cloth bichromate or chromate of potash is padded (see CALICO-PRINTING), and when this has been dried in the dark, the figures to be discharged are printed with a mixture of acid—oxalic, tartaric, nitric, or sulphuric; a thickener, gum, dyxtrin, or starch; and some pipeclay. The chromic acid is set free and the color discharged at once, and the goods are washed in warm water to which some chalk has been added to neutralize the excess of acid. Another plan is to print on the blue cloth chromate of lead properly thickened, and pass through warm hydrochloric acid, when chromic acid and chlorine are liberated, which discharge the color. Hydrated binoxide of manganese may be substituted for chromate of lead. The discharges can be made to include mordants, so that colored designs on a blue ground may be produced. Thus if acetate of alumina or of iron, or both together, be mixed with a discharge, and the alumina fixed in the washing off, the goods may be dyed in madder or garancine with the production of red, lilac, purple, or chocolate designs. Sometimes the discharge and resist are combined together; for instance, on a light-blue ground are printed simultaneously, first, an ordinary resist; second, the same resist, to which have been added bichromate of potash and hydrochloric acid; on vatting again a pattern of light blue and white will be found on a deep-blue ground. *Receipts.*—(1) Chrome liquor: water, 2 liters; yellow chromate of potash, 500 grammes. (2) Acid composition: tartaric acid, 3 kilog.; oxalic acid, 250 grammes; dextrin, 4 kilog.; nitric acid, 500 grammes; water, 4 liters.

Printing pencil blue, for which the orpiment vat is used, was formerly effected by hand, but is now accomplished from rolls by the aid of the "doctor box," by which the blue oxidized layer of color is removed and the roll works last in the green solution containing the indigogen, carrying it at once to the cloth. *Receipt for an Orpiment Mixture for Dark Pencil Blue.*—Indigo-pulp, 10 gal., containing 40 lb. indigo; yellow orpiment, 40 lb.; soda lye, 70° Tw., 11½ gal.; water, 18½ gal.; lime, 4 lb. Boil till yellow, when spread on glass; let settle, and thicken the clear liquor with 120 lb. gum senegal.

Artificial Indigo.—Several processes have been devised for the preparation of artificial indigo. That of Adolf Baeyer, of Munich, consists in heating ortho-nitro-phenyl-propiolic acid with some deoxidizing agent, as glucose or sodium xanthogenate, in the presence of some alkaline compound, such as caustic soda or borax. By thickening the mixture with starch it can be applied to yarn or cloth, and the color can then be developed in the fiber by heat, as is done in the case of other colors in calico-printing.

Ortho-nitro phenyl-propiolic acid. Indigo.

$$2C_9H_5(NO_2)O_2 + 2H_2 = C_{16}H_{10}N_2O_2 + 2H_2O + 2CO_2.$$

Articles dyed with the artificial indigo are said to be livelier in color than those dyed with natural indigo, and to resist wear and washing better. This method was used for a time but has been given up. A synthesis of indigotine has been devised by Heumann, which promises to be commercially successful. It consists in heating phenylglycocoll, $C_6H_5NH.CH_2.COOH$, with caustic soda to 260° in a closed retort. By dissolving the product in water and passing a current of air through it, indigotine is precipitated. Schultz, *Chemie des Steinkohlentheers* (Brunswick, 1890).

In 1882 Baeyer and Drewson showed that indigo can be made by treating ortho-nitrobenzoic aldehyde and acetone with an alkali. At that time ortho-nitrobenzoic aldehyde was expensive. Messrs. Kalle & Co., of Biebrich, in 1893 made this synthesis of Baeyer and Drewson the basis of a valuable method of dyeing with artificial indigo. By the action of ortho-nitrobenzoic aldehyde on acetone, a product known as ortho-nitrophenyllactone is formed. This forms with sodium bisulphite a soluble substance called "indigo salt." To dye with the salt, the goods are simply dipped into its aqueous solution, and then passed through a caustic soda solution of about 20° B. (*Journal of the Society of Chemical Industry*, Dec., 1893.)

Testing and Valuation of Indigo.—Water is determined by drying a weighed sample at 212° F. in a platinum crucible. After weighing, the whole is ignited for the percentage of ash. Starch may be detected by boiling with slightly alkaline water, and testing the cold filtrate with iodine. Older methods for determining approximately the percentage of indigotine were based upon oxidation—more recent methods on reduction. The following methods are used:

(1) *With Protosulphate of Iron.*—A weighed quantity of the finely pulverized indigo is well mixed with an equal weight of pure lime previously slaked with water. The mixture is poured into a stoppered bottle of known capacity, and the mortar is well rinsed with water, which is added to the rest. The bottle is now heated in a water-bath for several hours, and a quantity of finely-powdered sulphate of iron is added; the bottle is then filled up with water, the stopper is inserted, and after the contents have been well shaken, the whole is left at rest for several hours, till the indigo is reduced and the sediment has sunk to the bottom. A portion of the clear liquor is then drawn off with a siphon, and the quantity of liquid having been accurately measured, it is mixed with an excess of hydrochloric acid, and the precipitate, after having been oxidized (by exposure to the air), is collected on a weighed filter and washed with water. Lastly, the filter with the indigo-blue is dried at the heat of the water-bath and weighed; and the weight of the filter having been subtracted from that of the whole, the weight of the indigo-blue is ascertained. Suppose, for example, that the whole quantity of liquid was 200 measures, and that 50 measures have been drawn off, yielding 10 grains of indigo-blue; then the total quantity of indigo-blue in the sample is 40 grains. For 60 grains of indigo it is necessary to take from 1 lb. to 2 lb. of water. This method, though rather tedious, gives better results than any of the preceding. The quantity of indigo-blue indicated by it is usually somewhat less than the actual quantity contained in the sample.

(2) *With Stannous Chloride.*—The tin solution is titrated with a solution of pure indigo-blue, prepared by dissolving

the substance dried at 210 –230° C. (410 –446° F.) in sixteen parts of strong sulphuric acid, with the addition of pounded glass to divide the indigo and facilitate the solution. The indigo-solution thus obtained is diluted with water till a liter of it contains exactly a gramme of indigo-blue. The indigo to be examined is then dissolved in a similar manner, and the titrated tin solution is added to it from a burette till the blue color changes through green to light yellow. Iron, if present in the indigo, must first be removed by digestion in hydrochloric acid, with the addition of pounded glass.

(3) *With Zinc.*—A solution of indigo in sulphuric acid is diluted with water and hydrochloric acid and decolorized by zinc in an atmosphere of carbonic anhydride. A measured volume of this solution is then introduced into a graduated tube filled with air or oxygen gas, and the volume of oxygen absorbed is read off after a few hours. A similar experiment is then made with pure indigo-blue, and the value of the commercial sample is determined by comparison of the results.

Literature.—In addition to the works mentioned at the end of Calico-printing, see *Notes upon Indigo*, by John Q. Hayes, in the *Bulletin of the National Association of Woolmanufacturers* (Boston, 1873); lecture by Dr. Crace Calvert, *Am. Chemist*, iii., 221; Crooks, *Handbook of Dyeing and Calico-printing* (London, 1874); Reid, *The Culture and Manufacture of Indigo* (Calcutta, 1887); Rudolf, *Die gesammte Indigokūpenblaufärberei* (1885); Thorpe, *Dictionary of Applied Chemistry* (1891).

Revised by Ira Remsen and L. H. Bailey.

Indigo-bird: popular name of a beautiful finch (*Cyanospiza cyanea*), a native of the U. S. It is of a rich greenish blue, feeds on seeds and insects, nests usually on a low bush or on tall grass, and winters in tropical America. The bird is nearly 6 inches in length, and has a brief but very pleasant song.

Indigogen: See Indigo.

Indigotine: See Indigo.

In'dium [Mod. Lat., for Lat. *in'dicum*, indigo. See Indigo]: a metal discovered by means of the spectroscope in Freiberg zinc-blende by Reich and Richter in 1863. It has since been found in various zinc minerals and in wolfram, also in the flue-dust of the furnaces in which zinc ores are treated, as well as in the zinc itself. The zinc-blende of Roxbury, Conn., was found by Prof. Cornwall to contain a considerable proportion of indium. The Freiberg zinc contains about 0·05 per cent. of indium. Böttger found the flue-dust of the Gosler furnaces to contain about 0·1 per cent. of the oxide In_2O_3. Metallic indium is obtained by dissolving the ores or metal in acid and adding pieces of metallic zinc to the solution. The indium, together with some small amounts of other metals, is thereby precipitated in the metallic state. When purified the metal is found to have a bluish-silvery luster, resembling lead in its softness and ductility. Its specific gravity is 7·421, atomic weight 113·4. It tarnishes slowly in air. Its melting-point is 176° C. (349° F.). Its very low fusion-point compared with other metals permanent in air is a striking peculiarity. It is not very volatile, and resists oxidation at temperatures considerably above its point of fusion. The spectrum consists of two blue lines.

Individuality [deriv. of *individ'ual*, from Lat. *individuum*, individual, liter., an indivisible thing, neut. of *individ'uus*; *in-*, un + *divi'dere*, divide]: of things, unity; of organisms, the condition of a separate life, one which has its own principle of organization. Schultz-Schultzenstein, in the consideration of plants, has regarded "not only the shoot, but even its single parts, the internodes, with their leaves, as series of individuals shooting out of each other, or intimately connected by continuous bud formation." On the other hand, Huxley, by the study of the phenomena of increase in the lower animals, was led to believe that "the *individual animal* is the sum of the phenomena presented by a single life; in other words, it is all those animal forms which proceed from a single egg, taken together." If we attempt to apply either of these definitions, the results will often appear to be absurd. Thus if we accept the signification of Schultz-Schultzenstein for the plant, for the coral animal, for the protozoön, not only will the flowers and the leaves, as well as the distinct animals, be individuals, but the intermediate spaces will represent indefinite individuals; in this case potentiality of individualism, or the possible future development of a more or less perfect plant or animal from the space in question, is confounded with actual individuality, or the positive development of a plant or animal. But if we accept Huxley's definition it becomes, in the lower forms of life, equally impossible to recognize either the constituents of the individual or the complete individual. Inasmuch as the sum of the production of an egg or a seed constitutes the "individual" in the case of polyps, hydroids, etc., which are capable of indefinite reproduction by budding and by excised parts, the traces of individuality would be only evident if the entire life-phenomena, from the moment of exclusion from the egg to the death of the last constituent, could be observed; in the case of plants, too, the constituents of the individual may be propagated for centuries, and may be spread over the globe—e. g. the weeping-willows, and the many plants that are almost exclusively raised from buds or shoots—and although they may be thus entirely disconnected, and many of the derivative plants dead, inasmuch as they were derived from the same germ, they are only parts of an individual. At first, both views might appear equally absurd, but they are really not so. They follow naturally from different ways of viewing the diffused or limited individuality in the lower forms of life, which differs widely from the specific individuality in the higher and more familiar forms.

In the domain of teratology, or the science which treats of monsters, there is a special department of double monsters—i. e. the undoubted product of a single egg or ovum, but the contents of which were early segregated into two more or less distinct components, and both developed therefrom. There is, among such monsters, every grade of differentiation up to those twin organisms, such as the Siamese Twins, which severally manifest differences of habit and temperament, as well as possess a nearly or quite complete and independent set of organs. Now, the world would undoubtedly regard each of the constituents of the compound organism known as the Siamese Twins as an individual man. If we also view the female of any vertebrate animal, we shall find a greater or less number of well-developed eggs, and potentially each of those is an individual, as under certain exciting causes it may develop into an organism similar to the parent. Nevertheless, there is room for much difference of opinion as to when, exactly, the individual comes into existence, for there are all grades from the formation of the egg to its maturity as a simple egg, its fecundation, and the development thereafter of a fœtus. A similar although less obvious difficulty as to the precise identification of the individual thus may or does prevail in the vertebrates as in the lowest of animals and plants.

If we are prepared to admit the Siamese Twins as true individuals, notwithstanding their union and their origin from a single ovum, we must be prepared to apply the same principles to other forms of life. Thus in the case of the common sea-flowers or sea-anemones (*Actinidæ*, etc.) we have undoubted individuality exhibited in the single product of each egg, which does not increase by budding. But in the case of the colony of coral animals we have a number of similar forms living together and constituting a tree-like combination. Inasmuch as there is in all except their union an exact homology between the sea-flowers or sea-anemones and each of the coral animals, we are therefore compelled to recognize each constituent of the colony as an individual. In like manner we are obliged to recognize the individuality of each of the several constituents of the colony among acalephs, but in the case of many of these there is every gradation between a specialized individual and a mere permanent bud. On the whole, however, the recognition of individuality for the several components in these instances is attended with less embarrassment than an extreme course either way.

Still less is individuality developed in the vegetal kingdom. In plants generally, the elements of generation and reproduction (flowers, etc.) are developed periodically. Nevertheless the term "individual" is better applicable to the organisms which are destined to continue the species, and which perform the same *rôle* in the vegetal kingdom as do the sexes in the animal kingdom. It will be impossible, however, to discriminate the individual always, for the adage "Natura non facit saltum" is as applicable in this case as in others. Yet the application of the term "individual" to each more or less perfect expression or simulacrum of the reproductive organism seems to be most advisable. See the articles Heredity, Person and Personality.

Revised by J. Mark Baldwin.

Indivisibles, Method of: in the mediæval geometry, essentially the same as the modern method of infinitesimals. It proceeds on the supposition that lines are made up of an infinite number of points, that surfaces are made up of an infinite number of lines, and that volumes are made up of an infinite number of surfaces. The method of indivisibles holds the same relation to the infinitesimal calculus, as devised by Leibnitz, that the ancient method of exhaustions does to the method of limits, as employed by Newton. As an example of the method of indivisibles, let it be required to deduce an expression for the volume of a right cone with a circular base. Denote the area of the base by A, the altitude of the cone by h, and let h be divided into an infinite number of equal parts; through each point of division suppose a plane to be passed, cutting out a section parallel to the base, and denote the distance of any such section from the vertex by h'. Then, if we denote the area of this section by a, we shall have, from the principles of elementary geometry,

$$a : A :: h'^2 : h^2, \text{ or } a = \frac{A}{h^2} \times h'^2.$$

From the nature of indivisibles we shall have the volume of the cone equal to the sum of all the sections from the vertex to the base; that is, the volume will be equal to $\frac{A}{h^2}$ multiplied by the sum of the squares of all the values of h' from the vertex to the base. If we take one of the equal divisions of the altitude as a unit, and call it 1, the different values of h' will be the series of natural numbers from 0 to h; but the limit of the sum of the squares of the natural numbers from 0 to h, when h approaches ∞, is equal to $\frac{h^3}{3}$; hence the required volume is equal to $\frac{A}{h^2} \times \frac{h^3}{3}$ or to $A\,\frac{h}{3}$; that is, the volume is equal to the base multiplied by one-third of the altitude. This result agrees with the well-known expression for the volume of a right cone with a circular base. Revised by S. Newcomb.

Indo-China, also called **Farther India** and **Chin-India**: a name invented by Malte-Brun for the eastern of the three great peninsulas on the S. of Asia. It lies to the S. of China and Tibet, and has the Bay of Bengal on the W. and the China Sea on the S. and E. The total length from N. to S. is about 1,800 miles, of which more than one-half belongs to the Malay Peninsula. The greatest breadth is about 1,000 miles. Area, 815,000 sq. miles, or three times that of Texas. On the W. the coast is indented by the Gulf of Martaban, on the S. is the great Gulf of Siam, while in the N. E. is that of Tonquin.

Physical Configuration.—The peninsula is formed by great river valleys descending from the elevated plateau of Southeast Tibet. These are directed to the S. and S. E., and are separated by ranges of mountains, which, with the rapid elevation of the general level, render the interior relatively inaccessible. The principal mountain chains, beginning, in the W., are the Arrakan-Yoma, which separates the Irrawadi basin from the Bay of Bengal, culminating in 7,100 feet; the series of mountains which separate the Irrawadi and Salwen basins, known by various names in their course, and running the length of the Malay Peninsula, culminating in 10,500 feet; and the mountains which run parallel to the coast of Annam. The Malay Peninsula offers a noteworthy break in its range at the Isthmus of Kra, near its base. This isthmus is only about 20 miles broad, and a small river on each side make the necessary portage less than a half of this.

The largest river is the Mekong, or Cambodia, which rises probably in Southeast Tibet, and, flowing southeastward, forms a very large delta at its mouth in the southeast angle of Indo-China. It is navigable from its mouth to the cataracts of Kong, a distance of about 400 miles. The Irrawadi rises near the Tibetan frontier, and, flowing S., empties through a very extensive delta into the Gulf of Martaban. Its neighbor to the E. is the Salwen, a smaller stream with a similar course. The great valley of Siam is drained by the winding Menam, and in the N. E. the great river is the Song-Koi, or Red river, which rises in Yunnan and flows S. E. into the Gulf of Tonquin.

Climate.—The climate is tropical, and, as in India, the year is divided into two seasons by the monsoons. The S. W. monsoon prevails from May to September, and brings the wet season. The N. E. monsoon is dry, and prevails from September to March. The two months from March to May are very hot. The temperature is, in general, high, and near the coast there is little variation during the day. In the interior the temperature variations become greater, and the climate approaches the continental type. The rainfall is very heavy on the west coast, and decreases eastward. It reaches 10 feet in Arrakan, and even 20 feet in favorable places. E. of the Arrakan-Yoma it falls to 60 inches, and over a large part of the eastern half of Indo-China it is only 40 inches.

Productions.—The fauna and flora resemble those of India on the western versant of the Arrakan-Yoma, and the heavy rainfall here makes the flora very rich and luxuriant. E. of these mountains the type is more distinctly Chinese, while in the Malay Peninsula it is that of the East Indies. The forests abound in valuable woods, as teak, ebony, and sandalwood, and also in material useful in the arts and in medicine, as catechu and lacquer. Elephants are domesticated by both Burmese and Siamese. The rhinoceros, wild buffalo, and tiger abound.

Rice is the principal cultivated product, and it is especially common in Burma, Cochin-China, and the Tonkin delta. Tea is extensively cultivated in Burma and in the Malay Peninsula, tobacco in Burma, cotton and maize in Annam and Tonquin. The production and manufacture of silk is a flourishing industry in Burma and Annam. The mountains have the reputation of being rich in ores of iron, lead, copper, tin, silver, and gold. The production of tin on the Malay Peninsula reaches about $2,000,000 in value per annum. Tonquin and Annam furnish considerable coal, and petroleum has been found on the western slope of the Arrakan-Yoma. Ancient Ophir is thought by some to have been in the present state of Johore on the Malay Peninsula.

Population.—This is estimated at 33,625,000, or about half that of the entire U. S., and consists of very diverse elements. They are classified as follows by H. Jacottet: 1. The group subdivided into the Annamites, Shans, Laos, Siamese, and Burmans. They are related to the Chinese, but in the west have mingled with the Hindus. They are short, yellowish, with black hair, but little hair elsewhere than on the head, and have small oblique eyes. Their languages are alike in grammar, but differ greatly in vocabularies. 2. The Cambodians, who have been subject to a profound Hindu influence. 3. The wild tribes of the interior, other than those above mentioned. They are little known, and may be diverse. 4. The savages of the Malay Peninsula, called by the Malays "Orang," or "Man." They are apparently negritos profoundly changed by Malay intermixture. 5. Malays, found especially on the peninsula named after them.

In addition to these, the Chinese are very numerous in French Indo-China, on the lower half of the Malay Peninsula, and throughout Siam. The French hold a protectorate on the east coast as far W. as the Cambodia river and over its delta. The British control the west coast and, in the N., inland to the Cambodia river.

Political Divisions.—Burma, Arrakan, Tenasserim, and Manipur are British. They have a total area of 171,000 sq. miles and a population of (1891) 7,605,560. The Shan states are under a British protectorate. Siam is an independent kingdom, with an area of about 250,000 sq. miles and an estimated population of 6,000,000. Annam, Tonquin, Cochin-China, and Cambodia are French; area claimed about 200,000 sq. miles, with a population estimated at 19,000,000. The other independent states of the Malay Peninsula have an area of about 31,500 sq. miles, and a population estimated at 300,000. Of the British Straits Settlements there are on the mainland an area of 1,400 sq. miles, and a population of 400,000. The largest city is Bangkok in Siam, population estimated at 600,000. Next comes Rangoon in Burma, population (1891) 180,324.

History.—Indo-China was little known to the ancients, though it is possible that the Golden Chersonese of Ptolemy may have been the Malay Peninsula. From the seventh century knowledge concerning it began to reach Europe through the Arabs. In the Middle Ages it was visited by Marco Polo and Nicolao di Conti, who reached Arrakan and the kingdom of Ava (Burma). The Portuguese appeared in the seas of Indo-China in 1508, and established themselves at Malacca in 1511. The Dutch followed, but the Europeans were expelled in the seventeenth century. A few priests and Jesuits remained, however, and the number of Roman Catholics in the French possessions is now large. The British gained a footing in 1825, and gradually extended

their possessions until 1885, when all Burma came under their power. The French obtained a footing in 1859. They annexed Cochin-China in 1862 and 1867, Cambodia in 1863, and Annam and Tonquin in 1883.

REFERENCES.—Keane, *Eastern Geography* (2d ed. 1892); MacMahon, *Far Cathay and Farther India* (1892); Lehault, *La France et l'Angleterre en Asie*, vol. i., *Indo-Chine* (1892); Chailley-Bert, *La colonisation de l'Indo-Chine: l'expérience anglaise* (1892); Schrader, *Atlas de géographie moderne* (1891). See BURMA, SIAM, STRAITS SETTLEMENTS, ANNAM, TONQUIN, COCHIN-CHINA, CAMBODIA, SHAN STATES, etc. MARK W. HARRINGTON.

Indo-Europeans: the members of the Indo-European speech-family, otherwise known as Indo-Germans or Aryans. This family includes at least eight chief groups of languages, the Indo-Iranian or Hindu-Persian, Armenian, Greek, Albanian, Italic, Celtic, Teutonic, Balto-Slavic or Letto-Slavic. It is distinctly a speech-family, rather than a race. In its present extension it has absorbed the blood of many distinct races; thus, e. g., in India the Dravidian, in parts of Greece and Asia Minor the Tyrrhene-Pelasgic, in Southern Italy and Spain the Iberian, in Northwestern Italy and Switzerland the Ligurian, etc., but even at the earliest point where the Indo-Europeans emerge into history the Indo-Europeans were not of homogeneous race. The indications of craniology are decisive upon this point. Which of the early races inhabiting Europe represents, however, the original possessor of the Indo-European language is open to question. The Iberians, spreading over extreme Western Europe, Spain, and Southern Italy, were short of stature, long-headed (dolichocephalic), and of swarthy complexion. They are represented to-day by the Basques, the Corsicans, and part of the Welsh and Irish. A second race, represented to-day by the Slavs, Lithuanians, and a portion of the Celts, and perhaps the Danes, was tall, broad-headed (brachycephalic), gray-eyed, with reddish hair, and spread over Eastern Europe, Southern Germany, Belgium, and parts of France. A third race, whose type is best preserved to-day among the Swedes, Frisians, and North Germans, was tall, long-headed (dolichocephalic), blond, blue-eyed, fair-skinned. It is in this race that the majority of anthropologists find the original authors of Indo-European speech, but there are not lacking indications which may point to the second. At present, however, and until further data are provided, the question is incapable of final settlement. Whichever race it may have been, it seems clear that as a general rule it was its language rather than its race type which it succeeded in establishing in the districts which it overran. While the work of determining the original race character of the Indo-Europeans must be left with the anthropologists, it remains for the science of comparative philology to reconstruct the language of the original speech-community, of whatever race or races it may have been composed. By a reconstruction of the original vocabulary a certain clew at least may be obtained to a knowledge of the life, habitat, and civilization of this community. Perfectly satisfactory criteria for making this construction have not, however, as yet been found. Scholars differ widely as to the tests which may be viewed as determining the genuine Indo-European antiquity of a word. Certain features, however, of primitive Indo-European life may be regarded as definitely ascertained. It knew the use of at least one metal, probably copper. Weaving and spinning were known; so the construction of huts, probably of the round bee-hive shape, and of wagons which probably were drawn by oxen under the yoke. The equipment of life included the boat, plow, sickle, sword, bow and arrow, spear, war-club, a razor or scraper, etc. Trade was by barter. Money was unknown. Agriculture was scarcely advanced beyond the rudest beginnings; grazing was the chief livelihood. The cow, the sheep, the goat, and the dog were the commonest domestic animals. The horse was known, but had been broken neither to saddle nor yoke. The ass and the mule were lacking. The swine was probably known only as wild. Wolf, bear, otter, hare, beaver, and mouse were known, but not the tiger nor camel, and probably not the lion. Meat roasted on the spit, parched grain, a sort of porridge prepared from grain pounded in a mortar, milk, and curds, formed important constituents of the diet. Familiar trees were the birch, the fir, and probably the oak. The year was divided into two seasons, winter and summer. The moon and not the sun, the succession of nights rather than of days, measured the lapse of time. The family was monogamous, though concubinage was tolerated. The wife was acquired by purchase. The question of the original home of the Indo-Europeans is still a matter of dispute, but the weight of evidence points toward Europe and the neighborhood of the Baltic.

LITERATURE.—Schrader, *Sprachvergleichung und Urgeschichte* (2d ed. 1890; Eng. transl.); Müller, *Biographies of Words, and The Home of the Aryas* (1888); Taylor, *The Origin of the Aryans* (1889); Rendall, *The Cradle of the Aryans* (1889); van den Gheyn, *L'origine européenne des Aryas* (1889); Penka, *Origines Ariacæ* (1883); Poesche, *Die Arier* (1878); Spiegel, *Die arische Periode*; Hehn, *Kulturpflanzen und Hausthiere* (various ed., Eng. transl.); Schmidt, *Die Urheimath der Indogermanen, Abhandl. d. Kgl. Preuss. Akad.* (1890); Hirt, *Die Urheimat der Indogermanen* (*Indog. Forschungen*, i., 464 ff.). BENJ. IDE WHEELER.

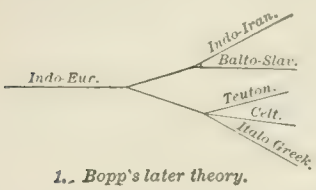
Indo-European Languages: a widely distributed body of related languages, also known as the *Indo-Germanic* or *Aryan*, to which the most important languages of modern Europe as well as many of the Asiatic languages belong. The parent speech from which they are all descended has left no record, and is known only by scientific reconstruction through the methods of comparative grammar.

Branches of the Family.—The various differentiations to which it was subjected, due to the separation and mutual isolation of the speech-communities, to contact with other languages, and especially to the adoption of the language among peoples of alien tongues, have left an abundant historical record in at least eight clearly marked types, constituting the eight main groups of the Indo-European languages: (1) The Indo-Iranian, also known as the Aryan in the narrower sense, (2) The Armenian, (3) the Greek, (4) the Italic, (5) the Celtic, (6) the Teutonic or Germanic, (7) the Balto-Slavic, or Letto-Slavic, (8) the Albanian. Scanty traces are also left of languages which belong to the Indo-European family, but which it is as yet impossible to assign definitely to one of these groups. The Thracian-Phrygian probably constituted a group by itself, though showing in some regards a close relation to the Balto-Slavic. The Messapian or Iapygian of Southern Italy was probably an offshoot of the Illyrian, the presumable parent of Albanian. The Scythian was almost certainly connected with the Iranian. The Macedonian, even if a separate group, was most closely related to the Greek. The Pamphylian belongs unmistakably to the Greek. The Etruscan has been by some identified as an Indo-European language, but recent evidence points to connection with the Tyrrhene-Pelasgic language of the northern Ægean islands and the adjacent coast of Asia Minor. This language, spoken originally by Tyrrhene colonists settling in Etruria, was impressed upon a subjugated population possibly of Indo-European (Italic) speech. The attempts to demonstrate an original unity for the Indo-European and Ugro-Finnic languages have resulted in nothing further than the indication of a probable prehistoric intercourse between these peoples. Even less can at present be said concerning the relations of Semitic and Indo-European.

Relationship between the Branches.—Various attempts have been made to reduce the original number of branches to less than eight, by joining into groups according to certain marked common characteristics. Thus Bopp, in the first edition of his *Vergleichende Grammatik*, grouped together not only the Indian and Iranian, but also the Greek and Italic, and the Balto-Slavic and Teutonic, though he later (*Abhandlungen der Berliner Akad.*, 1853) transferred the Balto-Slavic to closer association with the Indo-Iranian. Schleicher always grouped together Teutonic and Balto-Slavic, as well as Greek and Italic, Indian and Iranian, but differed from Bopp in regarding the separation of the Italo-Greek stock from the Indo-Iranian as of later occurrence than the separation of the Teutonic-Balto-Slavic from the common stock. Grassmann (*Kuhns Zeitschrift*, xii.), followed among others by Pauli, Sonne, and Spiegel, differed from Schleicher in joining Italic and Celtic with the Teutonic and Balto-Slavic, while grouping Greek with the Asiatic branch. Friedr. Müller (*Allgemeine Ethnographie*) joins Balto-Slavic and Teutonic with the Asiatic, and leaves Celtic and Italo-Greek to form a group by themselves. Lottner (*Kuhns Zeitschrift*, vii.), followed by Fick (*Etymolog. Wörterbuch*), divided the languages into two groups, the Asiatic and the European, and Fick continued, dividing European into North European and South European.

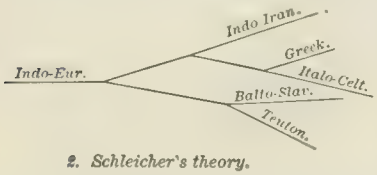
These different views if presented in the form of genealogical trees after the style of Schleicher's *Stammbaum* would appear in their essential features as given in the diagrams numbered 1 to 6, given below.

These various groupings had each a supposed competent ground of defense. The connection of Balto-Slavic with Indo-Iranian was commended, e. g., by the common tendency to reduce *k*-sounds to sibilants; cf. Lat. *centum* : Skr. *çatám* : O. Bulg. *sŭto*. The connection, on the other hand, of Balto-Slavic with Teutonic had its defense, e. g., in the common use of *m*-forms in the endings of the instrumental and dative plural where all other languages used *bh*-forms; cf. Goth. *wulfam* : O. Bulg. *vlŭkomŭ*, *vs.* Skr. *vṛkébhyas*. The connection of Greek with Indo-Iranian satisfied a great mass of facts in the field of comparative religion and culture as well as in language.

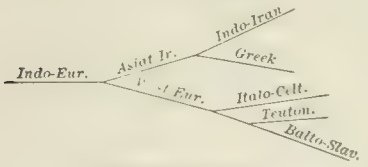


1. *Bopp's later theory.*

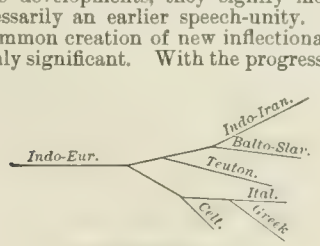
The grouping of Teutonic as well as Balto-Slavic with Indo-Iranian evaded the difficulty involved in separating Balto-Slavic from either of the other two. The division into an Asiatic and a European group was commended (1) by the marked differences in the vocabulary, such as, e. g., in words for agricultural processes and in names for trees; (2) by phonological facts, such as the European distinction between *r* and *l*, both appearing as *r* in Indo-Iranian, and between *e*, *o*, *a*, all appearing as *a* in Indo-Iranian. Any two of the Indo-European branches will indeed be found to share important common features; cf. Brugmann, *Techmers Internat. Zeitschrift*, i., 226 ff. Where they represent merely the common retention of something inherited from the mother-speech, they prove nothing. Where they represent like phonetic developments, they signify more, but do not prove necessarily an earlier speech-unity. Where they represent a common creation of new inflectional mechanism, they are highly significant. With the progress of the science of comparative philology many of the older arguments for relationship have lost much of their weight; thus the European vowel diversity *a*, *e*, *o* is now known to be merely the retention of the old, not the creation of something new. The identification of this vowel diversity in Armenian, furthermore, has disturbed the older division into Asiatic and European, and given Armenian a place as a distinct branch. The first suggestion of the possibility that all the different schemes of grouping were wrong, and yet all contained an element of truth, came from Johannes Schmidt (*Verwandtschaftsverhältnisse der indogerm. Sprachen*, 1872), though his general point of view was not new. He showed that the conception of dialectal differentiation represented by the *Stammbaum* was fundamentally false. The present prevailing view is an outgrowth of Schmidt's discussion. The first impulse toward the breaking up of the parent-speech into distinct languages



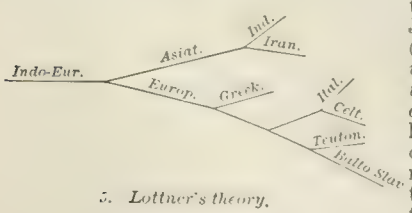
2. *Schleicher's theory.*



3. *Grassmann's theory.*

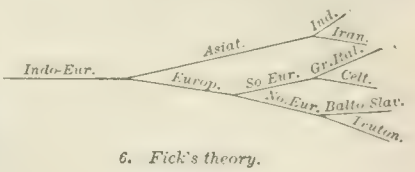


4. *Friedr. Müller's theory.*



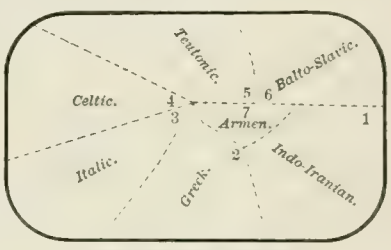
5. *Lottner's theory.*

was *not* given by migrations, i. e. by sudden and violent separations of peoples. What is known from the experience of other languages renders this improbable, and the facts in the particular case are against it. Dialects had begun to emerge while yet some loose form of intercourse remained throughout all parts of the speech-community, and before absolute separation had occurred. An absolutely uniform language extending over a large territory is under natural conditions impossible.



6. *Fick's theory.*

Dialectal peculiarities are the result of various independent impulses to historical change which overspread various portions of a linguistic community, the territory of one such impulse often overlapping upon that of another, and the vigor of each impulse generally diminishing as it becomes removed from the leavening center. Dialectal frontiers develop in sympathy with political, commercial, or social conditions. The usage of certain centers predominates. The features of gradual transition between such centers disappear; the inclined plane becomes, as it were, broken up into steps. It thus often happens that of mutually adjacent dialects, as *a*, *b*, *c*, *d*, two, as *a* and *b*, may share one peculiarity, *b* and *c* another, *a* and *d* another, and *b*, *c*, and *d* another. In the light of these considerations it is clearly unnecessary to choose between grouping Balto-Slavic with Indo-Iranian or with Teutonic. It probably represents a dialect of Indo-European originally tangent to them both. It is not unlikely that with the further progress of the science it may be possible to reconstruct with great accuracy a map representing the original distribution of the dialects in the Indo-European speech-territory. In rudest outline it would now appear somewhat as in the illustration. To illustrate the signification of this arrangement we may conceive that the tendency to assibilation of palatals was felt in 1, 6, and 7; in 5 and 6 *sr* tends to become *str*; in 5, 4, and 3 the tendency to the development of a new initial accent was felt; in 4 and 3 the nasal vowel tended to develop an anaptyctic vowel *e*, in 2 and 1 to become *a*; in 5 and 7 the pronunciation of the explosives tended in a common direction. While 6 and 7 shared with 1 the tendency to assibilation of the palatals, they shared with 2, 3, 4, and 5 the retention of the *a*, *e*, *o* vocalism.



Indo-European Territory.

While this theory of dialects in the parent-speech, or of plural tangencies, as it may also be called, serves to give competent explanation to the great body of facts which were utterly unmanageable under the pedigree or family-tree theory, it must be admitted that many of these facts may possibly be explained from a still different point of view. They may be due to the languages of peoples who were subjugated and incorporated either into the original undivided Indo-European speech-community, or into the different Indo-European speech-communities in the countries to which the Indo-European tribes migrated; cf., e. g., the traces of the vigesimal numeral system in French (*quatre-vingt*, etc.), derived through the Celtic, probably from Iberian. Our knowledge of the languages preceding the Indo-European in the territories occupied is too slight, and the present methods of language are too crude for us to expect as yet much light from this direction. For the general point of view, cf. Ascoli, *Ueber die ethnologischen Gründe der Umgestaltung der Sprachen* (*Verhandl. d. Berl. Orient. Congr.*, ii., 2, pp. 279 ff.); *Una Lettera glottologica* (1881); Schuchardt, *Zeitschr. für roman. Philol.*, iv., 142 ff.

Parent-speech Inflectional.—In the Indo-European parent-speech the commonest signs for relation, as distinguished from the signs for substance, were not consciously and distinctly significant parts of words as prevailingly in the agglutinative languages, nor distinct words, as, e. g., in English, but were generally elements of words which had merged

their identity in the substance-words. Prefixes and separate words were, however, used to some extent for this purpose. In the agglutinative languages the meaning is analytically distributed among the parts of the word; in Indo-European, as an "inflectional" language, the word is a conventionalized sign of substance in relation. The same relation is variously suggested; thus, in Latin, the genitive relation by *-æ*, *-arum*, *-i*, *-orum*, *-is*, *-um*, etc., and the same element serves various purposes; cf. Skr. *-as*, genit. and ablat., *-bhyas*, dat. and ablat. The situation may be so viewed as if a process of analytical distribution of signification had been arrested while in progress, in which case the analytical modern types, e. g. English, would represent the carrying out of the process. Or the inflectional method may be viewed as succeedant to an earlier agglutinative condition, in which case the harmony of earlier analysis has been destroyed by reduction in the number of the categories of relation, resulting in redundancies of form on the one hand and syncretisms of the relation-groups on the other. Hence the name *defective* languages has been suggested to replace *inflectional* languages; the term *symbolic*, as the opposite of *presentative* on the one hand and of *isolating* on the other, might, however, characterize them more accurately.

Cases.—The Indo-European distinguished eight cases of nouns, i. e. it singled out eight common relations (or nuclei of relations) of the noun in the sentence, as worthy of conventional expression: (1) The vocative, merely an interjectional form of the noun, a rudimentary sentence, therefore not strictly a case; (2) the nominative, the case of that in which the action of the verb is set forth or exhibited; (3) the accusative, the case of that most directly affected by the action, that which, so to speak, receives the full brunt of the action; (4) the dative, the case of that with reference to which or in the interest of which the action is; (5) the genitive, the case of that whole of which a part is affected or referred to; (6) the instrumental, the case of the attendant and tool of that which is expressed by the nominative; (7) the ablative, the case of the point of departure or source of action; (8) the locative, the case of the scene of action.

Syncretisms.—The nominative and the accusative were not distinguished in the neuter gender. The reason for this is probably to be found in the original unfitness of the non-personal neuters to serve as actors. The vocative as a distinct form appeared only in the singular, and was otherwise indicated by the nominative. The ablative originally existed only in the singular of pronouns, but before the dispersion had established itself in the singular of the *o*-stems of nouns. Elsewhere the relation was expressed in the plural by the dative, where, however, its occurrence was rare, and in the singular by the genitive, which in some of its original values approximated closely to the meaning of the ablative. In Greek the ablative became entirely absorbed in the genitive, while in Latin it extended itself beyond the *o*-stems and absorbed the instrumental, which shared with it the notion of cause and approached it in form (*ō* : *ōd*); in absorbing the instrumental it received also a large body of locatives whose form had merged them in the instrumental; thus in the *i*-stems, *-ī* is both instrumental and locative, and in the consonant stems the same may be true of *-ĕ*. The psychological blending of these case-categories is, however, to be carefully distinguished from mere formal coincidence. The latter did not by any means always induce the former. The persistence of, e. g., *Romæ*, *belli*, etc., in the *ā* and *o* stems proves the psychological independence of the locative category. The dative, instrumental, and locative became in Greek generally united in the singular under the form of the dative or locative, in the plural under that of the instrumental or locative. In Teutonic the locative joined with the instrumental or dative, and the ablative with the genitive or instrumental.

Number.—There were three numbers—singular, dual, and plural. The dual denoted originally a unity consisting of a natural pair of objects, such as eyes, hands, feet, nostrils (nose), horns, wheels, horses (span), etc. It was inflected originally as a singular; thus the Skr. dual genitive ending *-ōs* represents Indo-Europ. *-oṷs* or *-eṷs*, in which *-oṷ-* is an ablaut variety of the *-u* in the nominative, *dvâu*, *áçvāu*, etc.: cf. *sūnús*, genit. *sūnós*. The dual is preserved in Indo-Iranian, Old Bulgarian, and Homeric and Attic Greek.

Gender.—There were three genders—the masculine, feminine, and neuter. In the primitive speech the formal indication of gender was confined to a few groups of nouns; thus those in *-ā*, *iā* (*iē*) feminine, those in *-os* of the *o*-declension masculine, those in *-om* neuter. This means simply that gender had become thoroughly established as formal or grammatical gender only in regard to certain common word-endings. In the separate language this tendency to create formal gender-groups was extended, and at the same time cross-groups were formed on the basis of signification, as in Greek where names of rivers follow *ποταμός* in being masculine. The word-endings which served as signs of gender were not probably originally employed as such, but became appropriated to that use through their occurrence in words which emphasized sex. Apparently in many classes of nouns the original distinction was only between objects as having or lacking sex, and this distinction was probably indicated originally in language only by the pronouns referring to the words in question. For further discussion, see GENDER.

Inflection of Adjectives.—The inflection of attributive adjectives in "agreement" with the noun serves only what we may call a decorative and not a practical purpose in language. Though it had established itself in the language before the dispersion, it was probably not original. Traces of the original uninflected adjective may be found preserved, for instance, in the cardinal numerals "5"–"10," and probably in the old attributive substantives and adjectives which constitute the first part of many compounds; as in Gr. *βαθύ-κολπος ἀκρό-πολις, ναύ-αρχος*. There are indications that a group of adjective words of the signification all, every, any, etc., tended to follow the pronoun rather than the noun in their inflection; cf. Lat. *aliud? totius*, etc., Skr. *víçva-*, *sárva-*, *éka-*; from this source also the "strong" declension of adjectives in Teutonic.

Inflection of Pronouns.—The inflection of the pronouns was in many regards distinct from that of nouns. The case-endings were in general less distinctly marked. The inflections were in some cases made up by the co-operation of distinct roots; thus for the first personal pronoun, cf. Skr. *ahám*, I; *mâm*, me; *vayám*, we; *asmân*, us: for the demonstrative pronoun nomin. masc. *sa*, nomin. neut. *tad*. The pronoun "we" was not indeed regarded as the plural of "I"; thus in Greek the older forms as represented by Æolic *ἄμμε*, *ἄμμιν*, *ὔμμε*, etc., have no plural endings. The addition of such plural endings resulting in, e. g., *ἡμέας*, *ἡμᾶς*, etc., was relatively late. The pronouns of the first and second persons were indifferent to gender; so also the reflective pronoun *sṷe* (Gr. *Fέ*, *ἕ*; Lat. *sē*). Other important pronouns were the demonstrative *so*, *sā*, *tod*, the relative *ios*, *iā*, *iod*, the interrogative *qos*, *qā*, *qid*, or *qod*, which had the value of an indefinite when unaccented. (Cf. Greek *τίς*, who: *τις*, any one.)

Numerals.—The first ten cardinals were *oinós*, "1," *duō*, "2," *tréies*, "3," *qetuóres*, "4," *pénqe*, "5," *sueks*, "6," *séptṃ*, "7," *oktṓu*, "8," *néuṇ*, "9," *dékṃ*, "10." The first four were inflected. The multiples of ten, i. e. twenty, thirty, etc., were expressed by aid of a derivative of *dékṃ*—viz., *(d)kṃt-* or *(d)komt-*, meaning "group of ten." This appears in Gr. as *-κοντα*, in Lat. *-ginta*, Goth. *tigus*, O. Eng. *-tig*, Mod. Eng. *-ty*, Germ. *-zig*; cf. Indo-Eur. *(d)wīkṃti*, "20" > Lat. *vīginti*, Gr. *Fίκατι*, etc.; *trīkomtə* > Lat. *trīginta*, Gr. *τριάκοντα*, etc. Indo-Eur. *kṃtóm*, "100" (> Lat. *centum*, Gr. *ἑκατόν*, Eng. *hundred*), probably meant originally "ten tens." Name for "1000" was probably *ghéslo-* or *ghzlió-*. There were also numeral abstracts like Skr. *triṇçát*, Gr. *τριακάς*, "group of 30," and ordinals like *sṷektós*, "sixth," and *septmós*, "seventh." The numeral system is clearly decimal. Traces of other systems which intrude themselves into the separate languages are probably due to contact with non-Indo-European peoples after the dispersion. Thus the vigesimal traces in Celtic and hence in French (cf. *quatre-vingt*, "80") are presumably due to Iberian influence, and the duodecimal traces in Teutonic (thus the prominence of 12 (*twalif*), 60 (with 70 begins a new method of naming), and 120 ("gross")), and Balto-Slavic may be explained on the supposition of some contact with Mesopotamian civilization, possibly through trade viâ the shores of the Euxine.

Adverbs.—The adverbs are in general to be viewed as ossified case-forms of nouns or adjectives; thus Lat. *partim*, *statim* are isolated accusatives; Gr. *ὡς*. *τῶς* are probably ablatives, identical with Skr. *yád*, *tād*; Gr. *θύρᾶσι*, *ἄρᾶσι* are locatives; Lat. *istim*, *olim* are instrumentals (Indo-Europ. *-mi*); Germ. *tags*, *morgens* are genitives, in which, however, the completeness of their isolation from noun-declension is shown by the extension of this masculine ending to feminines, as *mittwochs*, *nachts*. These adverbial formations frequently preserve through their isolation older phonetic characteristics of the cases they represent. Thus their differentiation of accent often preserves a trace of earlier varia-

tions of accent within the declension which were later leveled out by analogy: cf. τάχα : ταχύς; Skr. *mádhyā* : *mádhya-*. Certain adverbs existed in the parent-speech as finished products entirely dissociated from the case-system; such were *ne*, "not," *perut*, "last year," *ghíes*, "yesterday."

Prepositions.—The so-called prepositions were in the parent-speech essentially preverbs, i. e. they were adverbial words standing in a fixed and conventional relation to the verb, and serving to define more closely the direction and application of the action. By virtue of this function they often assisted in defining more precisely the nature of the relation expressed by the case-forms, and were often therefore drawn over into closer connection with the dependent noun. In the parent-speech they were, however, prevailingly preverbs. Their usual position was before the verb and after the case-form. Their use in composition with nouns or adjectives was originally due to a verbal idea conveyed or suggested in these words, i. e. it was originally preverbial. Examples of Indo-European preverbs are: *ápo*, off, *áyo*, from (Lat. *aufugio*), *entér*, within, between, *úpo*, in hither, under, *péri*, around, *pró*, forth, forward, *ésqe* (*osqe*), clear up to (cf. Gr. ἔστε, Lat. *usque*, Skr. *áccha*), *ánti*, in the face of, etc. To some extent the prepositions are creations of the individual languages; thus Lat. *tenus*, an ossified neuter noun meaning extent, and *versus*, a participle of *vertere*.

Conjunctions.—The parent-speech possessed some special connective words: e. g. *qê* (enclitic), cf. Lat. *-que*, Gr. τε, Skr. *ca*; *jā́yat*, cf. Gr. ἕως, Skr. *yā́vat*.

Verbs.—The Indo-European verb was a highly developed complex structure. It expressed by variation of the personal endings the distinction between two voices, active and middle. There existed no mechanism for the passive. Two sets of personal endings were in use for certain parts of the verb, a set of fuller endings commonly called primary (e. g. *-mi*, *-si*, *-ti*), and a briefer, commonly called secondary (e. g. *-m*, *-s*, *-t*). The latter were used originally with verbs having a prefix, hence, e. g., with the past tenses which employed the augment (*e-*). Hence *bhéreti*, he bears, but *ébheret*, he bore. The appended *-i* of the primary endings probably served originally to emphasize present time. Forms without either the appended *-i* or the prefixed *e-*, e. g. *bheret* (injunctive), name the action without reference to time, and were used in a variety of values, as indicatives, present, past, future, and as imperatives. The variations of tense are expressed with a lavish outlay of form totally out of proportion to the distinctions of meaning and especially noticeable in the present. Not only is the same tense indicated by different formations, but different tenses sometimes employ what is essentially the same formation. The adaptation of form to meaning was evidently not complete. The differences of tense for which expression is obtained are: (1) the present, (2) the future, (3) the imperfect, or the tense of narrative past, whereby the hearer is carried in imagination back into the past, (4) the aorist, or the tense of announcement, whereby the element of time-duration is disregarded, (5) the perfect, or the tense of present completion. The moods are: (1) the indicative, (2) the subjunctive, or the mood of willing, (3) the optative, or the mood of wishing and of possibility, (4) the imperative, or the mood of direction and command. The infinitive was made up of oblique cases of verbal nouns closely attached to the verb. The participle expressed the verbal idea in adjective use. The formation of the stem of the verb preparatory to the addition of the personal endings displayed a remarkable parallelism to the stem-formation of nouns. Thus the contrast between non-thematic verbs (Skr. *ás-mi*, Gr. εἰ-μί) and thematic (Skr. *bhár-a-tha*, Gr. φέρ-ε-τε) was parallel to that between consonant stems of nouns (Skr. *mātár-i*, Gr. μητέρ-ι) and the *o*-(*e*-)stems (Gr. ζυγ-ό-ν, Skr. *yug-á-m*). The subjunctive stems of non-thematic verbs (Indo-Europ. subj. *es-e-t(i)* : indic. *es-ti*; cf. Skr. *ásati*, Lat. *erit*) were like *o-*, *e*-stems; those of thematic verbs (Indo-Europ. subj. *bher-ā-s(i)* : indic. *bhér-e-si*; cf. Lat. *ferās*) were like *ā*-stems as used in feminines of the *ā*-declension, or in neuter plurals of the *o*-declension.

Order of Words.—Certain general principles to which the word-order tended to conform may be stated: (1) The subject stood first; (2) the verb stood in the second place when unemphatic, but at the end when accented, as in clauses (note preservation of this rule in German); (3) adjectives and attributive genitives preceded their nouns; (4) appositives followed their nouns; (5) prepositions preceded the verb when that stood at the end, and consequently followed the cases affected by them; (6) enclitic particles and unaccented words like vocatives sought the second place in the sentence; (7) an emphatic word tended to occupy the first place.

Accents.—Each word-form had its own distinctive accent, but this might fall upon any syllable; thus *pénqe*, "5," *októu*, "8," *dékm*, "10," *sodéieti*, "he sets," *dhughətē(r)*, "daughter." It was an expulsive or stress accent accompanied also by characteristics of pitch. It might be a radical or slurred stress, i. e. acute or circumflex. The distinction between the two is preserved in Lithuanian and Greek. The distinction φορᾶ : φορᾶς is inherited from Indo-European. Within the sentence some words were accentless or enclitic: thus vocatives and the verbs of principal clauses unless initial.

Sounds.—The vowels were *ā, ē, ō, ə, i, ī, ū, r̥, l̥, m̥, n̥, ə̄*: the consonants, *j, w, r, l, m, n, h, s, z, j* (spirant), *c, p, ph, bh, t, th, d, dh*, and a double series of gutturals; (1) back gutturals or velars *q, qh, g, gh*; (2) palatals *k, kh, g, gh*. A marked feature of the phonology was the clear distinction between the unaspirated and the aspirated explosives *p* vs. *ph*, *d* vs. *dh*, etc.

Ablaut.—Before the dispersion there had developed itself, probably under the influence of varying accent, a variety in the form of the syllable which perpetuated itself in the separate languages even after the cause had been removed. Thus the English *sing*, *sang*, *sung* referred back to the Indo-European status would be *séngʰō*, *sesóngʰa*, *sungʰonós*; cf. Gr. δέρκομαι, δέδορκα, ἔδρακον (< *édr̥kom*). (See Ablaut.) For bibliography and further discussion, see Language, Greek Language, Grimm's Law, Latin Language, Sanskrit Language, Slavic Languages, Teutonic Languages, etc.

Benj. Ide Wheeler.

Indo-Germanic Languages: See Indo-European Languages.

Indo-Iranian: a term applied by many linguists to that branch of the Indo-European family which is composed of the Indian (Hindu) and Iranian groups. It is to be preferred to the term Aryan, used by some, as it avoids all possibility of confusion. See Iranian Languages, Sanskrit, Prākrit, and Indo-European Languages. B. I. W.

Indor: a native state and its capital in Central India. The state is also called the Holkar's Dominions, from a title of the reigning family. It is one of the principal feudatory states of British India. It is in many detached divisions in the western part of Central India, some in the valley of the Nerbudda, others in that of the Chambal. Efforts have been made to concentrate these separate tracts since 1861 by exchange. Area estimated at 8,075 sq. miles. The tracts are fertile, the poppy is extensively grown, and excellent wheat, tobacco, sugar-cane, and cotton are raised. The climate is generally hot, and after the annual rains the malaria of the jungles is deadly to Europeans. The population of the Indor agency in 1891 was 373,200. The ruling race is the Mahratta, but there are many other classes of Hindus in the state, besides Gonds and Bhils. The latter are to be found in the mountains, and are considered the aborigines. They are wild and predatory, warlike, but not so much as formerly. A line of railway leaves the Great Indian Peninsula Railway at Khandwa and runs northward through the city of Indor to Ajmir. The founder of the dynasty was Malhar Rao (b. in 1693), son of a shepherd resident in the village of Hol, hence called Holkar, an inhabitant of Hol.

The city of Indor is on the Kan or Katki river, an affluent of the Chambal, about 2,000 feet above sea-level. It was founded in 1770, and is well constructed and healthful. The political agent of the British Government for Central India lives near by with a small garrison of troops, and near the garrison is the college of Rajkumar, intended for young princes of the states within the general agency. Pop. (1891) 92,170. Mark W. Harrington.

In'dra: in Hindu mythology, the god of the firmament. His name is from the Sanskrit root *id*, to see, discover, or discern, the sky, from overhanging the world, being supposed to discern all. The primitive Aryans of India believed that it was the sky which caused rain, and they therefore regarded Indra, or the sky, as the chief of the gods. From all that we find narrated about Indra, it is evident that his causing rain was regarded by Hindus as the most important evidence of his divine power. Water means wealth in the East, and Indra's compelling the fleeting clouds to pause and drop their precious burdens on the earth was esteemed as the greatest of his godlike exploits. In offering him praise as the sender of rain, they fancied that the cloud which failed to bring rain was an *asura*, or demon. Such a cloud was particularly a *vritra* (from *vri*, to hide or en-

velop), because it spread over the face of the heaven and tried to obscure the face of the sun. Hindus pictured Indra's undertaking to cause rain as his going forth to do battle with this evil *vritra*; and they represented rain to be caused by his cleaving the demon-cloud with his *vajra*, or thunderbolt, and thereby slaying the *asura*. With reference to this feat, numberless songs were composed in praise of the sky-god; and inasmuch as Indra was completely victorious in every one of his contests with the cloud-demons, he gradually came to be regarded generally as the giver of victory, and in particular as the god who enabled the Aryan invaders of India to conquer the aborigines; and so his worship rapidly became more and more popular. In the epic and Puranic periods of the Hindu religion, Indra enjoyed great legendary fame, but he gradually lost his place in the Indian Pantheon as the chief of the gods. In Vedic times, however, he was supreme, or only shared his throne with *Agni* (fire), *Sûrya* (the sun), the *Maruts* (winds), and *Ushas* (the dawn). The hymns in praise of Indra are among the most spirited and beautiful in the *Rig-Veda*.

Indra afterward became less an object of worship than of admiration, and in the epic and Puranic period of Hindu literature he was made a favorite subject for the elaborate and extravagant eulogies of poets. These gradually invested him with a peculiar splendor, which again attracted to the god the languishing attention of Hindustan, and revived his *cultus*. He was now represented as enthroned in the east as one of the eight guardians of the world. He dwelt in an ineffably luxurious paradise, *Swarga*, the heaven of the inferior divinities, and the final blissful goal of all pious mortals who had attained sanctity by a life spent on earth devoted to the due performance of religious duties. We now find him being represented in paintings and sculptures. He possesses innumerable eyes, as the sky-god who discerns all. These eyes are represented as thickly covering his body. He has four arms, perhaps typical of the four quarters of the sky. In one famous painting he is represented as riding on an elephant with three trunks. In another he is depicted as standing on an elephant, while a tree grows out of his head and peacocks nestle in its branches. The eyes in the tails of the peacocks may represent the stars of the firmament. Sculptures of the god are to be found in the caves of Elephanta and Ellora. The later legends about Indra are not all creditable to him. Indeed, in Puranic times he became noted for his profligacy. Indra is also called by the names of *Sakra*, *Vajrapani*, *Satakratu*, *Vritrahan*, *Vasava*, and *Makendra*.

Revised by R. LILLEY.

Indre, ăñd'r: a river of France, chiefly in the department of the same name. It flows into the Loire S. W. of Tours, after a northwest course of 150 miles. It is a sluggish stream, intersected by dams, and is not subject to floods.

Indre: department of Central France, on the Indre, a tributary to the Loire. Area, 2,623 sq. miles. Although a part of the surface is barren or swampy, considerable quantities of wheat are raised for exportation, and much wine is made. The department is noted for its sheep and poultry. Among articles of industry are cutlery, earthenware, leather, and cotton cloths. Capital, Châteauroux. Pop. (1896) 289,206.

Indre-et-Loire, ăñd''r-ā-lwăr: department of Central France, on the Loire, along which high dikes have been built to prevent inundations. Area, 2,361 sq. miles. Wine and wheat are produced, truffles and fruits are raised, and powder, files, cloth, paper, and leather are manufactured. Pop. (1896) 337,064. Capital, Tours.

Inductance (in electricity): See IMPEDANCE.

Induction [Lat. *inductio*; *in*, in + *ducere*, *ductum*, to lead or draw]: the process by which facts or phenomena are investigated in order to discover their laws or causes. Its problem may be stated as follows: Given a phenomenon or group of phenomena related in certain ways to other phenomena; to investigate these relations in order to determine the laws or causes of the phenomenon or group. Under this general statement all cases of induction may be subsumed.

Data of Induction.—These include the ground of induction as well as certain facts and mediating relations. Stuart Mill finds the ground of induction in belief in the uniformity of nature; but we must go deeper, and seek the real ground in the idea of nature itself. Science rests on the supposition that there is a nature to investigate. Mill in his analysis and statement of the law of causation develops this idea of nature, and shows how it presupposes a system of things bound together by the universal relation of conditional dependence. This law of conditional dependence, according to which phenomena are to be explained by connecting them with their antecedents in the natural series, is the logical presupposition and ground of all induction. There are also certain facts or phenomena which suggest the problem of induction, and which must be carefully distinguished from the facts brought in later as tests of the hypothesis. For example, the appearance of dew on clear nights and its non-appearance on cloudy nights will suggest the problem of the cause or causes of dew. A third element of data are the mediating relations upon which the induction directly proceeds. These are either coexistences or sequences in time, or they are similarities or differences. When these relations are uniform they suggest causal connections, and thus supply hypothetical explanations which it is the business of the inductive process to test. The mediating relations serve in general as signs or finger-posts which point to the law of which we are in quest.

Instruments of Induction.—These are observation and experiment. Observation as an instrument of induction is not to be confounded with the process of that name in ordinary experience. It is much more rigid and methodical, and when employed by science presupposes the existence of a definite problem for which a hypothetical solution has been suggested. Observation is employed as a testing or verifying agent, and must be conducted under the most rigorous conditions possible. The difference between observation and experiment is only one of degree, experiment being that species of observation in which the investigator has most complete control of the conditions of his problem. An astronomer noting the phenomena of an eclipse of the sun through his telescope is making an observation, while the chemist employing a reagent in order to detect the presence of arsenic in a compound is performing an experiment. The exacter forms of both observation and experiment involve the use of artificial means for increasing the natural range and accuracy of the senses. The invention of the microscope and telescope and of the various instruments for measuring time, weight, volume, etc., has been one of the most important and indispensable conditions of the scientific progress of modern times.

Stuart Mill's attempt to classify the methods of observation and experiment forms the basis of most of the recent work in this department of logic. Mill's aim is not so much the development of specific methods as the discovery and formulation of principles on which specific methods may be founded. These principles are embodied in the so-called canons of agreement, difference, residues and concomitant variations. Agreement is the method by which the invariable antecedent of any phenomenon is selected as its cause or condition. For example, the fact that an increase of heat invariably precedes the expansion of solids leads to the selection of this antecedent as its cause. The principal dangers which beset the use of this method are expressed in the fallacies known as *post hoc, ergo, propter hoc*, and *non causa, pro causa*; that is, the fallacy of taking the invariable antecedent or consequent as in all cases the cause or effect of a phenomenon, when in fact the two are not in all cases identical. The danger can be escaped here only by the employment of supplementary methods, or, when this is impracticable, by a large number of observations. The method of difference takes a step in advance of agreement by selecting only that invariable antecedent of a phenomenon whose elimination is invariably followed by the disappearance of the phenomenon. Difference thus fortifies itself with both positive and negative instances, and is the method of exact research par excellence. But from its very nature the scope of its application is limited. Residues, Mill's third method, is a principle of elimination by the application of which the residual phenomena in a concrete may be isolated for special investigation. Thus, for example, in a case of food-poisoning where only certain members of a party have suffered, the problem may at once be simplified by throwing out all the articles of which any of the uninjured persons have eaten. This will perhaps result in the isolation of one or two articles of food as the probable causes of the poisoning, and the solution of the case will be rendered comparatively easy. Concomitant variations, Mill's fourth method, has an application where the employment of the other methods would be impracticable. There are, as Mill points out, certain permanent causes in nature, such as heat, gravitation, atmospheric pressure, etc., which are the invariable concomitants of every natural phenomenon. Here the rela-

tion of uniform antecedence, on which the other methods rest, can not be applied in its simplicity, and the only mode of determining the effects of such causes is by observing the consequences of their variation. Thus from the observation that the volume of bodies varies with the degree of heat that is applied to them, the discovery is made that heat is a cause of the expansion of solids. This method also involves the principle of quantitative induction, since the concomitant variation of a cause and effect makes it possible to determine their quantitative ratio, and thus to obtain the formula of their law.

These methods formulate the most general principles of inductive observation. Many special methods have been elaborated by the various sciences, of which mention can not be made. Systematic discussions of some of the principal of these will be found in such works as Jevons's *Principles of Science* and Venn's *Empirical Logic*. There seem to be no natural limits to the development of special methods of research, except the character and accessibility of the phenomena under investigation.

The Inductive Process.—This embraces two principal stages; namely, discovery and investigation. Mill excludes discovery, regarding it as only a preliminary to induction proper, while Whewell and Jevons, with more reason, admit it as an essential part of the process. Discovery includes two steps—first, the definite ascertainment of the problem to be solved. This involves what Whewell calls the decomposition of facts and the selection of those uniform connections which, as has been shown, constitute the basis of the whole inductive procedure. The second step is the suggestion of a hypothesis or provisional explanation. Writers on induction, like Bacon and Mill, treat the hypothesis very inadequately, failing to see that it is indispensable as a guide to investigation, and that without it the whole process would be aimless. Jevons has treated of the hypothesis with great discrimination. The stage of discovery culminates in the definite hypothesis. Investigation includes the larger part of induction. It consists mainly in the testing of the hypothesis by a systematic application of methods of observation and experiment. To this stage of the process belongs that elaborate collection of instances which Bacon mistakenly conceived to be a preliminary to induction. The result of the investigation will be either the verification or refutation of the hypothesis, or, as very often happens, its modification. It is quite common for investigation to start with some crude inadequate hypothesis, which the testing process gradually modifies in the course of verification.

Scientific Method.—Mill and other writers have shown that science must make a joint use of induction and deduction. Induction tends to the discovery of simple causes and laws. Sometimes, however, the problem is one that involves an additional step which Mill calls ratiocination. This is purely deductive and the necessity for it arises when the question to be determined is the complex result of the combined operation of a number of simple causes. This species of problem comes up most frequently in the sphere of social phenomena. For example, the problem is to determine the probable rate of wages at a given time in a given industry. Into the determination of this rate a number of simple causes will enter. The solution will involve a calculation analogous to that which enters into the solution of the problem of the composition of forces in mechanics.

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Induction Coil: a device for utilizing the mutual induction between neighboring coils of wire for the production of momentary currents. The essential parts of the induction coil are: (1) A central core (*c*, Fig. 1) which generally consists of a bundle of soft-iron wires; (2) a primary coil (*p*, Fig. 1) which consists of one or two layers of heavy copper wire encircling the core throughout nearly its entire length; (3) a secondary coil (*s*, Fig. 1) which is made up from many turns of fine copper wire wound around the primary; (4) an interrupter (*i*, Fig. 1) by means of which the circuit of the primary coil may be opened and closed at frequent intervals, either automatically or by hand. The arrangement of the parts (see Fig. 1) is such that the primary and secondary coil possessing a common axis surrounded with iron will lie approximately in the same field of force. When a current is sent through the primary coil the lines of force encircling it will, in great part, embrace also the secondary coil, and when the circuit through the primary is interrupted, again the disappearance of the lines of force, due to the current which had been traversing it, involves at the same time the suppression of lines which had surrounded the secondary coil of the instrument. Now, every change, whether of increase or decrease, in the number of lines of force which pass through a coil of wire induces currents of electricity in the latter. (See articles Electricity, Dynamo-electric Machine, Induction, Transformer, etc.) The induction coil, then, may be used in a variety of ways. Any operation which secures fluctuations in the strength of the field of the primary coil is capable of producing currents in the secondary. Aside from certain special uses which will not be discussed here, such as the application of the induction coil in telephone transmitters, etc., two chief methods of operation are in vogue. The first of these is due to Ruhmkorff, after whom induction coils are frequently called Ruhmkorff coils. The Ruhmkorff method consists in the automatic making and breaking of circuit already alluded to. The present article will be confined to the consideration of coils adapted to the utilization of this process.

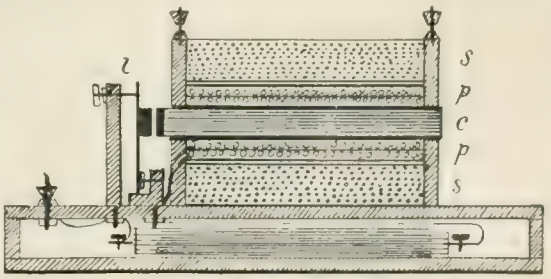

Fig. 1.—Induction coil.

Induction coils may also be operated by passing through the primary coil an alternating current. When used in this way the coil is termed a transformer, under which head its construction and the laws of its action will be fully treated. (See Transformer.) As regards the Ruhmkorff coil, the most important function which it is called upon to perform consists in the convenient production of interrupted currents with very high differences of potential. Now, the electromotive force in the secondary circuit depends upon the number of turns of wire in the secondary coil and upon the number of lines of force which are made to appear and disappear at each making and breaking of circuit. The electromotive force in the secondary circuit depends also upon the rate of change of the number of lines passing through the secondary coil. The points to be observed in the construction of an induction coil are, then, (1) an arrangement of the primary coil such as will produce a strong field; (2) selection of a core such that upon the disappearance of current from the primary coil the lines of force will vanish promptly; (3) the arrangement of the apparatus in such a manner that as many as possible of the lines of force due to the primary circuit may encircle the secondary coil. The simplest and best form of apparatus for interrupting the circuit through the primary coil is called the Neff's (sometimes Wagner) hammer. This consists of a stiff brass spring (Fig. 2) fastened rigidly at the lower end. To the free end is screwed a disk of soft iron which is situated with its axis in the axis of the core of the coil, and distant but a few millimeters from the end of the core. The primary circuit is so arranged that the current must flow in at the base of the spring and then out of the same through an adjustable screw with platinized tip. This screw is so placed that the moment the core of the coil becomes magnetized and attracts the disk upon the spring, the latter is drawn away from the contact screw and the circuit is broken. Upon the disappearance of the magnetization of the core, the spring returns to its position, contact is renewed, and the

current flows again for an instant, remagnetizing the core and breaking the circuit again. This process is automatically repeated with a rapidity which depends upon the period of vibration of the spring. Where very large currents are

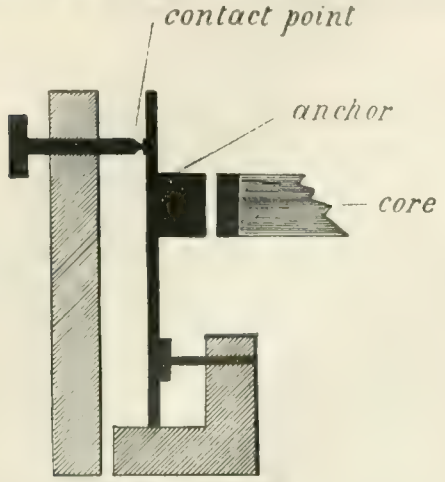

Fig. 2. Induction coil.

sent through the primary of the induction coil, difficulties are met with on account of the spark which forms at the contact point. In such cases other special interrupters must be employed. The ratio of the electromotive forces of the primary and secondary circuits of an induction coil is called the ratio of transformation. Where all the lines of force due to the primary circuit encircle the entire secondary coil, this ratio is the ratio of the number of turns in the primary and the number in the secondary; but this condition is very imperfectly met in the Ruhmkorff coil, and the ratio of transformation is very much smaller than the ratio of the turns. Since it is the object of induction coils in general to produce high electromotive forces in the secondary circuit, the question of the insulation is an important one. In all large coils it is customary to wind the

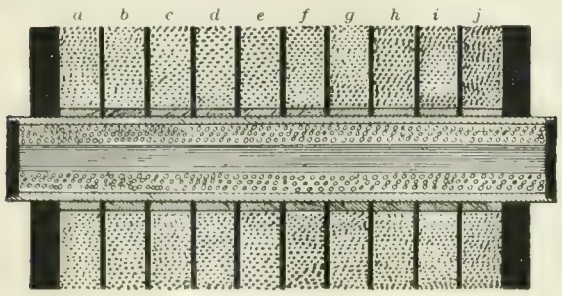

Fig. 3.—Induction coil.

secondary coil in sections (*a*, *b*, *c*, *d*, etc., Fig. 3), these sections being separated by disks of vulcanite or mica. The plan of winding is such that turns differing greatly from one another in potential are situated as far as possible apart within each section. The number of sections is sufficiently great so that wires the contiguity of which might endanger the intervening insulation are always separated by the intervening disks. In this way it has been found possible to wind coils containing many miles of wire, with potential differences which rise to extraordinary values. One of the most remarkable Ruhmkorff coils in existence is that in possession of Mr. Spottiswoode in England. The following data with reference to it, taken from *The Philosophical Magazine* (Jan., 1887), may serve to illustrate an extreme case of the application of electro-magnetic induction to the production of high from low potentials. The core of this coil consists of a bundle of iron wires, 44 inches in length and 3·56 inches in diameter, weighing in all 67 lb. The primary coil is 660 yards in length, with a total resistence of 2·3 ohms. It contains 1,344 turns in six layers. The weight of the primary is 55 lb. The secondary coil contains 280 miles of fine wire, with a total resistance of 110,200 ohms. It is wound in four sections, the inner sections being of somewhat smaller wire than those in the outside. Each of these sections is made up of parts wound between flat disks. The total number of turns in the secondary coil is 341,850. In parallel circuit with the primary, as is usual in induction coils, a condenser is employed which consists of 126 sheets of tin-foil, 18 inches by 8¼ inches in area, each pair separated by two thicknesses of paper. When a battery of thirty large grove cells was used in the primary circuit of this coil, it gave a spark 42 inches in length.

E. L. Nichols.

Induction, Electro-magnetic: a name given to phenomena which are related to or accompany the establishment of a magnetic field, or which result from changes in such a field. Whenever a conductor is moved through a magnetic field in such a direction as to cut the lines of force, it is found that an electromotive force is established in the former. The same thing occurs whenever the magnetic field which surrounds an electric circuit is created or destroyed, or is varied in strength. The electromotive force induced by such movements or changes in the field within which the circuit lies is a source of current. Such currents are called induced currents; they last only as long as the movements in question or changes in question are going on; the directions which they take have been expressed by Lenz in the form of a law. *Lenz's law* is as follows: *Induced currents which result from movements or other changes in an electro-magnetic system are always in such a direction that they tend to oppose these movements or changes.* A detailed discussion of this law is given in the article Electricity (*q. v.*). Electro-magnetic induction affords the most important means known for the production of electrical currents. Motion through a magnetic field may be obtained by the expenditure of energy derived from the most abundant sources at the command of man; that is to say, by means of the utilization of water-power or by the consumption of coal. Compared with such sources of work as these, the fuel consumed in voltaic batteries is very costly. The consequence is that wherever large quantities of electrical energy are required they are obtained by electro-magnetic induction, rather than by the use of any form of the voltaic cell. The device by means of which induced currents of the most useful type for general purposes are obtained is the dynamo, the principle of construction of which will be found in the article Dynamo-electric Machine. It is not, however, in the production of electrical currents alone that induction plays an important part, for since every electric circuit possesses a field of force, changes in the latter may be utilized for the creation of other currents in circuits situated in the neighborhood. This fact gives rise to another class of apparatus scarcely less important in the field of practical electricity than the dynamo itself—viz., the Induction Coil (*q. v.*) and the Transformer (*q. v.*). In the former class of apparatus two coils of wire are placed concentrically, so that they possess a common axis and are surrounded by a common field of force. The current flowing through the first of these, called the primary coil, is successively created and destroyed by means of a "make and break" device termed the *interrupter*. Each time a current is produced in the primary circuit an induced current (in opposition) arises in the secondary coil, in accordance with Lenz's law. Each time that the circuit is broken and the primary current disappears a secondary current is produced, the direction of which is such as to retard the change. The transformer is an induction coil in which, instead of making and breaking the primary circuit, an undulatory or alternating current is sent through the primary coil inducing similar undulations in the secondary circuit. The construction and the method of operation of these two important instruments are described in the articles just cited. The effect of the changes of current in one circuit upon a neighboring conductor is called *mutual induction*. It is also true that in a single circuit through which current is flowing there may arise (whenever the circuit is open or closed, or whenever the current value fluctuates) induced currents, which are superimposed upon the original currents in accordance with Lenz's law in such a way as to tend to reduce the fluctuations, or to retard creation and disappearance of the latter when the circuit is open or closed. This phenomenon is called *self-induction*.

E. L. Nichols.

Induction, Electrostatic: a name given to certain phenomena in Electricity (*q. v.*) which deal with the influence of charged bodies upon the electrical distribution of the charge in all neighboring conductors, together with the

transmission of this effect through space. The explanation of these phenomena, which are quite fully discussed in the article just cited, involves the assumption of a medium analogous to, and probably identical with, the luminiferous ether. Whenever a body is electrically charged an effect is produced upon the arrangement and condition of this medium throughout the surrounding space. The disturbances are most marked in the immediate neighborhood of the charged body, but may be appreciable even to great distances. This disturbance of the ether is not supposed to take place instantaneously, but by means of a wave-motion with a definite velocity. See further ELECTRICITY, ELECTRICAL MACHINES and CONDENSER, and other related topics.

E. L. NICHOLS.

Inductive Capacity (specific): the dielectric constant. The capacity of a condenser of given dimensions varies according to the nature of the dielectric used. Specific inductive capacity (K) is a constant which expresses the quality of the medium in this respect. Specific inductive capacity is measured by using the materials to be tested in a condenser, and determining the quantity of electricity necessary to produce a given difference of potential between the plates, in each case, compared with the quantity when air is the dielectric.

The following tables give the specific inductive capacity of some of the more important insulators:

TABLE I. (SOLIDS).

Glass	3·0 to 7·4	Gutta-percha	2·4
Ebonite	2·0 " 3·48	Fluorite	6·7
Sulphur	1·8 " 3·9	Quartz	4·6
Shell-lac	2·7 " 3·6	Calcite	7·6
Paraffin	1·8 " 2·3	Mica	6·6
Caoutchouc (raw)	2·1 " 2·4	Rock salt	5·8

TABLE II. (LIQUIDS).

Petroleum	1·92	Carbon disulphide	2·67
Turpentine	2·23	Sulphuric ether	4·9
Olive oil	3·16	Ethyl alcohol	27·0
Xylol	2·3	Methyl alcohol	32·7
Benzol	2·38	Water	83·0

The dielectric constant varies with the duration of the charge to which the condenser is subjected, diminishing to a minimum value for infinitesimal periods. It varies also with the temperature of the dielectric, rising with the same.

According to the electro-magnetic theory of light, there should be a definite relation between specific inductive capacity (K) and index of refraction (n), viz.:

$$K = n^2.$$

This has been verified experimentally in the case of media for which the index of refraction can be computed for long waves (by Cauchy's law). In the case of substances not obeying that law, there is an apparent discrepancy between the two values, owing to the fact that the index of refraction must be determined for wave-lengths which are infinitesimal as compared with those to which our values of the dielectric constant are applicable. E. L. NICHOLS.

Indulgence: in the Roman Catholic Church, a total or partial remission of the temporal punishment still due to sin after the guilt has been remitted by penance. It is granted through the power of the keys by an application of the treasure of the Church. An indulgence can not be granted for unforgiven sin. It is not the remission of sin nor of the eternal punishment due to mortal sin, still less is it a permission to commit sin in the future. Before an indulgence can be gained, sin must have been previously remitted by repentance. Thus instead of being an encouragement to sin, it is a strong motive to repentance. Many indulgences have been abrogated, or declared apocryphal. The Council of Trent (session xxv., de Indulgentiis) prohibited the "disreputable gains" made in some places at the expense of those who desired to obtain indulgences. The same council (session xx., cap. 9) lays down the principle that all indulgences must be granted "gratis." See Eusebius Amort, *De origine, progressu, valore ac fructu Indulgentiarum* (Augsburg, 1735). Consult also Maurel, *Les Indulgences*, and the latest edition of the *Raccolta*, an official collection of authorized indulgences. JOHN J. KEANE.

Indus: a great river of Southern Asia; in the western part of British India. It rises in the Himalayas in lat. 31° 20′ N. and lon. 81° 15′ E., on the northern side of the Kailas, at an elevation of 18,000 feet. After receiving the Gartok, it bursts through the Himalayas and flows through the lowland to the Arabian Sea. At Attok, the point where Alexander the Great entered India, 940 miles from its outlet, and at an elevation of only 1,000 feet, it receives the Cabul and becomes navigable; 470 miles from the ocean it is joined by the Punjaub (liter., the five rivers from it, viz., the Jhilum, Chinab, Ravi, Bias, and Sutlej), but at Migani, 8 miles N. of Haidarabad and 75 miles from the ocean, it divides and forms a delta whose breadth along the coast is 130 miles. It enters the Arabian Sea through a great number of mouths, of which even the widest and deepest is not accessible for vessels of more than 50 tons, the channel being much encumbered by shoals and mud-banks. The Indus abounds in fish and crocodiles. Its length is about 1,800 miles; area of basin, 300,000 sq. miles.

Revised by M. W. HARRINGTON.

Inebri'ety [from Lat. *in-*, in + *ebri'etas*, drunkenness, deriv. of *e'brius*, drunk]: in the present acceptation of the term, is used to denote the diseased condition of the system produced by the habitual use of alcohol. Its synonyms are *alcoholism*, *dipsomania*, and *oinomania*. Alcohol introduced into the circulation acts upon, and to a certain extent destroys, the red corpuscles of the blood, and thus, secondarily, affects all the organs of the body. Its most common mode of introduction into the system is in the form of spirituous and fermented drinks; and in those addicted to its habitual use the principal lesions are chronic hyperæmia and subsequent inflammation of the stomach, Bright's disease, fatty degeneration of the liver, chronic congestion and softening of the brain, heart disease, and various widespread degenerative processes. Formerly, inebriety was regarded as a crime, but within a few years science has shown it to be a disease, and institutions have been established for its treatment and cure. Statistics from these institutions have demonstrated—(1) Inebriety is a disease and is curable. (2) Relapses may or may not occur. The patients in hospitals for the treatment of inebriates may be divided into three classes—viz.: I. Those who by social indulgence, without hereditary taint, have become inebriates. These, as a class, are curable by the aid of an institution. II. Those in whom the disease is inherited, in which cases it manifests itself in paroxysms (sprees) at variable intervals. These are more difficult to restore to health. III. Those who seem totally depraved in all their instincts, and exhibit no desire for restoration to health. These, as a class, are incurable, and should, for the protection of society, be placed under permanent restraint in institutions distinct from those of a reformatory character. Careful reports from hospitals for inebriates show that between 50 and 60 per cent. of the patients there treated are restored permanently.

Revised by WILLIAM PEPPER.

Ineducabil'ia [Mod. Lat. from Lat. *in-*, not + *educabilis*, educable]: a term used by Bonaparte for a division of placental mammals containing the *Chiroptera*, *Insectivora*, *Rodentia*, and *Edentata*, and distinguished by the small size of the cerebrum, which leaves the olfactory lobes and cerebellum partly exposed. It is opposed to EDUCABILIA (*q. v.*).

Iner'tia, or **Vis Inertiæ** [Lat. *vis*, force, and genit. of *iner'tia*, indolence, liter., unskillfulness; *in-*, un + *ars*, *artis*, skill, cf. *soll-ers*, skillful]: a universal property of matter by reason of which if in motion it will for ever continue in motion, or if at rest it will for ever continue at rest, unless operated upon by some external force.

I'nez de Cas'tro: Portuguese princess, called *Collo de Garza* (heron's neck); descended from one of the richest and noblest families of Galicia, and renowned for her beauty. When her cousin, Donna Constantia, married Dom Pedro, the Crown Prince of Portugal, Inez accompanied her as maid of honor. Dom Pedro falling in love with her contracted a morganatic union, and when, in 1345, Donna Constantia died, he secretly married her. In 1355 Dom Pedro's father, the old King of Portugal, Alfonso IV., had her assassinated for political reasons, and the passionate depth and intensity of the love which Dom Pedro had entertained for her became apparent in his sorrow and revenge. According to the familiar legend, when Alfonso died in 1357 and Pedro became king, the corpse of Inez was placed on the throne in royal attire and received royal homage; then it was solemnly entombed under a magnificent monument and with gorgeous processional pomp. Modern writers, however, have discredited the story. Her assassins were put to death in a most cruel manner.

Infallibilist: one who believes in the infallibility of the pope. The term is of modern origin, and was brought into use in 1870, during the Vatican Council, which at first was

divided between infallibilists and anti-infallibilists, but at last decided that the pope was infallible—i. e. free from all error—in his official utterances as the head of the Catholic Church on questions of faith and morals. The anti-infallibilists were divided into two parties—those who opposed the doctrine of papal infallibility from principle as false (Bishops Hefele, Maret, Kenrick, Darboy), and those who opposed it only from expediency, deeming it inopportune and unwise to define and to declare the dogma; hence the latter were called also inopportunists, as distinct from the opportunists. See INFALLIBILITY OF THE POPE and VATICAN COUNCIL.

Infallibility of the Pope [*infallibility* is from Fr. *infaillibilité*, from Lat. *infallibi'litas*, deriv. of *infalli'bilis*, infallible; *in-*, un- + *falli'bilis*, that can be mistaken or deceived, deriv. of *fal'lere*, deceive]: in the Roman Catholic Church, the doctrine defined by the Vatican Council, session iv.; to wit, that "the Roman Pontiff when he speaks *ex cathedra*—that is, when in discharge of the office of pastor and teacher of all Christians, by virtue of his supreme apostolic authority, he defines a doctrine concerning faith or morals to be held by the universal Church—is, through the divine assistance promised him in blessed Peter, possessed of that infallibility with which the Divine Redeemer willed that His Church should be endowed in defining doctrine about faith or morals; and therefore such definitions of the Roman Pontiff are irreformable of themselves and not from the consent of the Church."

1. When this article was first voted upon in the "general congregation" of July 13, 1870, some seventy members of the council were absent. Of 601 who were present, 451 voted affirmatively (*placet*), 88 negatively (*non-placet*), while 62 gave a qualified assent (*placet juxta modum*). With the same freedom shown in this ballot fifty-five bishops, on July 17, signed a respectful petition to the pope declaring that they could not favor the definition, and seeking permission to leave Rome. A considerable number quit the city at once, and some of those who remained absented themselves from the solemn session on July 18. On the other hand, many of those who had not been present at the first ballot appeared for the second, and some who had voted against the decree, either absolutely or conditionally, answered *placet* in the formal session. The final vote stood: *placet*, 533; *non placet*, 2, and these two gave in their adhesion before the close of the session. Their example was followed sooner or later by all the bishops who had been absent or had withheld their approval.

2. For a right understanding of this doctrine it must be noted, first of all, that the infallibility ascribed to the pope has nothing to do with impeccability. Roman Catholics hold that the pope, under the conditions set forth in the decree, can not err in teaching the Church; no one claims that the pope, as an individual, can not sin. Again, infallibility is neither a reward of personal merit nor a quality of personal knowledge; it is a prerogative implied in the office of supreme pastor and teacher, and is intended to safeguard both pontiff and Church against error. In the exercise of this prerogative the pope is not the recipient of special revelations, nor is he inspired as were the writers of Scripture; he is, however, prevented by the divine assistance from teaching erroneous doctrine. Finally, the decree points out the province of infallibility—matters concerning faith or morals. In questions that belong exclusively to the domain of natural truth, that affect discipline only, that concern temporal policy and administration, that involve merely the changing relations of Church and state—the pope's views are to be respected and his decisions obeyed, but in such cases it is not held that he is infallible.

3. The earliest warrant for this belief is found in those passages of the New Testament which bear most directly upon the organization of the Church. The infallibility of the Church is assured because Christ is to remain with her all days (Matt. xxviii. 20), and the Paraclete is to abide with her forever (John xiv. 16), making her the pillar and ground of truth (1 Tim. iii. 15). But as for the government of the Church a visible head was appointed, so also for her stability in truth and the upholding of that truth among men a visible foundation is laid in the rock which is Simon, afterward called Peter: "Thou art Kepha, and upon this Kepha I will build my Church" (Matt. xvi. 18). Peter's faith is secured by his Master's prayer, in order that he may confirm his brethren (Luke xxii. 32) and feed the entire flock of Christ (John xxi. 15–17).

This special function of infallible teaching was assigned to Peter as chief pastor of the Church, and consequently belongs to his successors in that office. Hence in the whole course of tradition as voiced by the Fathers, the Roman Pontiff is regarded both theoretically and practically as the unfailing source of doctrine, just as he is acknowledged to be the center of jurisdiction. Such was the spirit of the Fathers at the Council of Chalcedon (A. D. 451), when they exclaimed, "Peter has spoken by the mouth of Leo!"

Viewed in this light papal infallibility as a definition is new, as a doctrine it is not new. The Vatican Council simply gave formal and authoritative expression to a belief which had prevailed in the Church from the beginning, growing more explicit with time, until circumstances required its solemn definition.

LITERATURE.—A comprehensive list of works on the subject is given by Roskovany in his *Romanus Pontifex* (Nitriæ, 1873, vols. viii. and xi.). The documents concerning the Vatican Council are found in the *Acta et Decreta Sacr. Concil. Recent.* (Coll. Lacensis, vol. iii., Freiburg, 1890).

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(2) Against infallibility.—Bishop Maret, *Du concile général et de la paix religieuse* (2 vols., Paris, 1869); Archbishop Darboy, *La liberté du Concile et l'infaillibilité* (in Friedrich's *Documents*, i., 129–186); Bishop Hefele, *Causa Honorii Papæ* (Naples, 1870), and *Honorius und das Sechste Allgemeine Concil* (Tübingen, 1870); Gratry, *Four Letters to the Bishop of Orleans* (Dupanloup) *and the Archbishop of Malines* (Dechamps), French, German, and English (1870)—all four of theses writers retracted; Janus, *The Pope and the Council* (German and English, Leipzig and London, 1869); Döllinger, *Ueber die Unfehlbarkeitsadresse* (Munich, 1870); Reinkens, *Ueber päpstliche Unfehlbarkeit* (Munich, 1870); W. E. Gladstone, *The Vatican Decrees in their Bearing on Civil Allegiance, with Rejoinders of Manning and Acton* (New York, 1874): Gladstone, *Vaticanism, an Answer to Reproofs and Replies* (London and New York, 1875). Compare also the literature on the VATICAN COUNCIL.

JOHN J. KEANE.

Infamy and **Infamous Crimes**: terms the meanings of which differ with the subject-matter in connection with which they are used.

At the *common law* the term infamy, in its technical sense, signified the legal status resulting from the commission of certain crimes (called *infamous crimes*), the commission of which disqualified the guilty person from giving legal evidence. (Eden, *Principles of Penal Law*, ch. 7, § 5.) This disqualification of course depended upon the nature of the crime, and not upon the nature of the punishment inflicted for its commission (Gilbert, *Law of Evidence*, 143), and the crimes by which it was created included TREASON and FELONY (*qq. v.*), the theory being that a person capable of committing such a crime could not be believed under oath. At present, however, statutes have been passed, both in Great Britain and generally in the U. S., by which this disqualification has been removed, and the fact of having been convicted of either of these crimes is left simply to affect the credibility of the witness, and not his capacity to testify.

In the U. S. the fifth amendment to the Federal Constitution provides that "no person shall be held to answer for any capital or otherwise infamous crime unless upon the presentment or indictment of a grand jury, except in cases arising in the land or naval forces, or in the militia when in actual service in time of war or public danger." In some of the early decisions of the Federal courts it was held that by "infamous crimes" as here used were meant only those crimes which entailed infamy at common law, disqualifying the convict to be a witness, and in some other decisions that only those were intended which were expressly declared to be infamous or made a felony by act of Congress. Later decisions, based upon the history of the proposal and adoption of the amendment, have disapproved these interpretations, and held that the true test is not whether the effect of a conviction is to disqualify the convict to be a witness, but whether in case of conviction an infamous punishment may be imposed by the court.

The question as to what punishments shall be considered infamous may be affected by the changes of public opinion. Thus in the first Judiciary Act of the U. S. whipping was classed with moderate fines and short terms of imprisonment, but Mr. Justice Gray (*Ex parte* Wilson, 114 U. S. 417, 428) says "at the present day either stocks or whipping might be thought an infamous punishment," and quotes as follows from 2 Dane, *Abridgment*, 569, 570: "Punishments clearly infamous are death, gallows, pillory, branding, whipping, confinement to hard labor, and cropping." It was held in this and in other cases that imprisonment in a State prison or penitentiary, with or without hard labor, is an infamous punishment, and that crimes so punishable are infamous crimes within the intent of the fifth amendment to the Constitution. See *Ex parte* Wilson, 114 U. S. 428; *Mackin* vs. *United States*, 117 U. S. 348. F. STURGES ALLEN.

In'fant [from Lat. *in'fans*, infant; *in-*, not + *fari*, speak]: in law, a person who is legally incapacitated because of age. The period of non-age and its disabilities are determined by positive law, and vary in different jurisdictions. By the common law every person under twenty-one years of age is an infant, or (as he is also called) a minor. As that law does not recognize fractions of a day, majority is reached at the beginning of the day preceding the twenty-first birthday. In the Roman law non-age, in case of one not under *patria potestas*, extended to the twenty-fifth year, but was divided into three stages. The first extended to the end of the seventh year. During this period the infant was deemed to have no legal understanding, and was devoid of legal capacity. From the beginning of his eighth year to puberty he was able to understand the language of legal transactions, but had not legal judgment. This judgment could be supplied only by a *tutor*. Hence during this stage the infant could bind himself by stipulation with the tutor's authority. After puberty, which was fixed at fourteen in males and twelve in females, he was called a minor. From this time to the age of twenty-five he was not subject to a tutor, although he might have a curator appointed, and his disabilities were greatly diminished. The common law did not adopt these rules of the Roman law, although we shall see it has felt their influence.

Nature of Disabilities.—The chief reason for subjecting an infant to legal disabilities is "the absence of that knowledge and experience which is necessary to enable any one to appreciate the consequences of his acts." Their object is the protection of the infant. When they would work harm to other individuals or to the public at large, rather than his reasonable protection, the law seeks to modify or suspend them. The result is a distressing conflict of judicial decisions, even within the same legal system. The most important rules upon this subject may be outlined as follows:

Capacity to Hold Office.—An infant can not hold an office where judgment, discretion, and experience are necessary to the proper discharge of its duties, though he may hold a merely ministerial office which requires only skill and diligence. Hence, though he may be duly elected and may qualify as a justice of the peace, his acts in such office will be void. (*Golding's Petition*, 57 N. H. 146.) Nor can he act as administrator, executor, or trustee, but he may fill the office of notary public. (*U. S.* vs. *Bixby*, 9 Fed. R. 78.) Official capacity is now largely dependent on statutory provisions, which should be carefully examined.

Contracts.—Formerly the courts were disposed to hold that those contracts of an infant which could not possibly benefit him were absolutely void. In some jurisdictions this view is still maintained, notably with reference to the appointment of an attorney at law or in fact. The modern tendency, however, is to hold all his true contracts voidable—neither absolutely void on the one hand nor absolutely binding on the other. In England the Infant's Relief Act of 1874 declares certain contracts by infants to be "absolutely void," and the common law on this point has been modified by statutes in some of the U. S. Although an infant's contract is voidable by him, it is binding on the adult contracting party. Moreover, the infant's right to avoid is personal; it must be taken advantage of by him, his heir, or personal representative; it is not available to a stranger, nor to a privy in estate, as his creditor, his transferee, or his guardian.

Time for Avoidance.—He may avoid his contracts either before majority or within a reasonable time thereafter. In the case of an executed conveyance of real estate, many courts hold on the one hand that he can not avoid the deed during minority, though he may re-enter and take the rents and profits, and on the other hand, that he need not avoid within reasonable time after majority, but that he may disaffirm at any time before the term of the statute of limitations has expired. *Sims* vs. *Everhardt*, 102 U. S. 300.

Manner of Avoidance.—Here the authorities are in serious conflict. One class holds that unless the infant party to the contract expressly affirms it after his majority it can not be enforced against him. Another class holds that any act or declaration after majority which recognizes the contract as binding is a final affirmance of it. Still another class treats the failure of the former infant to repudiate the contract expressly within a reasonable time after majority as a conclusive ratification. The last position does not seem tenable, except in cases where the former minor continues after majority to hold and enjoy property obtained by his voidable contract. If a minor's contract is voidable and not void, it should follow that no new promise by him is needed after he has attained full age. When, with a knowledge of all the facts, he freely admits that he is liable and bound to the terms of his infantile contract, he should be held to have waived finally his right to avoid it. It is believed the weight of modern authority supports this view. In case the infant wishes to avoid his contract transaction, whether before or after majority, he must avoid the whole or none. If he has received from the other party a consideration for his avoided contract, he must return it if he has it in specie; but if he has disposed of or squandered it, the other party can not complain, because he might have expected this from an infant.

Torts.—Where the infant has harmed another by a tortious act (see TORTS) his non-age will not protect him. His legal incapacity is a weapon of defense, not of offense. There is little difficulty in this branch of the subject, except where the tort is connected with a contract. The earlier English decisions tend to relieve the infant from liability wherever his wrongful acts might be treated as a breach of contract, and the rule still is that if the injured party must establish a contract between himself and the infant as an element of his cause of action in tort, non-age is a perfect defense; though if the defendant were an adult the plaintiff could maintain an action *ex delicto*. If the voidable contract has simply afforded the infant an opportunity to do the tortious act, and the act would be a tort had the opportunity for its commission been gained in some other way, the infant will be liable. As where the infant hired a horse for riding, and was told he must not use it for jumping, but did jump the animal and injure it, an action against him for damages was sustained. (Cf. *Eaton* vs. *Hill*, 50 N. H. 235.) An infant is not liable in tort for misrepresentations as to his age, though if another is induced thereby to deal with him, he will in some cases be subjected to an obligation in equity. Pollock *On Contracts*, p. 56.

Crimes.—In order to subject one to criminal punishment, it must be shown that he was actuated by criminal intention. By the common law an infant under seven years is conclusively presumed to be incapable of a criminal intent. The presumption of incapacity continues until the age of fourteen, but during this period it may be rebutted, except in one or two instances. After the age of fourteen his capacity is presumed, and his criminal responsibility is governed by the same rules as is that of an adult. The common-law doctrine has been changed by statute to some extent, and provision has been made for dealing with juvenile offenders in a manner not known to the common law, with a view to saving them from becoming criminals and to the protection of the public.

Obligations Imposed by Law.—An infant is bound to pay for personal necessaries. This liability is sometimes treated as an exception to the rule that an infant's contracts are voidable. It is not an exception. He is bound to pay, not because he has promised but because the law obliges him to pay, in order that he may obtain the means of proper support. What classes of articles and services are personal necessaries is a question of law. Generally speaking, they relate to his food, clothing, shelter, medical attendance, and education. They do not embrace articles or services solely for the protection of his property. Whether a given article or service is a necessary for the infant receiving it is a question of fact. In determining it regard must be had to his estate, his occupation, and his social position. A party who seeks to recover from an infant for necessaries must prove that he was not otherwise supplied, that they were suitable to his financial and social state, and that they were

fairly worth the price charged. Clearly the infant's liability is only *quasi* contractual. See QUASI-CONTRACT.

An infant above the age of puberty can not avoid his marriage, although he can avoid his contract to marry. After marriage an infant is subject to the same marital and family obligations as an adult, including the funeral expenses of a spouse. *Chapple* vs. *Cooper*, 13 M. and W. 252.

If an infant becomes a partner in business he may repudiate the contract of partnership and all contracts made by the firm, and thus avoid personal liability thereon; but he can not take any part of the firm assets to the detriment of firm creditors or his partner's equity. His interest in firm property is only a right to a share of any surplus remaining after paying firm debts and adjusting the equities of the partners.

Wherever the law imposes a duty upon an infant, acts done by him in the performance of such duty, though varying in form from those prescribed by law, will bind him.

The age at which infants may make wills is generally fixed by statute. By the common law the age of testamentary capacity as to chattels was fourteen in males and twelve in females; as to lands, twenty-one years. Reeve, Eversley, and Schouler *On Domestic Relations*; Macpherson and Tyler *On Infancy*; Stimson, *American Statutes*. See GUARDIAN, WARD, and PARENT AND CHILD.

FRANCIS M. BURDICK.

Infante, ĕen-faan'tā [= Span. < Lat. *in'fans, infan'tis*, infant; *in-*, un- + *fans*, speaking, pres. partic. of *fa'ri*, speak]: in Spain and Portugal the official title of the princes of the blood-royal, the princesses being called *infantas*. The specific title of the heir-apparent to the throne, however, is not *infante*; in Spain his title is *principe de Asturias*, or simply *el principe*, the prince; and in Portugal, until the separation of the American colony, he was called the Prince of Brazil. The name infante was also applied in Spain at an early period to the children of the nobility, and the "seven infants of Lara," who were killed in an attempt to rescue their father, the *señor* or Lord of Lara, from Moorish captivity in Cordova, are famous in Spanish ballad-poetry and romance.

Infan'ticide [from Lat. *infantici'dium*, infanticide, liter., child-murder; *in'fans*, infant + *cæ'dere*, kill]: at common law, the killing of a young child after its live birth. Continental jurists limit the term to the killing of a newly born child, although they are not agreed in their definitions of "newly born." In Bavaria such a child is one not more than three days old. Some authorities confine the term to a child which has not been fed nor clad. In English law infanticide is a species of homicide, and whether the child is a minute or a week old is immaterial. From the common-law conception of homicide (see HOMICIDE), it follows that the death of the child must take place after its complete separation from the mother, and its entrance upon an independent existence. Such independent life may begin before the severance of the umbilical cord, and, according to some authorities, before respiration, but not before independent circulation. (*State* vs. *Winthrop*, 43 Ia. 519, 22 *Am. R.* 257.) Other authorities declare that life and respiration are synonymous. (3 Cooper, *Forensic Med.*, 33.) Fœticide, or the killing of a child before its live birth, was not a crime at common law, but has been made such by statutes both in Great Britain and in the U. S. (See ABORTION.) If death occurs after live birth from injuries inflicted upon the fœtus, before complete separation from the mother, it is a case of infanticide, and will be murder, manslaughter, or excusable homicide, according to the facts. (See under those heads.) Such at least has been the general understanding of the rule from the time of Lord Coke, although some doubt is cast upon it by Justice Holmes in *Dietrich* vs. *Northampton*, 138 Mass. 14 (1884), when the court decided that a child, whose premature birth and subsequent death were caused by the falling of the mother upon a defective highway, was not a "person" under the statute giving an action for loss of life to his administrator. The difficulty experienced by the prosecution in proving the live birth of the infant led to the enactment of 21 Jac. 1, c. 27, declaring the concealment of the birth of a child by privately burying it, or the like, a criminal offense. (4 Blackstone's *Commentaries*, 198). Similar statutes have been enacted generally in the U. S. (See *State* vs. *Ihrig*, 106 Mo. 267.) See Wharton's *Homicide*, c. ix.; 2 *Tidy's Legal Medicine*, cs. v. and vi.

FRANCIS M. BURDICK.

Infant Jesus, Daughters of the: an order of nuns in the Roman Catholic Church. Founded at Rome by Anna Moroni, of Lucca, for the industrial instruction of poor girls, it was first acknowledged in 1673 by Clement X. No convent can have more than thirty-three members, that being the number of years Jesus was on earth. There was also an older order called Sisters of the Good Jesus, which appears to have been long extinct.

Infantry [from Fr. *infanterie*, from Span. *infanteria*, deriv. of *infante*, foot-soldier, young person (orig., infant), See INFANT and INFANTE]: that portion of a military establishment which is armed and equipped for marching and fighting on foot, in contradistinction to artillery and cavalry. It is the oldest of the "three arms" into which armies are conventionally divided; was the favorite of the Greeks, the Gauls, the Germans, and the Franks, and was mainly that with which Rome conquered the world. Under Grecian and Roman civilization it attained pre-eminence as *the arm of battle*, but fell into contempt and comparative desuetude early in the Middle Ages, and did not emerge from that obscurity till the decline of the feudal system. It steadily increased in power from the first years of the fourteenth century, and is now recognized as constituting the principal strength of military organizations. This importance results from the fact that it can be used everywhere, "in mountains or on plains, in woody or open countries, in cities or in fields, on rivers or at sea, in the redoubt or in the attack on the breach." It is the self-sustaining arm in the field of battle, and is moreover less expensive, man for man, than its auxiliaries.

Ancient Infantry.—The primitive formation of heavy infantry was massive, as is shown in the solid squares of 10,000 men portrayed in Egyptian history, and this order was gradually reduced in depth through the Persian and Dorian formations till it reached the phalangial systems of Sparta, Thebes, and Athens. These systems became homologous under the Macedonian empire, and the phalanx as it existed under that denomination is now described. The foot-soldiers were divided into three classes—the *hoplites*, or heavy infantry, in complete armor and carrying the sarissa, a spear over 20 feet in length; the *peltastes*, or light infantry, with shorter spears and less complete armor; and the *psiloi*, or skirmishers, who wore no armor and carried only missile weapons. The *phalanx*, comparable, in size at least, to a modern division, consisted nominally of 4,096 hoplites, organized into two *merarchias* (or brigades), each consisting of two *chiliarchias* (regiments or battalions), and these in turn divided into four *syntagmata* (battalions or companies). The syntagma combined sixteen files, each file (*lochos*) containing sixteen men, and was made up of four tetrarchias or companies, each of four files and sixteen ranks, or sixty-four men; and thus in line of battle the phalanx presented a nominal front of 256 men and a depth of sixteen men. In open order, as for the march, there were intervals of about 6 feet between the files; in close order, as in advancing to the attack, the spaces between ranks and files were reduced to about 3 feet; and in the locked or defensive order the men closed shoulder to shoulder on the front rank, overlapping their shields; and in this order presented an almost impenetrable hedge of steel to the enemy. The peltastes had a similar formation, though of less depth and under different denominations, but it is not clear that the psiloi had any systematic organization. Four of these elementary phalanges, with their complement of light infantry and cavalry, formed the grand phalanx, or army-corps.

A rival system, substantially anticipated in the Hebrew armies of Joshua, reappeared in Roman infantry. The *legion* was coetaneous with the foundation of Rome, and, in so far as it combined all the constituent elements, was a prototype of the *corps d'armée* of to-day. Originally, legionary infantry was massed according to the phalangial method, but as early as 340 B. C. that formation had been superseded by a system of heavy lines so divided into tactical units, called *manipuli*, that while each line and each unit could act separately, they could execute combined movements with celerity and precision. The complement of infantry for each legion gradually increased from 3,000 to 6,000, and in the details of equipment and organization changes were frequent. As existing in the first Punic war, and consisting nominally of 4,200 *pedites*, the heavy infantry was formed in three lines—in the first line 1,200 *hastati*, young and inexperienced warriors; in the second, 1,200 *principes*, men in full vigor of life; and in the third 600

triarii, the veteran troops. Each line was divided into ten *manipuli* (companies), each ten ranks deep, the hastati and principes of twelve files front, the triarii of six, and in each company the space between ranks and files was about 3 feet. The manipuli were arranged in quincunx order, the intervals in the first line being covered by the manipuli of the second, etc. To this force was attached a corps of ten manipuli (1,200) velites (skirmishers), whose company formation was loose, and who fought outside the legion, retreating behind it when hard pressed. At this period all of the heavy infantry were equipped in complete armor, and were armed with the short straight sword; the hastati and principes also carried heavy javelins, and the triarii had long spears. The velites wore very light armor or none, and used none but missile weapons. Prior to this period the long spear had been borne by the hastati, and the *pilum*, a heavy javelin, by the triarii; hence the name of the first line, and the designation of that and the second line as *antepilani*. These misnomers obtained, however, till these classifications of heavy infantry ceased. In the second Punic war the manipuli of a legion were grouped into ten *cohortes* (battalions), consisting each of a company of hastati, one of principes, and one of triarii, with probably a corresponding proportion of velites. About 100 B. C. the heavy infantry, ceasing to be divided into classes, were armed and equipped alike, the velites disappeared from the legion, separate corps of light infantry were formed from the auxiliary forces, and the cohort, becoming the tactical unit, resembled more closely the modern battalion. This was the formation employed by Marius and Cæsar, and maintained till about the time of Hadrian; and subsequent modifications did not destroy the distinctive features of the system.

This change in formation was made at the time when slaves were first allowed to fight in the legion. The denser formation seems to have been adopted to make amends for the real or supposed inferiority of the individual soldier.

The contrast between the rival systems of antiquity is confined to the heavy infantry, or troops of the line, and is, briefly, that of large masses comparatively inert, with smaller force-units of corresponding mobility. The phalanx, though equal to a modern division in numbers, was, tactically speaking, simply a huge battalion, and its usual figure was that of an oblong rectangle (Fig. 1). This formation could

Fig. 1.

change, and extend or contract its front, and form columns, squares, wedges, etc. It was peculiarly formidable in defensive attitude, and was overwhelming in an onslaught over favorable ground and for short distances; but there seems to have been no provision for manœuvering by fractional parts except to form masses of greater depth, and the phalanx engaged at all was engaged as a whole. On the other hand, the tactical units of the legion never exceeded 600 men, and these could be manœuvered separately, in groups, or as a whole. The formations most characteristic of the Roman system were the manipular array in quincunx order (Fig. 2), and the later formation in two or more lines

Fig. 2.

of cohorts, with small intervals in each line for the passage of light troops; and from either of these orders, columns, continuous lines, hollow and solid squares, etc., were readily derived. The manipular system gave great flexibility to the legionary infantry, but at the expense of its powers of resistance, and the later cohort formation as arranged by Cæsar (Fig. 3) was a partial reversion to the phalangial order. Modern criticism is pronounced in favor of the Roman cohort, but in its renaissance infantry was again displayed after the rival methods of Alexander and Cæsar; and in comparing the two systems there is danger of overestimating the effect of purely tactical combinations upon the fortunes of ancient armies. At Marathon an Athenian line only four deep and at "double time" successfully charged great odds in dense masses; at Leuctra the Spartan line, eight deep, was pierced by the Theban column; Greeks in phalanx conquered the Persians in like order, but finally succumbed to the Roman cohort, which was in turn anni-

Fig. 3.

hilated by the barbarian hosts in phalangial array; and it is significant that Pyrrhus and Hannibal did not discard the massive formation, although they adopted Roman weapons.

In the Middle Ages infantry continued to constitute the principal strength of the dominant powers of Europe till the feudal system was established. In the seven days' battle of Tours (A. D. 732) we find the heavy battalions of the Franks defying the fury of the Saracen's cavalry, and for ever turning back the northern tide of Moslem invasion; this, however, was its last creditable appearance for several centuries. During the period of its abasement, war was pre-eminently the occupation of mankind, but military science was in abeyance. Armies worthy of the name ceased to exist, and all discipline disappeared; cavalry became the principal arm, and for over 400 years the man-at-arms in comparative security trampled the despised infantry, then a tumultuous mob that pillaged or fled as fortune served their mounted masters. But feudalism forced royalty into alliance with the commons; to curb the noble the king armed and disciplined the peasant. "Communal" militia was organized, and soon proved superior to the baronial followings, and as early as 1214 some of the German infantry is described as "very good, and trained to fight on the level *even against cavalry*." In the next century Flemish infantry with crossbow and partisan overthrows the chivalry of France at Courtrai (1302), the Austrian man-at-arms comes to signal grief on the Swiss pike at Morgarten (1315), Sempach (1386), and Nafels (1388), and the English knight dismounts to fight beside the victorious archer at Cressy and Poitiers (1346–56). The prestige thus re-established, though often challenged, was never lost; corps of pikemen and archers became essential elements in all military organizations; and in the standing armies raised about the middle of the fifteenth century these troops attained such steadiness and dexterity that cavalry, in its last crustaceous security, soon fared but indifferently in disputing precedence with infantry; and when the weapons of the latter delivered missiles through the heaviest plate-armor that man and beast could bear, the issue was decided. Cavalry was still important, but was relegated to an auxiliary position.

From the fall of the Western empire till about the battle of Pavia (1525) details of military formations are exceedingly meager. While systematic arrangements obtained, there appears to have been adherence to the systems of Greece and Rome. At Casilinum (A. D. 554) the Franks in phalangial wedge are defeated by the cohorts of Narses; at Tours they are victorious in massive square; at Hastings the Anglo-Saxons adopted a similar order; at Bouvines (1214) the Germans were in hollow square; the *début* of Swiss infantry is in Grecian wedges and squares, while the Spanish infantry, equally famous a few years later, first appears in the Roman order, and, like its prototype, exhibits a partial reversion to the Greek method when confronted with the Swiss copy. The principal infantry weapons, offensive and defensive, during this period were straight swords, pikes, axes, spiked clubs, longbows, halberds, crossbows, partisans, helmets, mail-jackets, corselets, and shields. As in former periods, the use of missile arms is almost exclusively confined to light troops.

Modern infantry is conveniently assumed to date from the general introduction of firearms—not because that event at once revolutionized military methods, but because from that period there is authentic record of the gradual revival of military science. Firearms were in general use when the battle of Pavia occurred, but for many years these weapons were unwieldy, uncertain of aim, and limited in range. They did not entirely supersede the bow till about the middle of the sixteenth century, and the musket did not become the sole arm of civilized infantry till, at the beginning of the eighteenth century, it became, with the socket bayonet, a pyro-ballistic pike. In the infantry "bands"

organized by Francis I. in 1534, and promptly imitated by other nations, the arquebusiers and archers, in equal proportion to each other, constituted two-fifths of the entire force; in 1562 "regiments" of about 3,000 men became common, and, the bow disappearing, the proportion of firearms was soon increased to one-half. At the beginning of the Thirty Years' war "battalions" of about 500 men had been organized, which in extended order presented a line of contiguous company squares, ten or twelve ranks in depth, with the light infantry (then musketeers) on the flanks. But notwithstanding the steadily increasing destructiveness of artillery and small-arms, these battalions were still habitually massed for action into close columns of twenty, and even thirty, files; and these unwieldy imitations of the phalanx suffered an additional incumbrance in the immediate proximity of the enemy from the huddling of their own musketeers within the protection of their pikes. The impotence of this system was rudely exposed by the genius of Gustavus Adolphus, who seems to have been the first to awaken Europe to the value of infantry fire. His innovations consisted simply in so adapting his battalion formation and grand tactical combinations as to develop the full force of his own fire with the least possible exposure to that from the enemy. To accomplish this result, he formed battalions of mobile dimensions, reduced the depth of his ranks to six men, increased the proportion of firearms to about three-fifths, lightened the musket, shortened the pike, discarded useless armor, and introduced the cartridge and cartridge-box. Moreover, his men were taught to use the spade as well as their legs. His usual order of battle was in two lines, resembling the quincunx systems of the Romans (Fig. 4). The superiority of the Swedish system

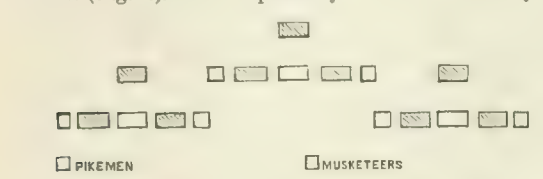


Fig. 4.

was so forcibly demonstrated at Breitenfeld and Lutzen (1631–32) as to be generally and speedily adopted.

About 1670 the bayonet was generally introduced, and the proportion of pikemen was correspondingly reduced, till in 1675 it did not exceed one-fourth in any of the principal armies. The socket bayonet appeared in 1699, and within six years the pike virtually disappeared from the battle-field; and while all infantry is armed with the same weapon, the distinction between heavy and light corps, originating in the incompatibility of the ancient wielded and missile weapons, remains nominal. With the discarding of pikes came a reduction of lineal formations to four ranks, but the distance between the ranks was variable; in them the elbow-touch was not preserved, and the cadence step, common from the most remote period of Egyptian history till the extinction of classic civilization, was not yet revived. This contrivance for securing mobility in cohesive order was adopted by Marshal Saxe, whose battalions thereupon astonished both friend and foe by the aggressive use of their legs.

Frederick the Great is generally considered as the next reformer of military methods, and the manœuvering of his battalions and their evolutions in line of battle certainly reconciled celerity with precision of combination to a degree till then comparatively, if not totally, unknown. Attaching greater importance to the fire of his infantry than to their use of the bayonet, he increased the volume of fire by extending the battalion in three ranks, and by thorough drill so accustomed his troops to the use of their weapons and to steadiness in marching that in unwavering lines, advancing or retreating, they could pour well-sustained volleys upon the enemy. His battalion, two of which constituted a regiment, consisted of six companies, five of fusileers, and one of grenadiers, and its nominal strength was 690 men, rank and file. In battle formation the grenadiers usually fought separately; the remaining five companies of fusileers were divided into eight companies of equal front, and each of these into four sections (Fig. 5). This resulted in breaking up the original companies and separating the officers from their own men. A force of supernumeraries accompanied each battalion to fill vacancies in the ranks. The Seven Years' war made the Prussian infantry the archetype for Christendom, and from the Peace of Paris to the present day only trifling differences have existed in the

Fig. 5.

organizations of different nations. The British were probably the first (1810) to adopt a habitual formation in two ranks, the other nations of Europe following their lead slowly. The Prussians retained the three-rank formation for manœuvers until 1888.

The division of infantry into light and heavy troops, that had become nominal about the year 1700, was revived, first by placing the new arms, as muskets were improved in range and accuracy, in the hands of picked men from each battalion or in special corps (fusileers, grenadiers, etc.), and subsequently by the introduction of rifled arms, which as first employed were deemed unsuitable for "troops of the line." Corps of riflemen were accordingly organized under various denominations (chasseurs, tirailleurs, etc.), were trained in gymnastic exercises, and especially drilled for marching and fighting in open order as sharpshooters; but the distinction has again become nominal. The rifle is universal, and all infantry is really light infantry.

The present organization of infantry is in companies, battalions, and regiments; for tactical purposes the companies are generally divided into platoons, the battalions into wings and divisions; and for like purposes the regiments are grouped into Brigades and Divisions (*qq. v.*). Regimental organizations are purely administrative; in the armies of Europe they generally consist of two or more battalions, and the nominal battalion strength, rank and file, ranges from 500 to 1,000 men.

In the army of the U. S. the infantry is organized into twenty-five regiments, each consisting of one battalion of ten companies. The drill regulations (adopted 1891), however, are designed for a regiment of three battalions. To each regiment there is a colonel, lieutenant-colonel, major, adjutant, quartermaster, sergeant-major, quartermaster-sergeant, chief musician, and two principal musicians, and to the two "colored regiments" a chaplain each. Each company has a captain, two lieutenants, five sergeants, four corporals, two musicians, two artificers, a wagoner, and from 50 to 100 privates, but under temporary restrictions in the annual appropriation for the army and orders from the War Department (1891), the number of companies is reduced to eight, each containing forty-six privates, making the aggregate strength of the regiment in officers and men 521. The companies are permanently designated by letters of the alphabet, and are so posted in the battalion as to have the senior captain on the right, the next in rank on the left, the third in the center, and so on. The lieutenants, when not commanding subdivisions, and the sergeants, when not acting as guides, constitute the "file-closers," and are stationed in rear of their respective companies. The formation of the U. S. regiment, battalion, and company in line is indicated in Fig. 6. The individual soldier is armed

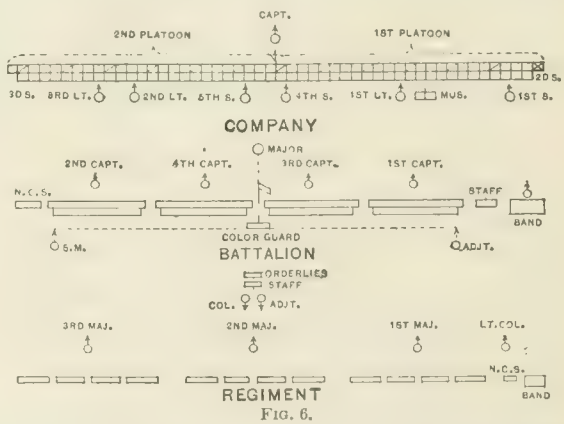


Fig. 6.

with the Krag-Jorgensen magazine rifle (approved 1892). His uniform is distinguished by white trimmings, and in heavy marching order he carries a knapsack, with complete

change of clothing, a blanket, great-coat, several days' rations in haversack, a canteen of water, and in addition his ammunition.

Theoretically, the proportion of infantry in all properly organized armies should be from two-thirds to three-fourths of the permanent establishment, but as efficient infantry can be created more readily than serviceable artillery or cavalry, this proportion is rarely maintained in a peace establishment. In the U. S. service the proportion of the three arms is about—artillery, one-eighth, cavalry, three-eighths, and infantry one-half, but the exigencies of this service demand a constant interchange of duties between the three arms. Revised by JAMES MERCUR.

Infant-schools: a term originally applied to charitable institutions that sprang up in the early part of the nineteenth century, simply to relieve the mothers of the laboring classes of the care of their little children when they are away at day labor. Their value was merely that they kept the children out of the streets and physically comfortable. They got the name of *schools* because among the devices for keeping the children quiet by circumventing their spontaneous activity, they were taught to march, to perform some gymnastic exercises, and to sing in rhyme or intone the multiplication table, the names of the days of the week, of the months of the year, and other things of that kind. Some of the disciples of Pestalozzi, and especially Wilderspin, endeavored to develop something educational out of these charitable institutions, introducing some object-teaching. But they were not even the germ of the *kindergarten* (see FROEBEL and KINDERGARTEN), because they were not founded on any study of the nature of childhood. A. B. Alcott pointed out the radical defect of the infant-school method of dealing with children's minds. His wonderful success in touching into activity the moral sense of the neglected children in the cellars of Broad Street, gathered by some charitable ladies of Boston into an infant-school in 1826, attracted the attention of the cultivated classes, and led to the establishment of a school, of which a volume called the *Record of a School* gives an account, and which contains a genuine study of childhood and a high appreciation of Mr. Alcott; but in the last edition of this book the author is seen to have become the disciple of Froebel's broader and more natural method, whose scope involves all that is good in the infant-school, corrects its errors, and supplies its deficiencies.

Infanzonado, ēēn-fȧȧn-thō-naa'dō [Span., liter., the district of the *infanzones*, or great *infantes*. See INFANTE]: a district comprising seventy-two villages in the plain-country of the Spanish province of Vizcaya or Biscay; it was considered as the noblest region of the Basque country, and its representatives enjoyed a preference at the *juntas*. The name indicates that this territory was once the domain of the *infanzones*—literally, the "great infants"—of the royal family. The territory is divided into the five *merindades* of Uribe, Busturia, Arratia, Bedia, and Marquina.

Infectious Diseases: in the modern usage, those diseases which result from the invasion and multiplication of pathogenic micro-organisms, and the term *invasion* is applied to the morbid conditions resulting from the entrance and growth within the body of such organisms, and to the act or process by which the disease is thus produced. The organisms included belong to the classes bacteria, fungi, and protozoa. It will thus be seen that in all cases there is the entrance of a causative factor capable of further growth or multiplication, and that the infectious diseases are therefore clearly distinguished from intoxications, such as poisoning by snake-venom, putrid meat, cheese, or other substances containing toxic agents, whether these be traceable to the action of bacteria or not.

Infectious diseases have been divided into those which are contagious, the miasmatic, and the miasmatic-contagious. By contagious in the ordinary sense of the word is meant the ready communicability of the disease from individual to individual, but it is extremely difficult to draw sharp lines between contagious or non-contagious affections. The mode of egress of the infectious principle from the body is the factor which determines the contagiousness of a disease, so that diseases in which the micro-organisms are found in the desquamated skin-flakes are easily transmitted to persons near the patients, while such as typhoid fever and Asiatic cholera, in which the organisms are thrown off in the dejecta of the intestines, are communicated in a roundabout way, and are therefore considered as non-contagious.

The miasmatic group includes especially malaria, and is composed of diseases which are neither directly nor indirectly transmissible from person to person.

Miasmatic-contagious diseases are those in which the infectious agent passes by a roundabout way, as in typhoid fever and cholera, through external media to the second person.

The number of diseases in which a definite micro-organism has been proved to be the cause of the disease is limited, but there are many which are clearly proved to be infectious by their general characters, their mode of incidence, their definite and regular course, and the immunity from future attacks conferred. These characters are quite constant and distinctive. In many diseases micro-organisms have been found which are probably the infectious agents, but which have not been definitely proved to be so. Among these diseases are typhoid fever, Asiatic cholera, influenza, and others. In a number of others, as scarlet fever, whooping cough, mumps, and rabies, no micro-organisms of any kind can be regarded as even the probable causative agents.

The micro-organisms in infectious diseases may gain entrance to the system through the mouth, the air-passages, the skin, the genito-urinary tract, or through wounds. A fœtus may be infected by the mother before birth, but such transmission is not frequent. After entrance into the body the micro-organisms multiply and evolve or produce certain poisons called toxines or poisonous proteids, which occasion the symptoms of disease, so that the micro-organisms do not often themselves give rise to the disease directly. The same class of poisons is often developed in decomposing meat, fish, cheese, and may give rise to disease-manifestations closely like those witnessed in infections; but, according to the definition first given, the conditions with which we are now dealing would be called intoxications and not infections.

During the multiplication of micro-organisms within the system there are produced, in addition to the toxic products, certain substances which so act upon the system that it is enabled to withstand the present attack, and that it becomes immune from subsequent seizures. This immunity may be temporary or it may be permanent. Thus an individual once having typhoid fever, typhus fever, or smallpox, rarely acquires a second attack, while in the case of diphtheria the period of immunity is brief, and second attacks after that interval are not infrequent. This method of producing immunity has been applied by man in the case of smallpox in the process of vaccination, and has been more recently extended to tetanus, rabies, pneumonia, and other diseases, but not as yet with that completeness of detail necessary to insure a general adoption. WILLIAM PEPPER.

Inference: See LOGIC.

In'fidel [from Lat. *infide'lis*, unfaithful (cf. Eng. *infidelity*), unbelieving, *in-*, un- + *fide'lis*, faithful, believing, deriv. of *fi'des*, trust, faith, belief. See FAITH]: a term applied, usually with something of reproach, (1) to disbelievers in the Christian religion, whether atheists or deists (see ATHEISM); (2) to non-believers, such as Mohammedans and heathens, but this use of the word is antiquated and infrequent; while (3) the skeptic or doubter (see SKEPTICISM), as a non-believer, is also to some extent liable to the reproach of infidelity; and in popular usage the term free-thinker is synonymous with infidel. Moslems apply the term to Christians.

Infinite, in philosophy: As a philosophical term, "infinite" expresses the form of Being which is self-related and contains no implied contrast to other-being. If the term is used to express a contrast with the finite or indefinite, and the infinite is regarded as a "beyond" to the finite, the thought of the infinite is inadequate, and the conception is really that of one finite over against another. The infinite must be conceived as containing the finite within it as an essential element of its self-relation. There are three significations in which the term "infinite" is employed, corresponding to the three stages of theoretical reflection: (*a*) the dogmatic, (*b*) the skeptical, (*c*) the speculative. 1. As merely negative of the finite, in which case the finite expresses concrete reality and fullness of relations, while the infinite expresses a merely abstract and negative notion, "conceived only by thinking away the very conditions under which thought itself is realized." The infinite in this sense is, according to Sir William Hamilton, "the unconditionally unlimited"; the absolute, defined as "the unconditionally limited," being the other species constituting the genus of

the "unconditioned." Such an infinite, being indeterminate, and devoid of all properties or attributes, and without distinction or difference from anything else or within itself, is an empty abstraction identical with the idea named by the word *nothing*. The very thought of it involves self-contradiction; the form of its definition places it in relation or contrast, as excluding the finite, while the content of its definition denies all relation or determination whatsoever. The attempt to conceive such a thought results in a sort of ideal oscillation between the determined and undetermined—the thought of the Indefinite, or Infinite Progress. 2. The "infinite progress" is the form under which the infinite is most commonly thought. The infinite divisibility of space, its infinite extent, the infinite regress of causes or conditions in the search of a First Cause, the doctrine of moral perfectibility, etc., furnish practical examples. The mind passes from one phase to its opposite, and returns again only to repeat the process; for it finds in each phase its other, and endeavors analytically to separate them. Each cause, inasmuch as it begins to act, must have another cause to explain the occasion of its action at this particular time; each space divided furnishes two spaces which are in all respects like the first space, and capable of division again; beyond any space which we may conceive or picture in our minds there is still other space; whatever is, is finite and imperfect, and therefore ought to be reformed or improved by changing it to another and better existence, which again is still finite and needs correction, and so on forever. In the thought of the infinite as a progress there is an unconscious dual activity in the mind, in which the imagination and reflection take part. The famous "antinomies" of Kant arise in this way. The finite is pictured to the mind, and the pure reflection transcends the picture or image, and defines for itself the logical conditions of the finite, but immediately applies these conditions to a finite realization and renews its mental image. Sir William Hamilton held that "all that is conceivable in thought lies between two extremes, which, as contradictory of each other, can not both be true, but of which as mutual contradictories one must be true." His proof is "by application to the phenomena." In regard to space, for example, he finds, on the one hand, that we are unable to conceive space as bounded, for then it would be surrounded by space; on the other hand, we can not conceive it as infinite, for we are unable to "realize in thought" unlimited space by "transcending in fancy" the finite, or even by "exhausting imagination" in the attempt to image it. In this we have the representative faculty failing to produce an adequate picture of infinite space. Since even mental pictures must be finite, a successful picture of space as a whole would prove its finitude, and thus contradict the inference of pure reflection, which pronounces space infinite, on the ground that any limitation of space must require space to exist in, and thus space can only be limited by space itself, and this would continue it instead of ending it. Since, however, an image or picture of space is impossible, the two results harmonize, and there is no antinomy. 3. Under the thought of the "infinite progress" lies, therefore, the thought of the positive infinite. Spinoza called this the *infinitum actu vel rationis*, to distinguish it from the *infinitum imaginationis*, already described. The infinite recurrence of the same limits implies the necessary self-relation of the process. To affirm that beyond every conceivable boundary or assignable limit there is still more space, implies an insight into the self-limiting or self-continuing nature of space. If it related to something else, it were finite; to be infinite, it must be its own limit or *alterum*. The highest example of this is to be found in conscious being, wherein the subject is its own object, knowing and known being identical. Aristotle makes the Infinite and highest truth to be *νόησις νοήσεως*. Dr. Noah Porter (*The Human Intellect*, p. 657) gives this standpoint clearly: "The 'antinomies' of Kant and the 'essential contradictories' of Hamilton, each of which seems necessary to the mind, and each of which excludes the other, are all made by the mind itself in the attempt to illustrate the infinite by the finite. The antinomies of Kant are incompatibilities between *an image* and *a relation* which the image exemplifies, or between two images adduced to illustrate different relations, or between two concepts which are not both necessary to the mind. The solution of them is to be found in the restatement of the conceptions between which these incompatibilities are said to exist." "When Hamilton says we must conceive of space as a bounded or not bounded sphere, he introduces the image of an object existing in space and limited in space, in order to illustrate space itself, and confounds the one with the other. To introduce the image of an extended object to show that space exists and holds some relation to every extended object, is legitimate, but to substitute the limited—i. e. an extended object—for the true unlimited—i. e. space which makes extension possible—and then to be embarrassed by the incompatibilities of our own creation, is to fall into the very serious error of confounding the image with the notion (*Anschauung* with the *Begriff*) against which Hamilton expressly cautions his pupils." While nominalists and materialists have generally denied the possibility of knowing the infinite, for subjective or objective reasons, most realists and idealists have claimed a knowledge of it more or less adequate. W. T. Harris.

Infinites and **Infinites'imals** [*infinitesimals* is from Mod. Lat. *infinitesima'lis* (sc. *pars* = part), deriv. of *infinitesimus*. Considering *infini'tus* (*infi'nitas*) as the limit of the numeral series, *infinites'imus* (after the analogy of *mille'simus*, thousandth, deriv. of *mil'le*, thousandth, etc.) is the "infinite-th" one or part]: an infinite quantity, or infinite, as it is commonly called for brevity, is an auxiliary quantity, which we conceive capable of increasing beyond any assignable limit, in order to discover relations thus arising between other quantities; while an infinitesimal is an auxiliary quantity which we suppose capable of becoming smaller than any assignable quantity, in order that we may thereby determine the relations between certain other quantities. The principles by which this is done depend on the doctrine of limits. (See Limits, Method of.) The idea of an infinite quantity grows out of the obvious fact that we can set no limit to the possible extent of space or duration of time. A straight line is conceived to go out in two directions forever, without necessarily having any end. The term infinity is therefore applied to quantity, whether space or time, which is conceived to have no limit. There are, however, two ways of considering such a quantity, which must be kept distinct in thought. We may assign as great a length as we please to a terminated straight line, so that there is no limit to its possible length, yet we must always conceive it as having ends. On the other hand, we may talk and reason about a line which we suppose to go out in one or both directions without end. Such a line is an absolute infinite. Absolute infinity can not be treated as a mathematical quantity and compared with other such quantities; for we can compare two quantities, showing them to be equal or unequal, only by bringing their boundaries into coincidence, or trying to do so. But absolute infinity, having no boundary, can not be compared with any other infinity as to magnitude. Fallacious or doubtful conclusions sometimes arise in mathematics by trying to make such a comparison. The idea of absolute infinity, as a quantity, has therefore no proper place in mathematics. S. Newcomb.

Infinitive Mood: See Verb.

Inflammation [from Lat. *inflamma'tio*, a setting on fire, deriv. of *inflamma're*, set on fire; *in-*, in, on, into + *flam'ma*, flame, fire]: a term used to include the series of phenomena which make themselves apparent whenever any part of the body sustains an injury. The injuries which cause inflammation may be of the most varied nature. It is only necessary that there should be a destruction of tissue brought about in some way to have the phenomena of inflammation excited. The injury may be produced by mechanical or chemical violence, or it may be the result of a death of tissue, brought about by interference with the blood-supply or in some other way.

The process of inflammation has been most clearly studied in transparent portions of the animal body which can be brought directly under the field of the microscope, and in which the various steps of the process and the changes which take place in the blood-vessels can be followed by the eye. The part which has been used with the greatest success for these experiments is the transparent mesentery of the frog. The animal is first placed under the influence of curare, an incision is then made in the abdomen, the intestine is drawn out and fastened to the edge of a cork ring, and the membrane brought directly under the microscope. The mere exposure of the delicate membrane to the air injures it sufficiently to produce inflammation, but various substances of an irritating character may be placed on the membrane and the results compared. The first thing which denotes the appearance of inflammation is the dilatation of the blood-vessels, which is accompanied by an in-

creased rapidity of the flow of blood through them. The blood-vessels become wider, and the blood flows through them with so much rapidity that the single blood-corpuscles can scarcely be distinguished. Capillary vessels appear, which before from their small size were scarcely visible. This phenomenon continues for a short time, the length of the time depending upon the care used to avoid injury to the membrane. It soon gives way to another appearance; the blood-vessels continue dilated as before, but the current of blood becomes slower. This is especially noticeable in the veins; the slowness of the circulation gradually becomes more marked until in some of the veins an actual stagnation of the blood takes place. Before this there is usually some oscillation in the blood-current. While this is taking place, certain changes appear in the circulating blood. In the normal circulation two parts can be distinguished in the blood-current, a central core which is made up of the red corpuscles and, outside of this, between the core and the wall of the vessel, a layer more or less variable in thickness in which there are no red blood-corpuscles, and only here and there a white blood-corpuscle. The same thing is seen when floating objects are thrown into a rapidly flowing stream; they will be hurried along in the center of the stream where the current is more rapid. In the blood-vessels the core or axial stream flows with greater rapidity than the outer so-called plasma zone where the friction of the vascular wall makes itself felt in retarding the stream. With the slowing of the stream in the vessels the distinction between the central and outer layers become less and less apparent. The motion of the white blood-corpuscles in the plasma zone become slower and slower; one will stop for a time and remain clinging to the wall and then be swept away again by the current. The number of these corpuscles becomes greater and greater until the inner surface of the vessels becomes paved with the white corpuscles clinging to the wall. After a variable time another and more striking phenomenon makes itself manifest; the white corpuscles begin to pass through the walls of the blood-vessels. They do this by virtue of their amœboid movements. A small protoplasmic bud first makes its appearance on the outside of the vessel opposite to the point where a white corpuscle is attached; this becomes larger and larger until the entire corpuscle is outside of the vessel. They go through in constantly increasing numbers until the tissue outside of the vessel is filled with them. The process of inflammation may stop at this point. If it continue longer, and if the vascular changes become more pronounced, the red corpuscles also pass through the walls and are found in the tissue along with the white. The white corpuscles principally pass through the walls of the veins, the red through the walls of the capillaries. Along with this passage of the corpuscular elements of the blood from the vessels, the fluid portions of the blood also pass through, and the tissue in consequence swells up and becomes thicker. The fluid portion which passes through is different in character from the fluid which passes through in dropsy; the chief difference being that it contains a greater amount of fibrin. From this study of the vascular changes the explanation of the common phenomena of inflammation, which may be seen when an external part is inflamed, is obvious. If a part of the skin is inflamed, four changes take place in it. The part inflamed is redder than the surrounding parts, it is hotter, it is swollen, and it is painful. Since the time of Cullen, heat, redness and swelling, and pain have been recognized as the cardinal symptoms of inflammation. The redness of the inflamed part is due in the first place to the dilatation of the vessels. If the inflammation is only slight, pressure on the part may press out the blood from the dilated vessels, and for a moment, when the pressure is removed, the part will have the normal color. If the inflammation has gone on to the point where the red corpuscles leave the walls of the vessels and are found in the tissue, these can not be pressed out, and the redness will remain in spite of the pressure. The part is hotter than the surrounding parts. There is not only the subjective sensation of heat in the inflamed part, but it feels hotter to the hand than the surrounding parts, and thermometric observations show that it is actually hotter than a neighboring portion of the skin. It was at first supposed that there was an actual production of heat in the inflamed part, but we know now that the heat never surpasses and does not even reach that of the heat in internal organs. The increased heat, as compared with surrounding parts, is due to the rapidity of the circulation and the fact that time is not allow by the rapidly circulating blood for the escape of the heat which has been brought from the heat-producing centers. The swelling of the part is due to the escape into the tissue of the fluid and corpuscular elements of the blood. The pain which is felt, not only on pressure, but without pressure as well, is due to the injury done to the nerves by the swelling of the tissue and the pressure made on them. The part can now, under certain circumstances, be restored to its normal condition. The swelling, the redness, and the heat, may gradually disappear. In other cases the inflammation goes on to the production of suppuration. When this takes place, the part gradually loses its redness, the swelling persists or increases, and in place of the hard, doughy feeling which the part formerly had, it becomes softer either all over or in one part, and the feeling of fluid in the tissue is communicated to the finger. When an incision is made in the part a white creamy fluid exudes, which under the microscope is seen to consist almost entirely of white corpuscles suspended in a fluid. This fluid is called pus, and when it is found there is said to be suppuration of the tissue. It may be confined to one part or be more diffusely scattered through the tissue. Under other circumstances there can be even a more serious termination; all of the circulation may be cut off from the part and the cells so injured that the inflamed part dies. When the inflammation takes place on a surface the products of the inflammation will be poured out on that surface. Thus in an inflamed pericardium the products of inflammation accumulate in the pericardial cavity; in an inflamed lung they accumulate in the air-sacs or small bronchi of the lung; in the peritoneum they accumulate in the peritoneal cavity. Inflammations are designated according to the predominant character of the inflammatory exudation, namely, as fibrinous, serous, and purulent inflammation.

Almost all inflammations, if they are sufficiently extensive, are accompanied by an elevation of the general body temperature; there is the production of fever. This inflammatory fever in some cases may reach quite a high point, from 4° to 7° above the normal temperature of the body. The fever is due to the absorption by the blood of some of the products of inflammation.

Among the causes of inflammation which most often come into play are the various micro-organisms. Especially all inflammations which are purulent in character are produced by certain bacteria, which are called from this faculty the pyogenic bacteria. The action of the bacteria generally consists in the production of inflammations and has especial characters given it depending on the nature of the special organisms.

Modern investigations have shown that the escape of the white corpus from the vascular walls is due to certain chemical substances which have a special attraction for the white corpuscles. (See PHAGOCYTOSIS.) For a long time there was dispute as to the origin of the great numbers of white corpuscles which are found in an inflamed part, especially in suppurative inflammations. It has been shown that whenever any extensive inflammation is taking place in the body that there is an active production of white corpuscles in the blood-producing organs, and they are found in greater numbers in the blood. The white blood-corpuscles which are concerned in inflammation are only one variety; they are the so-called polynuclear leucocytes which are distinguished from the others by the possession of several nuclei or one irregular horseshoe-shaped nucleus. The steps which ordinarily take place in the production of an abscess in an internal organ by pyogenic bacteria are as follows: The bacteria are usually carried to the point in small numbers by the blood-vessels, and remain clinging to their walls. Around these bacteria necrosis of the tissue takes place, all of the cells die, and circulation in the necrotic area ceases. Around this necrotic area an active inflammation with emigration of leucocytes takes place. This gradually fills up all the interstices of the tissue, the intercellular substance which holds all of the tissue together becomes softened, and a cavity is formed which contains the necrotic cells, bacteria, and pus corpuscles. If the contents of the cavity are now evacuated, under most circumstances healing takes place.

The means by which this is effected are as follows: Even during the height of the inflammation there are changes going on in the fixed cells of the part. These multiply rapidly, producing what is called granulation tissue. This is a tissue very different from the pus; the cells composing it are round cells, with small, round, brightly staining nuclei differing essentially from the pus-cells. With the escape of the pus and the cessation of the active inflammation the

whole wall of the cavity becomes lined with granulation tissue; new blood-vessels are formed in it and it gradually changes into connective tissue, the intercellular substance being formed by the cells. The cavity becomes closed by contraction of the walls. The part is never restored to its normal integrity, the tissue which was lost by the necrosis is not restored, and its place is taken by the new tissue, with the result of what is called a cicatrix. These cicatrices are formed of a dense whitish tissue, its lack of color being due to the absence of blood-vessels.

The treatment of inflammation depends largely for its success upon the recognition of these essential steps in the process. Inflammation should no longer be regarded as something to be combated, but it should be recognized that the various phenomena which take place are the results of the conservative attempt of nature to do away with the effects of an injury. Even the inflammatory fever of inflammation is frequently a conservative process, because, under the influence of fever, substances are formed in the inflamed part which, to a large extent, are antidotal to other injurious substances. W. T. Councilman.

Inflammation of the Bowels: See Peritonitis.

Inflammation of the Brain: See Meningitis.

Inflammation of the Kidneys: nephritis or Bright's Disease (*q. v.*).

Inflammation of the Lungs: See Pneumonia.

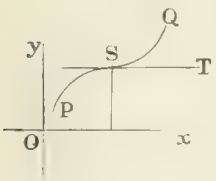
Inflammatory Rheumatism: See Rheumatism.

Inflation (of currency): See Currency.

Inflection [from Lat. *infle'xio*, inflection, liter., a bending, deriv. of *inflec'tere*, bend, inflect]: the general term comprising all the various modifications in the form of a word (declension, conjugation, etc.) by which its relations to the other parts of a proposition are expressed. In the monosyllabic or isolating languages, like the Chinese, Siamese, etc., the relations are indicated by distinct form-words, or are left to be inferred from order and context; in the agglutinative the form-words added to indicate relation do not remain independent, but combine with the substance-words and form composite words, in which, however, the constituent elements maintain a consciously distinct existence; but in the inflectional languages a change of the ending of the word—with or without some phonetic change in the root itself—suffices to express the various relations of the word. It must be observed, however, that these inflectional endings are in many cases to be regarded as originally independent form-words, which have, however, not only been merged in the substance-word, but have entirely lost their conscious identity. See Language and Declension.

Benj. Ide Wheeler.

Inflexion, Point of [inflexion is from Lat. *infle'xio*, a bending, deriv. of *inflec'tere*, bend]: a point at which a curve from being concave in any direction becomes concave in the opposite direction. Thus in the curve P S Q, the concavity is turned downward from P to S and upward from S to Q; hence S is a point of inflexion. The analytic condition of a point of inflexion is that the second derivative of either co-ordinate with respect to the other becomes zero.



Revised by S. Newcomb.

Inflorescence [from Late Lat. *inflorescen'tia*, deriv. of *inflores'cens*, pres. partic. of *inflores'cere*, begin to blossom; *in-*, in + *flores'cere*, begin to blossom, deriv. of *flore're*, blossom, deriv. of *flos*, *flo'ris*, flower]: the term which botanists use to designate the arrangement of flowers upon a plant. Flowers and branches are evolved from buds. These two kinds of buds agree in the positions which they occupy; consequently, flower-buds, like leaf-buds, may terminate the stem or branches or may rise from the axils of leaves. The former are called *terminal*, the latter *axillary*. When one flower only occupies the summit of the stem, it is *terminal and solitary*; when only one occurs in the axil of a leaf, it is *axillary and solitary*. If several flowers are developed near each other on a stem or branch, so as to form a cluster, the contiguous leaves are generally unlike ordinary foliage, and are known as *bracts*. The stalk which supports a flower or a flower-cluster is its *peduncle*, and the stalk of each flower of a cluster, its *pedicel*. When flowers have no supporting stalks, they are *sessile*. The *axis of inflorescence* is the name given to that part of the stalk on which the flowers of a cluster are arranged. When it bears sessile flowers, it is called the *rhachis*; when it is very much shortened and thickened, the *receptacle*. All forms of inflorescence are referred to two types, or to a combination of the two. These plans are known under the following names: (1) *indefinite*, *indeterminate*, or *centripetal*; (2) *definite*, *determinate*, or *centrifugal*; (3) *mixed*, in which the main axis develops in one way and the separate flower-clusters in the other.

1. *Indefinite inflorescence* is characterized by the springing of flowers from axillary buds, while the terminal bud of the stem develops as an ordinary branch, by which the main axis may be indefinitely prolonged. The simplest case is that in which the flowers are axillary and solitary. Many such solitary flowers may appear as the main axis lengthens. If approximated, and the leaves are diminished to bracts, they form a flower-cluster of the indefinite sort. Such clusters are simple when the peduncle is unbranched, compound when the peduncle branches to support smaller clusters of the same kind. Simple, indefinite clusters may have (1) the flowers borne on pedicels along the sides of an elongated axis (*raceme*, Fig. 1, B); (2) along a shorter axis, the lower pedicels lengthened (*corymb*, Fig. 1, C); (3) clustered on an axis which is so short that all the flower-stalks appear to spring from the same point (*umbel*, Fig. 1, D). If the flowers are sessile and arranged along a lengthened axis, the cluster is *a spike* (Fig. 1, A); if the axis is very short, *a head* (Fig. 1, E F). The *ament* or *catkin* is a peculiar scaly and usually drooping spike. The *spadix* is a fleshy spike or head with inconspicuous flowers, the whole frequently enveloped by a showy bract, a *spathe*. The raceme, corymb, and umbel may become compound. If the two former branch irregularly, they form a *panicle*; if this is crowded into a compact cluster, it is sometimes called *thyrsus*. The little clusters of a compound umbel are *umbellets*. When several bracts are grouped closely together at the base of a cluster, they constitute an *involucre*; if they occur at the base of partial clusters, *involucels*.

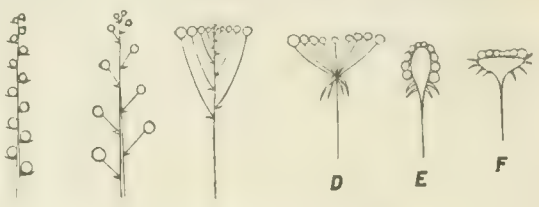


Fig. 1.—Indefinite inflorescences: A, a spike; B, raceme; C, corymb; D, umbel; E F, heads.

2. *Definite Inflorescence.*—In this the main stem, or each successive independent branch, is terminated by a flower. When a blossom is evolved from a terminal bud, growth of the stem or branch is of course arrested, and all further growth depends upon the development of other axes or branches from axils below, which in turn are arrested in the same way. The simplest definite inflorescence is that of a solitary and terminal flower. When several branches from the axils underneath have been successively terminated by blossoms, the cluster so produced may be distinguished from one of the indefinite kind by the reversal of the order in which the flowers expand. The upper flowers bloom earlier than those which are below. Such a cluster is a *cyme* (G to J, Fig. 2). Cymes may be simple or compound.

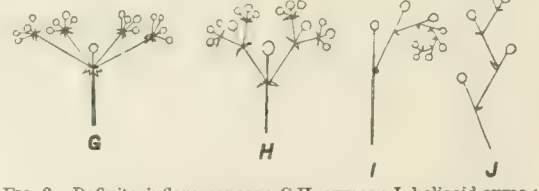


Fig. 2.—Definite inflorescences: G H, cymes; I, helicoid cyme; J, scorpioid cyme.

The clusters of a compound cyme are termed *cymules*. A very compact cyme is called a fascicle or glomerule. Cymes

of an anomalous character result from the suppression of the central flower or one of the side branches.

3. *Mixed Inflorescence.*—Indefinite and definite inflorescence may occur in the same plant, and in two ways; first (as in *Compositæ*), by centrifugal development of the branches which bear the heads, while the flowers of each head expand centripetally; second, the reverse of this, has the main axis (as in *Labiatæ*) producing, in centripetal order, clusters which develop centrifugally.

The following table exhibits the principal sorts of inflorescence at one view:

A. *Indefinite*, from axillary buds.
  Simple:
    Flowers on pedicels:
      On the sides of a lengthened axis, *raceme.*
      On a short axis, lower pedicels lengthened, *corymb.*
      On an extremely short axis, *umbel.*
    Flower sessile:
      On an elongated axis, *spike.*
      On a very short axis, *head.*
        With their varieties, *spadix* and *catkin.*
  Compound:
    Branching regularly, *compound raceme, corymb*, and *umbel.*
    Branching irregularly, *panicle* and *thyrsus.*
B. *Definite*, from terminal buds:
    Open, mostly flat-topped, *simple* and *compound cyme.*
    Contracted, *fascicle.*
C. *Mixed.*

G. L. Goodale.

Influenza [= Ital., liter., influence, i. e. some peculiar atmospheric influence]: an essential, infectious, epidemic, febrile disease, characterized by a variable degree of constitutional disturbance, especially nervous depression, and having a local expression in irritation and catarrhal inflammation of the air-passages and their appendages. In France it is termed *la grippe*, from *agripper*, to seize, indicating the sudden, precipitate onset of the epidemic and of the individual attack. It is also termed epidemic catarrh, epidemic bronchitis, and, perhaps more appropriately, epidemic catarrhal fever. It is said to have been referred to by Hippocrates, but he has left no accurate account. It is described as first prevailing in Europe in the tenth century, and later in the years 1311, 1387, and 1403. But its certain and undoubted record begins with the epidemic of 1510, and in this epidemic the disease for the first time appeared in the British islands. Since that time to the year 1875 there have been ninety-two epidemics, of variable severity and at irregular intervals. These epidemics are singularly uniform in identity of characteristics and in obedience to law of origin and diffusion. The disease appears suddenly in the east or northeast, usually in the north of Europe, rarely in the Indies or Northern Asia, and travels to the west. It travels in cycles, invading the whole of Northern Europe, often extending to America, and is occasionally felt in the equatorial regions and the southern hemisphere. Its progress is rapid, a great wave from E. to W. precipitating itself upon communities and countries with a suddenness warranting the names popularly applied to it—"lightning catarrh," "le petit courrier," "la grippe." Less often it appears coincidently at places far removed, as at the Cape of Good Hope and London, in 1836. In its zone of progress it often appears simultaneously at many isolated foci, from which it seems to radiate until disseminated over vast areas. Its influence is not confined to the continents, but is immediately exerted at mid-sea upon all who sail into the districts of atmospheric infection. Appearing in a community, it attacks a majority of its members, and with a rapidity precluding the idea of customary communicability, though distinct contagion may be distinctly observed in some cases. No nationality is exempt, and as a rule only a fractional part of the population escapes its effects. In some epidemics children are exempt. During the prevalence of influenza the animal vitality is lowered, the type of other diseases is modified, assuming adynamic or typhoid forms, and tending to a greater general mortality. Influenza is not confined to man, but often extends its epidemic influences to the domesticated animals, especially the horse, and is known as "the *epizoötic.*" In England the epidemics of 1728, 1732, 1733, 1737, 1743, 1803, 1831, and 1837 were accompanied by epizoötics among cows, horses, and dogs. The pestilential epizoötic extending throughout the U. S. in 1872–73, attacking in New York 16,000 horses, was an outbreak of influenza, prevailing with less severity among men. Influenza is first recorded in America in 1577. The chief epidemics in Europe have extended to the U. S. The most noticeable ones are that at the close of the war of 1812, those of 1843, of 1872, of 1874–75, of 1889–90, of 1890–91, and 1891–92. The latter occurred late in the year, extending to the new year. The first was perhaps the most severe and widespread, the main complication and cause of mortality being pneumonia. Of the intimate nature of the subtle atmospheric or telluric cause of influenza nothing is definitely known. Much has been written of its concurrence with the appearance of comets and meteoric showers, and the opinion is in favor that electrical and magnetic disturbances of the atmosphere are related to the epidemics. The advocates of the infectious nature of the disease regard influenza as due to the wide dissemination, by air-currents, of some living germ. A particular bacillus has been described as producing the disease. The epidemic of influenza occurs at all seasons of the year, often in the spring, and in both warm and cold, in dry and damp or foggy weather. The usual duration, in one locality, of an epidemic is from four to six weeks, exceptionally much longer. There may be local recurrences in the same season, but as a rule the victims of the first are exempt from the second attack.

The specific cause of the disease is supposed to act directly upon the mucous lining of the respiratory tract, producing inflammation, and at the same time to cause some profound depression of the nervous centers. The symptoms vary in severity in different epidemics and in individual cases. The attack is sudden, announced in severe cases by a marked rigor, more often by chill and shivering alternating with flashes of feverish heat. Then follow general lassitude, debility, nervous prostration, soreness and stiffness of the limbs; pains in the neck, back, and loins; headache, frontal oppression, pain in the orbits, cheek-bones, and root of the nose; injection and sensitiveness of the eyes, with copious flow of tears—often heated, the "fiery tears" of the early records—sneezing and tingling, followed by watery and often acrid discharge from the nose; soreness of the tonsils, Eustachian tubes, and ears, experienced in swallowing; hoarseness, a short, frequent, harassing cough, with slight expectoration, and a slight fever of the remittent form, having its exacerbation toward evening. The fever is seldom pronounced, but the restlessness, irritability, exhaustion, and mental depression are marked, and usually disproportionate to the amount of fever or bronchitis present. In the more pronounced cases inflammation of the bronchial tubes occurs, and there is danger of a complicating pneumonia, which is apt to assume an adynamic type, and constitutes the gravest danger in the disease. It is most apt to supervene in the aged and debilitated, and in children. Sometimes the bronchial and respiratory symptoms may be almost entirely wanting, catarrhal conditions of other parts taking their place. Thus there are forms in which the stomach or bowels suffer most; or the bladder and kidneys, or the catarrhal element may be entirely absent, and nervous depression remain as the only manifestation of the disease. The usual duration of mild cases is from three to five days, of grave cases from seven to ten days. The termination of the disease is often as sudden as its onset, and frequently occurs with a critical and profuse perspiration or diarrhœa. The mortality from uncomplicated influenza in previously healthy persons is very slight. Influenza has no pathology indicative of its specific nature, and presents only the lesions of the associated catarrh. The majority of cases are mild and require no treatment beyond care. More marked cases may require a preliminary purgative, a low diet, the avoidance of exposure to cold and sudden changes of temperature, resort to hot draughts, as of lemonade or elder-bloom tea, to stimulating foot-baths, to the use of Dover's powder, spiritus Mindereri, or other remedies to secure free perspiration, and the relief of bronchial congestion by inhalation of steam, by ammonia, or by stimulating expectorants. In all cases, however, the amount of depression by medicine or treatment must be carefully limited. Small doses of antipyrine or phenacetine with Dover's powder will relieve headache and other pains or restlessness, but it will always be well to administer quinine and strychnia for their stimulating qualities to counteract the depressions of the other remedies. The favorite popular treatment by free use of whisky or brandy is not to be encouraged. Headache and distress in the nose and orbits, due to irritation of the Schneiderian membrane and its processes, may be relieved by the inunction of oil or grease or by the insufflation of warm anodyne solutions. Quinine in doses of 5 grains three times a day, if taken at the begin-

ning, may cut short the attack. When the bronchitis tends to become capillary, quinine or tincture of bark is indicated to support the strength, ammonia to favor the liquidity and discharge of mucus, and the oil-silk jacket to favor free secretion. The extension of pneumonia may be limited by carbonate of ammonia, quinine, and anodyne poultices or fomentations. It is essential to proper treatment to remember that blood-infection is primary and bronchitis or pneumonia is secondary; the constitutional disease will admit of no depressing remedies, and the speedy termination of the inflammatory complications will follow supporting measures. During epidemics of influenza the aged and feeble should keep within doors, in well-warmed rooms, and partake of quinine, ammonia, and guarded but nourishing diet, as measures of prevention. Revised by WILLIAM PEPPER.

Information: in law, a written charge or accusation made against a defendant in a suit or proceeding which is directly instituted against him in behalf of the state or government by or in the name of the attorney-general or other proper law-officer representing the government. It is so called from the words by which it gives the court to understand and "be informed" of the facts alleged in it. This form of legal process is employed in proceedings of various kinds, being used either as a mode of criminal prosecution, a form of civil remedy, or a particular method of instituting a suit in equity in certain cases. These various modes of legal procedure may be considered separately.

I. A *criminal information* differs from an indictment in that in the former the accusation or charge is presented directly by the attorney-general or prosecuting officer, while in the latter the accusation proceeds directly from a grand jury, upon whose oath it is based. They do not, however, differ materially in form and substance, and whether the prosecution be instituted in the one way or in the other the charge must be tried before a petit jury. See INDICTMENT and GRAND JURY.

Criminal informations in the English law are either such as are partly at the suit of the crown and partly at that of a subject, or such as are wholly at the suit of the crown. The former are brought upon certain penal statutes at the instance of common informers. The latter are of two kinds: (1) Those filed *ex officio* by the attorney-general, or, in the vacancy of his office, by the solicitor-general, solely in behalf of the crown; and (2) those filed by the king's coroner and attorney in the court of king's bench, usually called the master of the crown office, at the relation of some private person or common informer. These two varieties of proceeding by information in the name of the king alone may be resorted to in all cases of misdemeanor (except misprision of treason), but in practice are seldom employed except when the offense is of a particularly grave and serious character, or has an especial tendency to disturb the administration of the government, or when a more speedy mode of prosecution is desired than a proceeding by regular indictment. In both these classes of cases the prosecuting officer in early times possessed authority to file an information at his own option, without obtaining permission from the chief court of criminal jurisdiction, the king's bench; but in the second class of cases, to remedy the abuses which had arisen, the practice was changed by a statute passed in 1692 (4 and 5 Will. and M., ch. 18), providing that informations should not be filed at the suit of a private person except by leave of the court (which will not be granted except in serious cases, and upon prompt application), and on such persons giving security to the party proceeded against for costs.

In the U. S. several of the States have retained the English practice of prosecution by information, though the extent of its application and the mode of procedure are variously modified by statute. In some of the States prosecution by information is allowed in all cases, in others only in cases of crimes not infamous, and in others only where an indictment will not lie. The officer by whom it is usually provided that the information shall be filed is the attorney-general of the State. By the provisions of the U. S. Constitution no offense which is capital or infamous can be prosecuted by information, but only by indictment. See INFAMY AND INFAMOUS CRIMES.

II. *Information in the Nature of a quo warranto.*—This species of information is a proceeding which superseded the ancient common-law writ of *quo warranto* (precisely when it is not known, but according to the general opinion about 1337) in those cases in which the object of the proceedings is to inquire by what authority or warrant the defendant exercises certain official or corporate powers, or asserts a right to certain franchises or offices which are alleged to be unlawfully claimed or to have been forfeited. (See QUO WARRANTO.) It lies only in cases where the writ of *quo warranto* was issuable, except as otherwise provided by statute, and originally of a criminal nature, the usurper having been liable to be punished by fine and imprisonment, as well as to be ousted from the office or right wrongfully exercised or possessed. Now, however, it is criminal in name and form only; or not at all, as in England where it has been enacted (47 and 48 Vict., c. 61, s. 15) that proceedings in *quo warranto* shall be deemed to be civil proceedings.

Most of the cases in which this proceeding is employed are included among those which are brought against an unincorporated association for assuming corporate powers; against a lawfully organized corporation for non-user, long neglect, or misuse of its franchises or powers, or for a violation of its charter or the provisions of any law; against any person for a usurpation of or intrusion into a public office, or for the exercise of any franchise not conferred upon him by law, or for the performance of official duties after his office has been forfeited, or after the term for which he was appointed or elected has expired. It is a common form of procedure against corporations to deprive them of their franchises and obtain their dissolution, on the ground that corporate powers have been forfeited by misfeasance.

Procedure.—In England informations in the nature of a *quo warranto* may be presented in three ways, two of which are practically the same as those given above under criminal informations. The third way is a form of practice established by the statute of Anne, ch. 20, in which the information is presented by the proper officer upon leave of the court at the relation of some person or persons (the "relator" or "relators") who desire to prosecute the defendant. It affords the means of determining controversies between private parties in regard to the right to corporate or other franchises, public offices, etc., the crown or state being only the nominal prosecutor. Informations at the suit of a private person can be presented only by leave of the court, which will be granted, not arbitrarily nor as a matter of course, but in the exercise of a sound discretion. Permission will usually be granted when the right upon which the suit is based is disputed or uncertain, or depends upon a point of doubtful law, or where there is no other remedy. The proceeding in these cases resembles closely the bill, petition, or declaration in place of which it is used.

In the U. S. the proceeding by information in the nature of a *quo warranto* is still in use either as a statutory or a common-law proceeding under that name in several of the States, and corresponds very closely with the English practice; and in those States (as New York) where it has been abolished by name the proceeding under the statute is substantially the same as the information. The suit is usually instituted by the attorney-general of the State of his own authority, or by the private prosecutor or "relator," who employs the name of the attorney-general in the proceeding as a matter of form. It is the usual rule that the leave of the court shall be obtained in cases of this kind.

III. A *crown or exchequer information* is another form of the proceeding by information as a civil remedy. It is used for the recovery of money or other chattels claimed by the crown, or to obtain damages for any injury committed upon the lands or the possessions of the crown, and was filed in the court of exchequer while that court existed. The attorney-general institutes the suit of his own authority and at his own discretion. Informations of this kind are most frequently used in cases of intrusion (for trespasses on crown land), in cases of debt (for moneys due to the crown upon breaches of penal statutes), and in suits *in rem*, as for treasure-trove, wrecks, waifs, and astrays. In the U. S. informations are not infreqently employed in the Federal courts for the recovery of penalties and forfeitures, as, e. g., in cases of violation of the revenue laws. These are usually civil proceedings *in rem*. See IN REM.

IV. *Informations in Chancery.*—This species of information was in use in England in cases where a suit was instituted on behalf of the crown or Government, or on behalf of those of whom the Government has custody by prerogative (as idiots and lunatics), or on behalf of those whose rights are under its special protection. These informations differed from bills in little more than form and name, and both were governed by practically the same rules. They are now abolished by the Supreme Court of Judicature (R.

S. C., 1883, ord. i., r. 1), and an ordinary action substituted. As in the case of the information in the nature of a *quo warranto*, the suit might be brought wholly in the interests of the crown by the attorney-general or solicitor-general of his own authority, or it was maintainable at the instance of a "relator," whose rights and interests were involved, and who was responsible for costs, etc. The question whether the power of the attorney-general to file an information for the purpose of establishing or administering a "charity" was a regular part of English jurisprudence or was derived from the statute of 43 Eliz., ch. 4, concerning charities, has assumed importance in some of the U. S. in which that statute has not been re-enacted or recognized, and careful investigation shows that the information has its roots in equity as well as in strict common law. (See the authorities collected in Dwight's *Argument in the Rose Will Case* (New York, 1863), pp. 257–270.) In the U. S. informations may be employed in some of the States as a mode of instituting equitable suits.

On this whole subject see Cole *On Informations*; Shortt *On Informations*; Angell and Ames *On Corporations*; Bishop's *Criminal Procedure*; Daniell's *Chancery Practice*; Story's *Equity Pleading*; Tudor *On Charitable Uses*; Boyle *On Charities*. F. STURGES ALLEN.

Informer: in law, a person who brings suit or prefers an accusation against another for the violation of some penal statute. It is sometimes provided in a statute of this kind that the whole or a certain portion of the penalty recovered from the person who shall be convicted of violating its provisions shall be given to any one who will sue for the same, or who will give information of the offense to the proper prosecuting officer. The party by whom the proceeding may be instigated is sometimes termed not merely "informer," but "common informer," because he may be any member of the community. The object of such legislation is to elicit the active efforts of the people generally in the detection and punishment of wrongdoers by the prospect of a reward, and the person who furnished the information which led to the beginning of the prosecution is entitled to the share in the penalty recovered, and not one who afterward furnishes information upon which conviction is had in proceedings so instigated. (*U. S.* vs. *George*, 6 Blatchford (U. S.) 406, 418.) Actions brought by an informer under such a statute, when the penalty is recoverable partly for himself and partly for the benefit of the state, are technically termed *qui tam* actions, because the plaintiff is described in the suit as one *who sues as well* (Lat. *qui tam*, who as well) for the king or commonwealth as for himself. This peculiar Latin phrase was adopted at a time when legal pleadings were expressed in that language, and these words formed the commencement of the allegation in which the plaintiff described the character in which he appeared in the action. Statutes authorizing *qui tam* actions are more common in England than in the U. S.

Revised by F. STURGES ALLEN.

Infundib'ulum [Lat., a funnel, from *infun'dere*, to pour in]: an outgrowth from the floor of that region of the brain known as the thalamencephalon. See HYPOPHYSIS.

Infuso'ria (so called because first found and studied in infusions of hay, pepper, etc.): a term sometimes loosely used to include all minute organism occurring in infusions, stagnant water, etc., but when properly restricted it is given to a class of unicellular animals (Protozoa) characterized by the possession of a permanent and definite body-form, in which certain regions are set aside for the performance of definite functions. Thus there is usually a fixed area for the taking of food, a contractile vacuole for the excretion of nitrogenous waste, definite organs of locomotion, and in some cases a differentiation of muscular portions. All the Infusoria are microscopic; they occur in both salt and fresh water, while several occur as parasites in other animals, sometimes as concomitants if not actual producers of disease. Reproduction occurs by division, by budding, and by a peculiar process known as spore formation, previous to which the animal retracts all protruding portions of its body, and incloses itself in a protective case or cyst. Three sub-classes are recognized, *Flagellata*, *Ciliata*, and *Suctoria*.

The *Flagellata* (from Lat. *flagellum*, a whip) are characterized by the possession of one or more vibratile organs like a whip-lash which serve either as efficient agents in swimming or, in the fixed forms to create currents to bring food to the organism. The *Flagellata* approach most nearly of all the Infusoria to the vegetable kingdom. Thus the Monads (small forms with one or more flagella and no collar) pass through a stage in which they present the closest resemblance to the *Plasmodia* of the Fungi. Even more plant-like in their reproduction are forms like *Volvox*, frequently claimed by the botanist, but which in other respects are distinctly animal in their nature. In the collared flagellates (*Choanoflagellata*) there is a delicate collar surrounding the single flagellum, and food is taken into the body through the region inside the collar. It is interesting to find similar collared cells forming the digestive tract of the sponges. Another group contains the marine *Noctiluca*, a phosphorescent form large enough to be visible with the naked eye.

The *Ciliata* (from Lat. *cilium*, an eyelash) have instead of flagella numerous rapidly vibrating small hair-like organs (cilia), which take their place both in obtaining food and in locomotion. The distribution of these cilia is used to divide the *Ciliata* into smaller groups; thus the *Holotricha* have them equal in size and evenly distributed over the body; the *Heterotricha* have them much larger around the region where the food is taken; the *Hypotricha* have them restricted to one side of the body and interspersed with hooks and spines; while in the *Peritricha* they are arranged in a ring around the body or a spiral around the mouth. In many forms there is a well-marked "mouth" and a digestive cavity hollowed in the protoplasm of the single cell. The balls of food circulate through the cell, and the indigestible portions are cast out at a definite spot. Some forms secrete protective cases often of extreme beauty. Some species are fixed, either directly or by the intervention of a long stalk, and in *Vorticella* this stalk can suddenly contract in a spiral, causing the body to jump through the water. In some the outer layer of the body contains minute rods, which upon stimulation can be shot out in a way which recalls the nettle-cells of the CŒLENTERATA (*q. v.*). The *Ciliata* contain the majority of the larger Infusoria, and of these a large proportion belong to the *Peritricha*.

The *Suctoria*, or *Tentaculifera*, are carnivorous forms living upon other Protozoa. They may be either fixed or free, but in place of the flagella or cilia of other Infusoria they have tubular retractile tentacles which they thrust into the body of the prey, and through them they suck the protoplasm of the cell. They have, besides fission and the usual budding, a peculiar process of reproduction by the formation of internal buds. *Acineta* is possibly the best-known genus. J. S. KINGSLEY.

Infusorial Earth, or **Kieselguhr** [Germ. *kiesel*, flint + *guhr*, sediment]: a geologic formation composed of the frustules of DIATOMS (*q. v.*). These minute bodies occur in many formations, and there are certain local strata of Tertiary age composed entirely of them. Consisting of sharp, angular, siliceous grains of microscopic size, they constitute a valuable abrasive material, and are extensively used for scouring and polishing, and also in the manufacture of dynamite, etc. In the U. S. there are important deposits in Virginia, Maryland, New Jersey, Connecticut, New Hampshire, Nevada, California, and Oregon. The most celebrated European locality is at Bilin, Bohemia. The production for the U. S. in 1889 was 3,466 tons, valued at $23,372. The value of the product in 1890 was $50,240; in 1891, $21,988; in 1892, $43,655. G. K. G.

Ingalls, JOHN JAMES, LL. D.: senator; b. at Middleton, Essex co., Mass., Dec. 29, 1833; graduated at Williams College, Massachusetts, 1855; admitted to the bar in 1857; removed to Kansas 1858; delegate to Wyandotte constitutional convention 1859; secretary of territorial council 1860; secretary of State Senate 1861; member of Kansas Senate from Atchison County 1862; major, lieutenant-colonel, and judge-advocate Kansas volunteers 1863–65; elected to U. S. Senate as a Republican; took his seat Mar. 4, 1873, and was re-elected in 1879 and 1885; was the candidate of his party for a fourth term and was defeated in 1891 by the Farmers' Alliance; was president of the Senate *pro tempore* from Feb., 1887, till the close of his service.

Ingalls, RUFUS: general; b. at Denmark, Me., Aug. 23, 1820. He graduated from the U. S. Military Academy in 1843, and was promoted second lieutenant of Rifles; transferred to the Dragoons 1845, and to the quartermaster's department 1848. He served with distinction in the Mexican war, and had a varied experience as quartermaster in the Northwest. On the outbreak of civil war in 1861 he served in the defense of Fort Pickens April to July, and was then transferred to Washington and called upon to assume re-

sponsible duties as chief quartermaster of the rapidly arriving volunteers, in providing for the embarkation of the Army of the Potomac to the Virginia Peninsula, in transferring the vast supplies of that army from the York to the James river, and as chief quartermaster of that army in the subsequent evacuation of the Peninsula, the establishment of a new base of supplies at Acquia creek, and, as chief quartermaster of the armies of the Potomac and of the James, of establishing a dépôt of supplies at City Point. He was present at nearly every important battle fought by the Army of the Potomac. He was breveted lieutenant-colonel to major-general. At the close of the war he served at headquarters of the army, and in 1867 at New York city, as chief quartermaster of military division of the Atlantic; he became quartermaster-general U. S. army in 1882; retired in 1883. D. Jan. 15, 1893. Revised by James Mercur.

Ingelow, in'je-lō, Jean: poet; b. at Boston, England, in 1820; has published several volumes of verse (1850, 1863, 1867, 1871, 1887), besides prose works of fiction, including *Tales of Orris* (1860); *Studies for Stories* (1864); *Home Thoughts and Home Scenes* (1867); *Off the Skelligs* (1872); *Fated to be Free* (1875); *Don John* (1876); *Sarah de Berenger* (1880).

Ingemann, Bernhard Severin: poet and novelist; b. on the island of Falster, Denmark, May 28, 1789. During 1818–19 he traveled on the Continent, and in 1822 was appointed instructor of the Danish Language and Literature at the Academy of Sorö. While a student at the University of Copenhagen he published his first collection of poems (1811; vol. ii., 1812), which show great influence of German romanticism. Their sickly sentimentality reflects the unhealthy condition of the poet's body and mind at this time. They were followed by a long allegorical poem, *De sorte Riddere* (The Black Knights, 1814), which closed his first period. Then followed six plays, of which the best is *Reinald Underbarnet* (The Miraculous Child Reinald, 1816), and the most popular, *Blanca* (1815). In 1817 he published his first prose work, *De Underjordiske, et bornholmsk Eventyr* (The Subterranean Ones, a Story of Bornholm), which was followed in 1820 by *Eventyr og Fortællinger* (Narratives and Miraculous Tales), many of them imitations of Hoffmann. During the next period, inspired by the Waverley novels, Ingemann produced his series of historical romances, by virtue of which he disputes with H. C. Andersen the title of the children's writer of Denmark. Their subjects are all taken from Danish history. The first, and perhaps the best, is *Valdemar Seir* (Valdemar the Victorious, 1826), which was followed by *Erik Menveds Barndom* (Erik Menved's Childhood, 1828); *Kong Erik og de Fredlöse* (King Erik and the Outlaws, 1833); and *Prins Otto af Danmark og Hans Samtid* (Prince Otto of Denmark and his Time, 1835). During 1837–39 Ingemann wrote *Morgen- og Aftensange* (Morning and Evening Songs), a collection of religious poems of great beauty and spirituality. While his historical romances show a lack of accuracy their strong nationality gives them a special interest to the student of Danish culture. Ingemann's style, both in prose and poetry, is characterized by grace and delicacy rather than by strength. *Samlede Skrifter* (Collected Works, xli. vols., Copenhagen, 1843–65). D. at Sorö, Feb. 24, 1862. D. K. Dodge.

Ingenhousz, ing'gen-hows, Jan: physician; b. at Breda, Holland, in 1730; studied medicine, and after practicing in Holland went to England in 1767. He traveled in France and Italy, and returned to London, where he devoted himself to scientific research, and became a fellow of the Royal Society, in whose *Transactions* he published several important essays. To Dr. Ingenhousz is ascribed the first medical use of carbonic acid and the invention of the plate electrical machine; he discovered that plants when exposed to light exhale oxygen. He died at Bowood, the seat of the Marquis of Lansdowne, Sept. 7, 1799.

Ingersoll, ing'ger-sŭl: town of Oxford co., Ontario, Canada; on the Thames, and the Great Western Railway; 19 miles by rail E. of London (see map of Ontario, ref. 5–C). It has a heavy trade in grain and lumber, important manufactures of farm implements, woolen goods, cheese, and lumber, a branch bank, and two weekly newspapers. It has fine public buildings. Pop. 4,200, about equally divided between English, Irish, and Scotch.

Ingersoll, Charles Jared: politician and author; b. in Philadelphia, Pa., Oct. 3, 1782. He was a son of Jared Ingersoll (1749–1822), jurist. He received a collegiate education; became a lawyer, and was a member of Congress 1813–14 and 1841–47; U. S. district-attorney 1815–29, and held various important offices. He wrote *Chiomara*, a poem (1800); *Inchiquin's Letters* (1810); *Historical Sketch of the Second War with Great Britain* (4 vols., 1845–52); and several other works, chiefly historical and poetical. D. in Philadelphia, May 14, 1862.

Ingersoll, Ernest: naturalist; b. at Monroe, Mich., Mar. 13, 1852. He was educated at Oberlin College and at the Harvard Museum of Comparative Zoölogy, and was connected with the Hayden survey and the U. S. Fish Commission. Among his publications are *Nests and Eggs of American Birds* (1879); *Friends Worth Knowing* (1880); *The Crest of the Continent* (1885); and *The Strange Adventures of a Stowaway* (1886). H. A. Beers.

Ingersoll, Joseph Reed, LL. D., D. C. L.: lawyer and politician; brother of Charles Jared Ingersoll; b. in Philadelphia, June 14, 1786; graduated at Princeton in 1804, and became a prominent lawyer of Philadelphia. He was a Whig member of Congress 1835–37 and 1842–49. He was an advocate of protection, and a firm supporter of Henry Clay; and U. S. minister to Great Britain 1852–53. He published a memoir of Samuel Breck (1863) and *Secession a Folly and a Crime*. D. in Philadelphia, Feb. 20, 1868.

Ingersoll, Robert Green: lawyer and author; b. in Dresden, Yates co., N. Y., Aug. 11, 1833; went West when twelve years old; was a short time in an academy in Tennessee; also taught school in that State; began to practice law in Southern Illinois in 1854; was defeated as Democratic candidate to Congress in 1860; became colonel of the Eleventh Illinois cavalry 1862; was attorney-general for Illinois in 1866; refused the post of minister to Germany in 1877. The authorized publications of Col. Ingersoll are *The Gods, and Other Lectures* (Washington, 1878); *Ghosts* (1879); *Some Mistakes of Moses* (1879); *What Shall I do to be Saved?*; *Interviews on Talmage and the Presbyterian Catechism*; *The North American Review Controversy*. Other minor publications have appeared, including *Prose Poems* (1884); *A Vision of War*; a funeral address over his brother Eben's grave, also one over a child's grave. He has also written some occasional poems in verse and introductory chapters for two works, *Modern Thinkers*, compiled by Van Buren Denslow (Chicago, 1881), and *The Brain and the Bible*, by Edgar C. Beall (Cincinnati, 1882). Col. Ingersoll's notoriety has been made by his public lectures denying the existence of a God and criticising the Bible and the Christian religion. He was the orator at the Decoration Day celebration in New York in 1882. He first attracted political notice by his brilliant eulogy of James G. Blaine in the Cincinnati convention of 1876, which subsequently nominated Rutherford B. Hayes for President. He practiced law for many years in Peoria, Ill., but afterward settled in New York.

Ing'ham, Benjamin: religious leader; b. at Ossett, Yorkshire, England, June 11, 1712; was educated at Batley School and at Queen's College, Oxford, where in 1733 he became associated with John and Charles Wesley, the founders of Methodism. He graduated B. A. 1733; was ordained and accompanied John Wesley to Georgia in 1735, remaining two years in America, returning with Wesley, and accompanying him in his visit to the Moravians in Germany. So strong was his attraction to that body of Christians that he wished to assimilate the rising Methodism to their type, and he actually founded in Yorkshire several congregations of what might be called Moravian Methodists, otherwise "Inghamites," and in a few years there were in England eighty-four of these societies. In process of time Ingham, who had married in 1741 a sister of the Earl of Huntingdon, removed to Aberford and evangelized the whole surrounding region, being elected a bishop or *general overseer* by the church he had founded, which was long in fellowship with Methodism, but in 1759 and the succeeding years three-fourths of the societies, and finally Ingham himself, went over to the Sandemanians. He died in Aberford in 1772.

Ingolstadt, ing'ōl-staat: town in the province of Upper Bavaria, on the Danube; 53 miles by rail N. of Munich (see map of German Empire, ref. 7–F). Its fortifications, which were destroyed by Moreau in 1800, were rebuilt in 1830, and are considered very strong. It has some manufactures of leather and paper. It was once the seat of a famous university, which was founded in 1472, transferred to Landshut in 1800, and to Munich in 1826. Pop. (1890) 17,646.

Ingraham, ing'grā-am, Duncan Nathaniel: naval officer; b. at Charleston, S. C., Dec. 6, 1802; entered the U. S.

navy in 1812 as midshipman; rose to the rank of captain in 1855, and rendered himself famous in the Martin Koszta affair at Smyrna in 1853; for his conduct in this matter he was voted thanks and a medal by Congress. In 1856 he was appointed chief of the ordnance bureau of the Naval Department, and held that position until South Carolina passed her ordinance of secession in 1860; he then resigned his commission in the U. S. navy and took service under the Confederate States, rising to the rank of commodore. D. at Charleston, Oct. 16, 1891.

Ingraham, Joseph Holt: novelist; b. in Portland, Me., in 1809; early engaged in mercantile pursuits, but afterward became an instructor in Washington College, Mississippi. He published *The Southwest, by a Yankee* (1836), which was followed by a considerable number of romances, some of which had a very wide popularity. He afterward took orders in the Protestant Episcopal Church, and was in charge of a parish at Holly Springs, Miss. Besides the above he wrote *The Prince of the House of David* (1855); *The Pillar of Fire* (1859); and *The Throne of David*. D. at Holly Springs in Dec., 1866.

Ingres, ăñgr, Jean Auguste Dominique: historical and portrait painter; b. at Montauban, Tarn-et-Garonne, France, Aug. 29, 1780. He was a pupil of Roques, at Toulouse, and of David; gained the Grand Prix de Rome 1801; member of the Institute 1826; director of the French Academy in Rome 1834–41; grand officer of the Legion of Honor 1855; senator 1862. D. in Paris, Jan. 14, 1867. The stilted style of David and his followers was at the climax of its glory in France when Ingres appeared upon the scene after his studies in Rome, and he who is in our day looked upon as a typical classicist was then considered revolutionary. He combated the principles of David throughout his career, and among his first admirers were Delacroix, Géricault, and others who wished to throw off the yoke of the Institute, and believed they could do so under the leadership of such a man as Ingres. Afterward, when they were successful, they divided into two camps, the draughtsmen and the colorists, and the latter, with Delacroix at their head, founded the new romantic school. The romanticists ardently opposed Ingres, and in their views of art separated more and more widely from the principles he upheld, finishing in our time in the famous Fontainebleau group of painters. However purist and classical the work of Ingres may now appear in the light of the movement toward *plein air* and impressionism which marks the works of contemporary painters, it is certain that the impulses that have brought modern French art to its present high position were first given by him. His art stands to-day as the epitome of Academy traditions, to which he always adhered, but he found his inspiration, not as David did in the antique, but in the beautiful conceptions of Masaccio and Raphael. His compositions are almost without color, being painted in pale neutral tints generally, but his drawing is magnificent. He may justly be said to be the greatest draughtsman of the French school. In some of his portraits, such as that of Bertin in the Louvre, the drawing is simply marvelous. Four other portraits are in the Louvre, as well as his beautiful nude figure *La Source, Roger Rescuing Angelica, Apotheosis of Homer, Christ giving Keys to St. Peter, Apollo Crowning the Iliad and the Odyssey*, and *Jeanne d'Arc Holding the Oriflamme*. William A. Coffin.

In'grians: a Finnish or Ugrian race, inhabiting Ingria, or Ingermanland, a portion of Russia now mostly included in the government of St. Petersburg. Ingermanland was captured by the Swedes in the fourteenth century, became Russian territory in the fifteenth century, was restored to Sweden in 1617, and finally conquered by Peter the Great in 1702. The Ingrians are mainly Lutherans, very poor and ignorant, but the process of Russianizing in manners and religion is going on. The true Ingrians (Vod) are estimated to number 15,000, but there are reported in the district 42,979 Savakot and 29,344 Auramoiset—Finnish peoples allied by language with the Karelians rather than with the Ingrians and the true Finns. Revised by R. B. Anderson.

Ingulph, or **Ingulf**: Abbot of Crowland, or Croyland, in Lincolnshire, England; supposed to have been born about 1030. He went to Normandy, where he became the secretary of William the Conqueror; made a pilgrimage to Jerusalem, and on his return entered a monastery in Normandy, of which he became prior. In 1086 he was called to England by William to become Abbot of Croyland. D. in office Nov. 16, 1109. He was long credited with the authorship of a work entitled *Historia Monasterii Croylandensis*. It was printed in Savile's *Scriptores Rerum Anglicarum post Bedam* (London, 1596), and again by Fulman, with a continuation by Peter de Blois, in vol. i. of the *Rerum Anglicarum scriptores veteres* (Oxford, 1684). A translation by Riley appeared in Bohn's Antiquarian Library in 1854. Sir Francis Palgrave, in *The Quarterly Review* for Sept., 1826, stated his belief that the history was produced in the thirteenth or fourteenth century; other writers support him, and also assert that the work has no historical value. English, in *Crowland and Burgh* (1871), holds that it is based on an original by Ingulph, and Birch, in *Chronicle of Croyland Abbey by Ingulph* (London, 1883), attributes parts of the *History* to the abbot. The little that is known concerning the life of Ingulph is derived from a biography at the end of the *History* and from the *Historiæ Ecclesiasticæ* of Ordericus Vitalis.

Inhauma, Marquis and Viscount of: See Ignacio, Joaquim José.

Inheritance: See Heir.

Inhibition [from Lat. *inhibi'tio*, from *in* + *habere*, to hold]: the process of checking or preventing. The term is used in neurology and psychology to express the suppression or modification of one nervous process by another, i. e., a voluntary action may "inhibit" a reflex; or of one conscious state by another, i. e., a strong emotion may "inhibit" a train of thought. J. Mark Baldwin.

Injunction: in law, an order made by a court possessing equitable powers, addressed to a designated person, and commanding him either (1) not to commit some act which he threatens to commit, or (2) to desist from the further prosecution of some act which he has already commenced, or (3) to restore to its former condition something which has been interfered with and altered by his act. This judicial instrument for the prevention of wrong was, like many other remedies and forms of proceeding, borrowed directly from the Roman law, in which it was extensively used under the name of interdict. Interdicts were commands issued by the prætor or other magistrate, in which he ordered something to be done or not to be done. The number of particular instances in which they might be used was very great, and indeed they might be resorted to for the protection of all species of property, public and private. The certainty and ease with which threatened wrongs could be prevented by their means, and a restoration of rights could be effected, raised the remedial department of the Roman law to a high position of practical efficacy which has been surpassed by no modern system of jurisprudence. The primary division of interdicts was into three classes: (1) Prohibitory, which prohibited something from being done; (2) restoratory, which commanded something to be restored; and (3) exhibitory, which directed some person or thing to be produced and exhibited. In this last class was one, *de libero homine exhibendo*, which was used to prevent a freeman from being improperly restrained of his liberty, and which therefore bore some resemblance to our writ of *habeas corpus*.

Classes of Injunctions.—The only species of injunction for a long time used by the courts of Great Britain and the U. S. merely forbade the commission of some act; but a modified form has been recently introduced under the name of mandatory injunction, which is similar in its design and effects to the restoratory interdict. The ancient common law furnished no remedies which were directly preventive; its reliefs, in all ordinary private controversies, were either (1) the recovery of money as a compensation for the wrong complained of, or (2) the recovery of a specific tract of land, or (3) the recovery of a specific chattel. The court of chancery, untrammeled by the arbitrary and technical forms and doctrines of the law courts, was able to introduce a preventive mode of relief, and from the very outset the injunction became the most potent instrument in building up its peculiar jurisprudence. The first important and constant use to which it was put was the restraining the prosecution of suits in courts of law. As the doctrines of equity are often quite different from those which prevail at law, and since from the same facts and circumstances involved in a given controversy it frequently happens that the law would regard one party as possessing the legal right, while equity would look upon the other as the one entitled to relief, it necessarily follows that the courts of law would decide such controversy when brought before them in favor of one litigant, and the court of equity would render its decree in favor of his antagonist. The prohibition was not, however,

directed against the courts of law nor the judges thereof personally, but against the suitors before those courts. The theory of the court was that it was unjust and inequitable for the suitor in the particular case to make use of his strict legal remedies. By the use of the injunction the chancellor, when a proceeding was instituted before him to establish an equitable right, forbade the opposing party from beginning or carrying on any action in a court of law based upon the same facts and circumstances, and thus a conflict of jurisdiction in all cases was prevented. In this manner and for this purpose an injunction to stay the prosecution of suits at law became, from the very commencement of his judicial functions, an ordinary remedial instrument in the hands of the chancellor, and by its means alone was he finally enabled to establish his jurisdiction and to create the system of equity jurisprudence as a co-ordinate branch of law.

When to be Used.—The question as to the power to interfere by injunction being decided favorably, the court of chancery at length established the following general principle, which determined the occasions on which it would resort to such preventive remedy. In all cases where the courts of law can furnish an adequate relief for the wrong done or about to be done, equity will not interpose its restraining power, but will leave the injured party to his legal action. By the term adequate relief is meant the recovery of a judgment at law which is considered a sufficient satisfaction for the wrong done or contemplated. The most important occasions to which this principle does not apply, and in which, therefore, an injunction will be granted in order to prevent a threatened wrong or to restrain the further commission of an inequitable act, are the following: (1) To restrain proceedings at law. This general class embraces many particular instances. Among the grounds for such interference the most important are when the legal right and the proceedings to enforce it are affected by fraud, mistake, or accident; when they require a long accounting; when the litigation is vexatious; when the controversy involves the rights and duties of trustees, partners, executors, administrators, sureties, mortgagors, and mortgagees, or requires the marshaling of assets, or depends upon the effects of an equitable set-off or assignment. In these, and in certain other similar instances, the litigant parties and their attorneys and agents will be restrained from carrying on proceedings not only in courts having full common-law powers, but also in tribunals of an inferior or special jurisdiction. In addition to this use of the injunction, it is also resorted to in certain well-defined classes of cases to prevent the commission of acts which would be so permanently injurious to property that no adequate relief could be given by the common-law remedy of damages. It is true that in all the instances about to be mentioned some pecuniary compensation could be obtained, but from the very continuous and lasting nature of the wrongful act done, repeated and perhaps innumerable suits at law would be necessary, unless it could be stopped at once by some preventive relief. The classes of cases thus described, in which a wrong will be prevented because the law can give no sufficient remedy, are as follows: (2) to restrain the commission of waste, which is necessarily a permanent injury to the land wasted; (3) to restrain continuous or repeated trespasses upon land. Although an injunction will not be granted to prevent violence to the person nor to chattels, nor single acts of injury to lands, yet if the trespass to land is continuous, so that it becomes analogous in its effects to waste, courts of equity will now interfere, by a liberal use of the injunction, both to prevent the further wrong and to compel a restoration of the premises to their original condition; (4) to restrain the creation and maintenance of nuisances; (5) to prevent the infringement of patents and copyrights, and the unlawful use or piracy of trade-marks; (6) to restrain the breach of covenants or agreements in a few special instances. In general, the breach of an agreement will not be enjoined, but in a few cases, where the injury would be of such a character that damages would be no adequate relief, courts of equity will interfere by injunction. In some cases an injunction is used as a means of enforcing an agreement. Thus where a party has agreed that he will not do a particular thing, an injunction will cause him to fulfill his contract; (7) to restrain a disposition of their property by debtors so as to hinder, delay, or defraud their creditors; (8) to restrain assignments and transfers of property which would interfere with the settlement of bankrupts' estates. These are the most important and usual cases in which the power of equity tribunals to issue an injunction is now firmly established. There are some other special and exceptional instances which it is not necessary to enumerate.

In respect to their effects, injunctions are either prohibitory or mandatory. In the former class the order of the court is negative, and commands the party not to do the specified act; in the latter it is affirmative, and commands the party to do the specified act. The object of a mandatory injunction is generally to compel the defendant to remove some structure which he has wrongfully erected, and which is a nuisance or a trespass, and to restore the premises to their original condition.

In respect to their form and the manner of granting them, injunctions are either final and perpetual or interlocutory and temporary. Final injunctions are granted after the hearing and decision of the cause, and form a part of the decree which determines the rights of the parties. Interlocutory or temporary injunctions are orders made at the commencement of the action or during its pendency, on the application of the plaintiff. Their object is to prevent the defendant from so interfering with or disposing of the subject-matter in controversy as to render a final decree against him ineffectual.

The reformed system of procedure which has been adopted in many of the U. S. and in Great Britain has to a great extent obviated one most important use of the injunction as above described. According to that procedure, equitable defenses can be set up and maintained in legal actions; the whole matter in dispute, the legal and equitable rights and claims of the parties, can be presented and adjudicated upon in one controversy, and the holder of the equitable right is no longer forced to institute a separate suit in chancery and to enjoin the adverse action brought against him in a court of law. With this single exception the preventive remedy of injunction is freely used by the courts, although in most of the States the same tribunals are clothed with both equitable and common-law powers and jurisdiction. Revised by F. M. Burdick.

Ink [M. Eng. *inke*, from O. Fr. *enque* > Fr. *encre*, ink < Late Lat. *encaus'tum* = Late Gr. ἔγκαυστον, purple ink, ink, liter., burnt stuff, neut. of ἔγκαυστος, burnt in; ἐν, in + καίειν, burn]: any colored fluid used in writing or printing. The essential difference in composition between writing-inks and printing-inks leads to a natural division of the subject.

I. Writing-inks. *Historical.*—Very little is definitely known of the composition of the inks used by the ancients, but it is generally conceded that the use of the stylus indicates the use also of carbon inks, like the China or India ink which is still used almost universally among the Chinese and other Asiatic peoples. The use of iron salts is certainly very ancient. Dr. Blagden (*Phil. Trans.*, vol. lxxvii.) found that the faded characters of very ancient MSS. could be restored by the use of prussiate of potash and dilute muriatic or sulphuric acid, or less perfectly by infusion of galls, redeveloping the iron black. Pliny, Dioscorides, and other ancient writers give evidence, however, that carbon in the form of soot was the essential constituent of ancient ink.

Black Inks.—The black ink in common use formerly was a solution of gum, sugar, or mucilage, holding in suspension a finely divided precipitate formed by exposing to the air green vitriol dissolved in an infusion of gallnuts. This ink was far from being chemically perfect, and was open to the objections that it corroded steel pens, was prone to mould in warm weather, and to deposit a sediment on standing. The writing was also liable to grow yellow or brown with age, owing to the decomposition of the black gallo-tannate, leaving the yellow-brown oxide of iron on the paper, and, when not carefully prepared, to destroy the paper on which it was used. But these difficulties have been in great part corrected by skillful manufacture. The fact that well-made iron inks stain the substance of the paper with a stain difficult of removal, and speedily growing darker with age up to a certain time, has rendered their use very general in spite of their acknowledged defects. The carbon writing-inks are liable to the objection that they are not true solutions, and usually are wanting in fluidity. The logwood chrome inks are true solutions, but open to some objections. True solutions with an iron base are pale when first written with, but rapidly grow darker to a fine black. One of the coal-tar dyes, nigrosine, is also used in making black ink, and enjoys some advantages over other inks.

Nutgall Iron Inks.—The modern inks of this class, although made from gall-solution and copperas, like the inks

described above, differ radically from them in several particulars. While the original iron inks depended for their color on the finely divided precipitate of tannate of iron held in suspension by gum, the color being a pale brown turning black on the paper, the commercial inks of to-day are true solutions, the formation of a precipitate being prevented by the free sulphuric acid present in a slight excess, while the color is a deep blue, due to the addition of indigo-carmine, and a small quantity of aniline blue, the deep black of the writing not appearing until some time after the ink has been put on paper, when the free mineral acid has become absorbed, and the black tannite and gallate of iron are formed in the fiber of the paper. Inks of this kind—true fluids with the addition of blue coloring-matter—were first made by Stephens, of London, in 1856. He used indigo alone, aniline blue not being known, and not added until some years later. They were known as "alizarin" inks, a name having nothing to do with the composition.

The principal raw materials in the manufacture of this ink are Aleppo nutgalls and green vitriol or copperas. The former contain from 60 to 75 per cent. of tannic acid, and a small amount, 3 to 5 per cent., of gallic acid. The galls are crushed, extracted with hot—*not* boiling—water in vats constructed for the purpose, with cloth filters to separate the clear solution from the gummy and woody residue, the galls being allowed to steep for one or more weeks, until the solution has the proper density or degree of concentration, determined by a hydrometer, when it is mixed in a large vat with a solution of copperas, to which some free sulphuric acid, the indigo and aniline blues, a solution of gum arabic, and an antiseptic—usually carbolic or salicylic acid—are added. The gum is added to enable the writer to make fine strokes with his pen, by preventing the otherwise too limpid ink from spreading on the paper. The acid prevents the formation of the solid particles of iron tannate, increases the fluidity of the ink, and prevents oxidation and precipitation in the bottle. The antiseptic prevents the ink from moulding.

Numerous formulas for making ink are given in books of reference, but most of them are of little value, as the amount of tannin contained in galls varies, while that extracted by different experimenters varies still more. The proper proportions must be determined by experimenting with the materials at command, and this is done by the different ink-manufacturers, who have their own formulas, which they regard as trade-secrets.

For making ink on the small scale it is more convenient to buy the tannic and gallic acids sold by wholesale druggists than to extract them from the nutgalls. The following are good proportions to use:

For a tannate-of-iron ink: 100 parts of tannin to 80 parts of copperas.

For a gallate-of-iron ink: 100 parts of gallic acid to 150 parts of copperas.

The latter formula gives a finer ink than the former, although it turns black less rapidly, for which reason a mixture of the two is desirable.

The *chrome-logwood ink*, invented by Runge in 1848, is prepared by adding 1 part of potassium-chromate to 1,000 parts of a saturated solution of logwood, made by boiling 22 lb. of logwood in a sufficient quantity of water to give 14 gal. of decoction; to this menstruum, when cold, the chromate is gradually added, and the mixture well stirred. The addition of gum is injurious. If care is taken not to permit the proportion of chrome salt to exceed 1 part for 1,000 parts of decoction of logwood, a deep blue-black writing-fluid is formed, which forms no deposit, like the original gallo-tannate-of-iron ink. Paper written upon with it may be washed with a sponge, or be left for hours under water without the marks being erased. It does not corrode steel pens, and is not liable to turn mouldy; but, on the other hand, it is prone to gelatinize.

To avoid this last objection, and obtain an ink which shall have the rich deep color of the chrome compound formed with the hæmatoxylin of the logwood, and yet a greater fluidity than can be obtained with Runge's ink, manufacturers now substitute a basic chloride or acetate of chromium for the potassium-chromate, boil the clear and filtered decoction of logwood with these chromium salts, and obtain a very fluid deep-purple ink, which turns darker on paper, and possesses the advantage over iron-gall inks that it will not fade.

Vanadium Black Ink.—Berzelius advised the use of vanadate of ammonia with infusion of gallnuts. A surprisingly small quantity of the vanadium salt suffices to produce a perfectly black ink. The writing obtained with this ink is perfectly black. No sediment forms from it. It flows readily from the pen, and does not corrode steel; is not attacked by dilute alkalies, but is turned red by acids. The objections to this ink are the high price of vanadium salts, and the fact that the writing soon turns brown, then yellow, and finally becomes almost illegible.

Stylographic Ink.—This name was given to an ink made by dissolving in water a coal-tar color, known commercially as nigrosine, and first made in 1867. It was found peculiarly adapted to use in stylographic pens, owing to its fluidity, its forming no sediment, and its deep blue-black color. Owing to these advantages it was also put on the market under other names. It will not fade, but, on the other hand, it grows no blacker on paper, and does not attain the luster of the iron and logwood inks. Moreover, it does not, like these inks, become so oxidized on paper as to be insoluble in water, but it blurs and smirches with water after years. It is not only not discolored or bleached by strong solutions of sulphuric and hydrochloric acids, but is, as it were, mordanted into the paper by the action of these acids, and rendered insoluble in water and practically indelible.

Carbon ink is made by boiling shell-lac, or common resin, in carbonate of soda, potassa, or ammonia solution, in about equal proportions, until all the resin is dissolved. This solution is then mixed with finely levigated lampblack until it has the proper consistency. This alkaline liquid may also be mixed with other colors to form an indelible ink. On standing, all carbon inks are weakened by a partial or total precipitation of the pigment, and hence must always be shaken before using.

Copying-inks differ from the ordinary fluid writing-inks only in being more concentrated. The addition of a large amount of gum, sugar, or other viscous substance to a writing-ink will not, of itself, make it copy. The object of adding gum to a copying-ink is to prevent it from soaking in the paper, and to keep it on the surface until it is brought in contact with the moist tissue-paper in the copying-press. The best logwood copying-inks are known as French copying-inks, and are made of a strong decoction of logwood extract with alum—sulphate of alumina and potash—or with chloride of aluminum, the logwood extract being largely in excess of the proportions used in a logwood writing-ink, for the reason that it is frequently necessary to take fifteen or twenty copies at once, and by using yellow copying tissue-paper, the color being due to chromate of potash, in a solution of which the sheets have been soaked, the logwood solution, in penetrating through the sheets, forms a black compound—becomes mordanted, as in calico-printing—with the chrome salt in the tissue-paper.

Carbon and other so-called Indelible Writing and Marking Inks.—The resistance offered by carbon to the action of chemical agents is well known, and hence it is the basis of the most permanent and unchangeable inks, chiefly printing-inks, as carbon can not be brought into solution. All inks on this basis must be, like China or India ink, sediments held in suspension by some vehicle, and consequently less fluid than is desirable for easy and constant use with a pen of modern construction. Hence we find Oriental nations writing chiefly with a pencil of camel's hair, and the ancient nations with a stylus of split reed. The elaborate engrossing on parchment in both ancient and modern times, in inks of all colors and in gold and silver sizing, is performed with like implements and the use of colors held in vehicles of various kinds, and always of a certain consistency unsuited to use in an ordinary pen.

Indian Ink or China Ink.—This well-known pigment is prepared from finely divided carbon, chiefly lampblack or the soot of the oil of sesame, formed into cakes by the use of some glutinous vehicle or adhesive substance, such as gum-water or glue, and strongly compressed in wooden molds, on the interior of which are engraved the characters seen upon the cakes. The surface of the cakes is finally coated with a kind of animal wax, which gives a polish and prevents the ink from staining the hands. The peculiar odor of India ink is produced by adding a mixture of Borneo camphor and musk during preparation. Only the finer qualities, however, receive this addition.

Native Vegetable Inks.—The juice of *Coriaria thymifolia*, or ink-plant of New Granada, locally called *chauchi*, is at first of a somewhat reddish color, but becomes intensely black in a few hours. This juice can be used for writing without any further preparation. It corrodes steel pens less

than ordinary ink, and resists chemical agents better. All the old documents under the Spanish dominion in America were written with chauchi. Sea-water does not affect it.

Colored Writing-inks.—Inks may be made of almost any desired color, and the variety and richness of colored inks have been greatly increased by the introduction of coal-tar or aniline dyes, many of which may be used with great advantage, and have already a wide circulation under various trade-names. *Red ink* was formerly made of either cochineal or Brazil-wood. The cochineal inks have a rich, deep color, but are expensive, and are objectionable on account of the excess of caustic ammonia necessary to dissolve the solid cochineal carmine, or carmine-lake, and to keep it in solution. The Brazil-wood and tin-salt red inks were driven from the market some years ago by the more brilliant and less expensive solutions of coal-tar colors, known commercially as crimson, scarlet, and red inks. While fuchsin or magenta may be used for this purpose, the color known as eosin is now almost exclusively employed. It was discovered by Caro in 1874, and three or four years later was used in the manufacture of ink with great success. It is readily soluble in water, to which some antiseptic should be added to prevent the formation of a peculiar fungus growth which causes a loss of color. Eosin inks copy readily, but are not fast, and writing exposed to strong light soon fades.

Blue Inks.—A good blue ink may be made as follows: Prussian blue is digested in hydrochloric acid, washed completely neutral with water, gently dried, carefully mixed with oxalic acid in fine powder, and distilled water added until a solution of the desired strength of color is obtained. This blue ink resists the action of chlorine and strong acids, but it yields to oxalic acid and alkalies. Indigo carmine dissolved in water is also sold as a blue ink. The aniline blue inks are not quite equal in color to the well-made Berlin blue inks, but owing to the ease with which they are made, by merely dissolving any one of the water soluble dyes in water, they are now in general use. *Violet aniline ink* is made by dissolving 1 part of methyl violet in 200 parts of boiling water. The solution is of a vivid and beautiful violet color, never forms a precipitate, flows smoothly, and dries quickly, and gives three or four excellent copies. The writing, however, fades in direct sunlight. This was the first coal-tar color used in making ink. It was discovered by Hofmann in 1863. *Green aniline ink* is made by dissolving 1 part of iodine green in 100 parts of boiling water. The solution has a beautiful brilliant color, gives several good copies, and is much faster than the other aniline inks, the writing being but little affected by direct sunlight. *Yellow* and *orange* aniline inks may be made of any of the water soluble coal-tar colors by dissolving in sufficient boiling water to give the depth of color desired.

Hectograph ink, used in printing from a gelatin pad, generally called a hectograph, is made by mixing 1 part of iodine green or methyl violet, used in making colored writing-inks as described above, with 1 part glycerin, and dissolving the paste thus formed in 10 parts of distilled water.

Sympathetic inks are those fluids which, when used to write upon paper, are invisible until brought out by heat or the influence of some chemical agent. Acetate-of-lead solution leaves no trace of the marks made by the pen until exposed to sulphuretted hydrogen, when it suddenly develops an intense brown-black indelible color. A weak infusion of galls leaves no sign of the writing until developed by a solution of iron. Even milk (mentioned by Ovid) will develop visible characters by gently heating the paper, or even dusting it over with some dark powder. The same is true of sugar-water. Water made acid with dilute sulphuric acid, written with a quill or gold pen, is quite invisible till by a slight warming the evaporation of the water leaves the acid in a form sufficiently concentrated to char the paper in black characters. Dilute yellow prussiate of potash develops blue with a ferric salt. The metal cobalt is remarkable for the fine blue-green tint it develops on paper written with a solution of its chloride, while the acetate of cobalt develops pink when held to the fire.

Indelible Marking-inks for Cloth.—A number of formulas are recommended for this purpose, but the old-fashioned nitrate-of-silver ink is still generally used. It turns a deep black on the fabric when exposed to the direct rays of the sun, and modifications on the market consist of ammonio-nitrate, tartrate and ammonio-tartrate of silver.

Removing Ink-stains.—The reagent to be employed depends altogether on the nature of the ink. Muriatic acid, for instance, will remove logwood ink-stains, first turning the spot red, while it will convert a stain of an eosin ink into a brick-red insoluble stain and a nigrosine ink into an absolutely indelible blue-black dye. Oxalic and mineral acids will remove the black stain of an old-style iron-gall ink, but only turn a modern ink blue, decomposing the black tannate of iron, but having no effect on the indigo and aniline blues in the ink. The best method of procedure is to first attack the stain with water. If this shows the ink to be nigrosine, an alkali should be used. If an iron or logwood ink, an acid may be tried. If the acid does not do the work, an alkali should be used. One of the surest ways of removing ink-stains or writing is to cover the spots with bleaching-powder, then moisten this with a weak mineral acid, which sets the chlorine free. Silver stains may be removed with cyanide of potassium, which should be used with great care, owing to its very poisonous nature. Acids and strong alkalies can not be used on colored fabrics. For this purpose pyro-phosphate of soda has been recommended. In all cases the fabric should be thoroughly washed with clean water as soon as the chemical treatment is concluded.

All inks become thick on standing in an open receptacle, owing to the evaporation of the water and the resulting concentration of the solution left. Where much gum is used in an ink, as in the case of a blue-black copying ink, the contents of the ink-stand become ropy, and a sediment is formed. This can be partly avoided by keeping the ink-wells covered. When the ink has become thick, however, it may be diluted with distilled water.

II. Printing-ink.—Printer's ink is a carbon ink in an oily and resinous vehicle. The carbon is lampblack, sometimes ivory-black, mixed with a little indigo or Prussian blue. The oil is generally boiled and burnt linseed oil, or in some European countries nut oil. In addition to these chief ingredients, rosin and turpentine are used, more rarely balsam copaiba, and lastly soap (common yellow rosin soap) is a very essential ingredient. The preparation of these ingredients requires care, and every manufacturer has his own methods and technical secrets in the manufacture of his ink, which printers in these days seldom or never make for themselves. The conditions required of a good ink are chiefly—(1) that it distribute itself easily and well over the rollers and type; (2) it must give a sharp and clean impression, without adhering to the type tenaciously or blurring the paper with excess of oil; (3) it must dry rapidly on the paper, but remain soft upon the type and rollers; this is especially important for the rapid-moving printing-machines of modern times and the exigencies of great newspapers, printing 50,000 to 100,000 impressions in two or three hours; (4) it must be black and not brown in color; and, lastly, it must be proof against all the ravages of time and the power of chemical agents. It is not, however, to be understood that even the best printer's ink is incapable of being removed by means of chemical skill. The linseed oil is clarified from the fatty matters, and the pure oil is boiled with great care at a carefully regulated temperature; and during the boiling the best pale yellow soap is added to give it consistency, and the required dryers are also now mixed to it. The best black is that obtained from the smoke of naphtha, the combustion being carefully regulated. This black is ground up carefully with the drying oil, which has assumed the character of a varnish, and the ink is complete.

Colored printing-inks are made by using in place of carbon any desired color to mix with the varnish. Ink of any tint of color may thus be obtained, and by the use of the bronze powders, made now of almost all colors, every metallic effect required by ornamental printing may be readily produced. In the use of bronzes a nearly colorless size is used in place of ink, and the bronze powder is dusted on while the size is yet fresh. H. B. Hodges.

Inkberry: the popular name of an elegant shrub, *Ilex glabra*, of the holly family, generally from 2 to 4 feet high, with slender and flexible stems, brilliant, evergreen leaves, leathery and shining on the surface and of a lanceolate form, and small black berries. It is found on the Atlantic coast of North America, and is much cultivated by florists.

Inkerman: a small Tartar village in the Crimea, near the eastern extremity of the harbor of Sebastopol (see map of Russia, ref. 11–D). It is built on the ruins of an ancient city, supposed to be the *Ctenos* mentioned by Strabo, at the foot of a perpendicular hill, which rises several hundred feet above the valley of the river Tchernaya, and is covered with remains of walls and towers, while in the sides are numerous caves hewn in the solid rock, with traces of al-

tars, chapels, and paintings. The heights of Inkerman opposite to this hill, across the valley of the Tchernaya, are memorable as the scene of one of the most desperate battles of modern times (Nov. 5, 1854), in which 14,000 allied British and French troops (chiefly the former) held their ground for many hours against 60,000 Russians, ultimately driving them from the field with great loss. The action began early in the morning by the Russians attempting to carry the allied positions by assault. The fifth volume of Kinglake's graphic *History of the Crimean War* (1875) is entirely occupied with the battle of Inkerman, which is commonly known as "The Soldiers' Battle."

Inlaying: the ornamentation of surfaces of wood, metal, shell, stone, etc., by the insertion of pieces of a different color, generally made level with the general surface, but sometimes in slight relief. Marqueterie, damaskeening, mosaic-work, etc., are forms of this art. Russia, Italy, and India are the most important seats of the inlayer's art. A kind of minute and elaborate work inlaid in geometrical patterns on wood, and called Bombay work, comes from India. Revised by RUSSELL STURGIS.

Inman, HENRY: painter; b. in Utica, N. Y., Oct. 28, 1801. He studied with John Wesley Jarvis; went to Boston as a portrait-painter in 1822; in 1832 removed to Philadelphia; returned to New York, but, being disabled by ill-health, was induced to visit England with commissions to paint for friends in the U. S. portraits of Chalmers, Macaulay, and Wordsworth. In 1845, resisting strong professional and social temptations to remain in England, where his success as an artist had been considerable, he returned to New York city, where he died Jan. 17, 1846. His best works are portraits. Among his sitters were Bishops McIlvaine and White, Dr. Hawks, William Wirt, Nicholas Biddle, Horace Binney, Audubon, Chief Justice Nelson, De Witt Clinton, Martin Van Buren, and William H. Seward. The subjects of his other pieces were various—*Birnam Wood*, *Rydal Water*, *Lake of the Dismal Swamp*, *Trout-fishing*, *The Newsboy*, *Rip Van Winkle Awaking*, and *Scene from the Bride of Lammermoor*. Revised by RUSSELL STURGIS.

Inn (in Lat. *Œnus*): a river of Southern Germany, the largest Alpine tributary of the Danube. It rises in the Swiss canton of Grisons from the Lake of Longhino, nearly 7,000 feet above the sea; flows N. E. through that canton, forming the valley of the Engadine; enters the Tyrol at Finstermunz; flows with great violence through Northern Tyrol by Innspruck; flows through Bavaria for about 90 miles to Braunau, whence it continues nearly N., forming the boundary between Upper Austria and Bavaria, and enters the Danube at Passau, after a course of 315 miles. It receives the river Salzach from the S.; is navigable as far as Innspruck for small vessels, and to Hall, 8 miles below, for steamboats. The upper Inn is called Engadine in the Romansch language, which is spoken by a small remnant of an ancient nation near the head of this river. The Inn is broader than the Danube at their junction.

Innate Ideas: See INTUITIONALISM.

Inneberg: See EISENERZ.

Innervation [pref. *in-* + *nerve*]: the process of discharge of nervous energy from the brain into the nerve-tracts. In psychology the phrase "feelings of innervation" designates the hypothetical sensations which arise in consciousness from the central centrifugal discharge; hypothetical because it is an undecided point in the theory of the action of the WILL (*q. v.*) in voluntary movement, whether we have any such sensations or not.

REFERENCES.—(In favor of "feelings of innervation") Bain, *Emotions and Will*; Wundt, *Physiologische Psychologie*, 1st and 2d ed.; Waller, *Sense of Effort* in *Brain* (1891); Beaunis, *Les Sensations Internes*; Baldwin, *American Journal of Psychology*, vol. v., p. 272 ff., and *Mental Development in the Child and the Race* (New York and London, 1892); (against) James, *Principles of Psychology*, ch. xxvi.; Münsterberg, *Die Willenshandlung*; Delabarre, *Die Bewegungsvorstellungen*; Bastion (and others: a symposium), *Brain* (1887). J. MARK BALDWIN.

Innes, THOMAS, M. A.: historian; b. at Drumgask, Aberdeenshire, in 1662, of a noble Scottish family; was educated in the College of Navarre in Paris; became a Roman Catholic priest 1692, and after three years of mission work at Inveraven, Banffshire, 1698–1701, he returned to Paris and succeeded his brother Louis as principal of the Scotch college at Paris. He was the author of a highly esteemed ethnological work, *A Critical Essay on the Ancient Inhabitants of the Northern Parts of Britain* (1729), and divides with his brother Louis the reputed authorship of the *Memoirs of James II.*, published in 1816 by Dr. Clarke. He wrote also one volume of a *Civil and Ecclesiastical History of Scotland*. D. in Paris, Jan. 28, 1744.

Inness, GEORGE: landscape-painter; b. at Newburg, N. Y., May 1, 1825. He was for a short time a pupil of Regis Gignoux, and studied in France and Italy without a master. He became a National Academician in 1868, and received a third-class medal at the Paris Exposition of 1889. He was one of the ablest and most original of American landscape-painters, and his works are very highly valued by collectors. D. at Bridge of Allan, Scotland, Aug. 3, 1894. W. A. C.

Innkeeper: in law, one who holds out his house as a place of entertainment for all who choose to visit it as transient guests. Inn, hotel, and tavern are generally treated by the courts as synonymous, unless a statute gives to one of them a peculiar signification. Their legal history is sketched by Judge Daly in *Cromwell* vs. *Stephens*, 2 Daly 15. On the one hand, the innkeeper is to be distinguished from the boarding-house keeper, who reserves the right to receive or to reject any applicant, and on the other hand, from one who supplies his patrons with food and drink, but not with lodgings. It is to be borne in mind, however, that the same individual may be an innkeeper toward certain persons, a boarding-house keeper toward others, and a *restaurateur* toward a third class. In which capacity he acts in a given case is generally a question of fact. If he is an innkeeper, any one entertained in his establishment is presumably a guest, and the burden is on him to show that a different relation existed. (*Fay* vs. *Pacific Imp. Co.*, 93 Cal. 253.) A private house is not turned into an inn by being thrown open to public patronage on special occasions, except during such occasions; but it is not necessary that the establishment be kept open during the entire year, nor does it matter that it is at a distance from the highway, and that the grounds are inclosed and the gates locked at night.

Sleeping-car proprietors, who also provide meals for their patrons, are not generally regarded by the courts as innkeepers, although they have been treated as such in Nebraska. (*Pullman Car Co.* vs. *Lane*, 28 Neb. 239; 40 *Am. and Eng. Ry. Cases*, 637 and note.) Nor are steamship proprietors, although they supply their passengers with lodging and food.

Guests.—The early English cases required that one should be a traveler or wayfarer in order to become the guest of an innkeeper; but it is now generally conceded that a resident of the town where the inn is situated is entitled to a guest's privileges. Whether a particular person is a guest is not usually a perplexing question, but in some cases the courts have found great difficulty in resolving it. He is to be distinguished from the caller, from the visitor of a guest, and from the boarder. Where a person entered an inn shortly after midnight, deposited his property with the innkeeper, asked for a room, but declined to have one assigned to him then, stated that he would return in a short time and left the hotel, though he came back about five A. M. he was held to be a caller and not a guest. (*Arcade Hotel Co.* vs. *Wiatt*, 44 Ohio 32.) In another case it appeared that the plaintiff, upon the invitation of his uncle, who was a guest, dined at defendant's hotel. It was decided that plaintiff was not a guest. Had the uncle not been a guest, and both had entered the hotel for the usual entertainment, it would not have mattered that the uncle was to pay the entire bill. More difficulty has been experienced in deciding whether a particular person is a guest or a boarder. In *Hancock* vs. *Rand*, 94 N. Y. 1, it was ruled by a divided court that a person belonging to the U. S. army, who with his family lived at a hotel under a special contract to pay an agreed price per week so long as everything was satisfactory and until he was called elsewhere on military duty, was to be deemed a traveler, and although not strictly a transient visitor, was a guest and not a boarder. The case has been freely criticised, and probably will not be followed in other jurisdictions. Undoubtedly the existence of a special contract as to entertainment is not decisive of the relationship between the parties; but generally if one boards and sojourns at an inn pursuant to a special contract he is a boarder and not a guest.

Liabilities of Innkeepers.—The early Roman law did not subject the innkeeper to exceptional responsibility. Later, the prætor provided that a shipowner, innkeeper, and stable-

keeper who took property belonging to a traveler should be answerable for its loss or injury, except this was caused by the traveler's negligence or by unavoidable accident. By the common law the innkeeper was subjected to peculiar liabilities. Because he held himself out as the keeper of a public house a duty was laid upon him "by the law and custom of England," in the language of the ancient writs against innkeepers, to receive and entertain all fit persons whom he could accommodate, and who were ready and able to make him reasonable compensation—that is, the customary compensation at that house. He was not bound to receive everybody who applied for entertainment, but might turn away one having a contagious disease, or who came from an infected district, or who misconducted himself, or whose presence tended to injure his business. (*State* vs. *Steele*, 106 N. C. 766.) In the U. S. many statutes have been passed for the punishment of innkeepers who deny the accommodations of their houses to persons because of their race, creed, or color. *Ferguson* vs. *Gies*, 82 Mich. 358.

As soon as the relation of guest and innkeeper is instituted the latter becomes responsible for all goods which are committed to his custody by the former, unless they are lost or injured by the fault of the guest, by the public enemy, or by the act of God. The goods are within the custody of the innkeeper as soon as they are received by him or his authorized servants, or have been placed on his premises where it is usual for him to receive like goods. This unusual liability at common law, amounting nearly to that of an insurer, had its origin at a time when innkeepers were often in league with robbers. It has been continued in most jurisdictions, partly because of the conservatism of judges and partly because they believe that considerations of public policy still demand it. (*Hulett* vs. *Swift*, 33 N. Y. 571.) However, some of the courts in the U. S. have modified it, deeming the interests of the public sufficiently subserved by holding the innkeeper *prima facie* liable for the loss or injury of the guest's goods, but permitting him to exonerate himself by proving it happened without any fault whatever on his part, and that he exercised the strictest care and diligence. *Cutler* vs. *Bonney*, 30 Mich. 259; 18 *Am. R.* 127.

The common-law liability has been modified by statute in Great Britain and in most of the U. S. By a provision common to many of these legislative acts, the innkeeper may free himself from responsibility for money and valuables of his guest which are not delivered to him for safekeeping by providing a safe place for such articles and posting certain notices. (1 *Stimson's American Statutes*, pp. 523–524.) As a rule, these statutes have been strictly construed against the innkeeper. His omission from the printed notice of a single material word was held fatal in an English decision. (*Spice* vs. *Bacon*, 2 *Ex. D.* 463.) It has also been held that the statute did not apply to a guest who, about ready to leave the hotel, had packed his valuables in his trunk, locked his room, and given the key to the clerk.

The common-law liability may be modified by express agreement of the parties, provided the courts do not declare such contract unreasonable or against public policy. An agreement that hats, overcoats, and umbrellas of guests while taking meals shall be put in a certain place, or that money or valuables shall be deposited in a safe provided by the hotel-keeper, is reasonable and binding on the guest. Moreover, the innkeeper may refuse to receive a guest who will not assent to such terms. The entry of the guest's name, however, on the hotel register, under a printed heading containing hotel regulations, will not bind him, unless it be shown that he knew their provisions. A local usage which is reasonable, and known to the guest and innkeeper, may modify the latter's liability.

The innkeeper's responsibility for injuries to the person of the guest is not as extreme as that for injuries to his property. As a rule, he can be made to respond for personal injuries only upon proof that they have been caused by a breach of duty toward his guests. *Rommel* vs. *Schambucher*, 27 *Am. L. Reg., N. S.* 156 and note.

We have seen that the innkeeper is not liable to the guest when the goods are injured by the latter's fault, or by the public enemy, or by the act of God. Where a guest was so drunk that he did not hear the thief who entered his room, the innkeeper was not exonerated, because it was his duty to keep out thieves, without regard to the state of the guest's hearing; but where a guest left an unlocked hand-bag containing a large amount of jewelry with the servant in charge of a coat-room, his negligence barred recovery. "The public enemy" does not include rioters or insurgents, but is confined to those at open war with the government. "The act of God" is a narrower term than inevitable accident. It is confined to natural forces which are set in motion without human agency. An accidental fire is not an act of God unless it is kindled by a natural force, as lightning, and, in the absence of a statute modifying the common law, an innkeeper is responsible for all damages by fire to the guest's goods in his custody, although entirely the fire is not imputable to his fault.

Rights of Innkeeper.—Some of these have already appeared. An important right is that of lien. This extends, for the entire bill of the guest, to every part of the goods brought by him to the inn, except the articles on his person, even though he is an infant, or the bailee, or the wrongful possessor of such property, provided, in the two last-mentioned cases, the innkeeper does not know when he receives the goods that the guest is wrongfully subjecting them to the lien. This lien may be lost by the innkeeper knowingly and willingly or carelessly letting the property go from his possession. At common law it was a possessory lien. (See LIEN.) The innkeeper could not subject the property to a sale for the purpose of satisfying his claim except by a bill in chancery. This has been changed in Great Britain and in the U. S., where statutes frequently give the right to sell the property without suit. See Wharton *On Innkeepers* (London, 1876); Wandell, *Law of Inns, Hotels, and Boarding-houses* (Rochester, 1888). FRANCIS M. BURDICK.

Innocent I.: saint; b. at Albano, Italy; was elected Bishop of Rome (pope) Apr. 27, 402; interceded without success with Arcadius, Emperor of the East, in behalf of the patriarch Chrysostom, who was deposed from his see and banished; prevailed on Honorius, Emperor of the West, to persecute the fanatic Donatists, who were excommunicated by the Council of Carthage (405); made exertions to save Rome from Alaric and his Visigoths, who nevertheless sacked that city Aug. 24, 410; condemned the doctrines of the Pelagians and the Novatians; first practiced the system of sending legates to represent the papal see in remote districts; was vigorous in maintaining the right of his see to exercise appellant jurisdiction over other bishoprics, and enforced the celibacy of the clergy. D. Mar. 12, 417. His feast is celebrated.—INNOCENT II. (*Gregorio Papareschi*), b. in Rome about 1090; was a monk and afterward abbot of the convent of St. Nicholas; was legate to France 1124; was chosen pope Feb. 14, 1130, on the death of Honorius II., by seventeen cardinals, but Peter de Leon was put forward as pope by a minority of the electoral body under the title of Anacletus II. Innocent was driven from Rome; went to Cluny in France, and was recognized by the monarchs of France, Germany, and England; was supported by St. Bernard and by the Council of Reims; was forcibly restored to power at Rome by Lothaire, whom he crowned emperor in the Church of St. John Lateran 1133; was again driven from Rome the same year; held a council at Pisa and excommunicated his rival; was again restored by Lothaire 1137, and was finally recognized by the rebellious cardinals after the death of Anacletus in 1138. Innocent convoked in 1139 the second Council of Lateran, attended by 1,000 bishops; condemned the opinions of Arnold of Brescia and of Abelard (1140); pronounced an interdict upon the kingdom of France, and had his temporal authority overthrown by an insurrection of the Romans, who restored the senate and the tribunes of ancient Rome. D. Sept. 24, 1143.—INNOCENT III. (*Lotario Conti*), b. in 1161 at Anagni; studied at Rome, Paris, and Bologna; became a cardinal-deacon in 1189; succeeded Celestine III. as pope in 1198; enlarged the papal temporalities; twice dictated the election of the German emperor; greatly diminished German authority in Italy; excommunicated Philip Augustus of France, and placed the kingdom under an interdict in 1200; afterward visited the same fate upon Spain and Portugal, on account of the illegal marriages of the Kings of France and Leon; in both instances the pope was victorious; compelled King John of England, by the same means, to give up the right of investiture, while the latter made his possessions the tributary fief of Rome; sustained the suzerainty of the papal see over Sicily, and received the homage of Aragon, Hungary, Poland, Norway, and Dalmatia, who submitted to his arbitration their temporal dissensions; proclaimed in 1208 the crusade against the Albigenses; approved the Franciscan and Dominican orders; annulled Magna Charta 1215, though his legate recognized it in the following year, and excommunicated the English barons; sent out the crusade

which founded the Latin empire at Constantinople; convened the fourth Lateran council 1215; and died at Perugia July 17, 1216. Innocent was by far the most powerful of the popes in temporal matters, his power being as much the result of favoring conditions as of his own great ability and ambition. (For the Roman Catholic view of Innocent III., see Hurter, in German, Hamburg, 1841–43, 4 vols.)—Innocent III., Antipope, called *Landus*, was a Frangipani, who wore the tiara 1178–80, and died in prison.—Innocent IV. (*Sinibaldo de' Fieschi*), b. at Genoa; became a cardinal 1227; succeeded Celestine IV. in 1243. D. at Naples, Dec. 7, 1254. His pontificate was characterized by continual warfare with the Ghibelline party, the pope's chief opponents being Frederick II. of Germany and Conrad, his son.—Innocent V. (*Peter of Tarantasia—Doctor Famosissimus*), b. at Moustier, Savoy, in 1225; became a Dominican; succeeded Aquinas at Paris; was made Archbishop of Lyons 1272, and Cardinal-Bishop of Ostia; was chosen pope in 1276; d. June 12, 1276. He wrote numerous scholastic works.—Innocent VI. (*Étienne Auber*), b. at Mont, Limousin; was Professor of Civil Law at Toulouse; became Bishop of Noyon and Clermont; cardinal-bishop in 1342; was pope at Avignon 1352–62; was contemporary with Petrarch and Rienzi, and one of the ablest of the French popes. D. at Avignon, Sept. 12, 1362.—Innocent VII. (*Cosmo Migliorati*), Bishop of Bologna and Archbishop of Ravenna, became cardinal in 1389, pope in 1404; was a man of learning and of many virtues. D. Nov. 6, 1406.—Innocent VIII. (*Giovanni Battista Cibo*), b. in Genoa in 1432 of Greek stock; was in his early years a man of irregular habits, but was afterward married, and on the death of his wife ordained priest; became Bishop of Savone and Malfi, and cardinal in 1453. His election, though not simoniacal, was obtained by a capitulation favorable to the cardinal electors. (See Hergenroether, *Church History*, ii., 746. For the correct view of his pontificate see Reumont, *Geschichte der Stadt Rom*, vol. iii., part i., pp. 187–200.) D. July 25, 1492.—Innocent IX. (*Giovanni Antonio Facchinetti*), b. at Bologna in 1519; became cardinal 1583, pope in 1591; was a man of learning and wisdom. D. Dec. 30, 1591.—Innocent X. (*Giovanni Battista Panfili*), b. at Rome, May 7, 1574; became a cardinal in 1629, pope in 1644; extended the temporal and spiritual sway of the papacy; opposed Jansenism; and died Jan. 6, 1655.—Innocent XI. (*Benedetto Odescalchi*), b. at Como in 1611; became cardinal in 1647; was elected pope as successor of Clement X. Sept. 21, 1676; undertook to revive the ancient discipline of the Church, and had quarrels with Louis XIV. about the revenues of vacant benefices (1678), in which that monarch was supported by a general assembly of French bishops, who declared (Mar. 16, 1682) the authority of the pope inferior to that of a general council. Innocent thereupon held a consistory, in which he condemned the Gallican propositions, and compelled their implicit withdrawal by refusing to confirm the bishops who accepted them. In 1687 he published a brief abolishing the right of asylum as formerly exercised by foreign ambassadors; refused to receive the French envoy, who maintained that right and entered Rome with a military escort; sanctioned the condemnation by the Inquisition of Molinos' doctrine of Quietism; joined the League of Augsburg, and died Aug. 12, 1689.—Innocent XII. (*Antonio Pignatelli*), b. at Naples, Mar. 13, 1615; became Archbishop of Naples; cardinal in 1681, and pope in 1692; was a just man and able ruler of his temporalities. D. Sept. 27, 1700.—Innocent XIII. (*Michel Angelo Conti*), b. at Rome, May 15, 1655; became Archbishop of Tarsus in 1695, cardinal in 1707, and Bishop of Viterbo in 1712; succeeded Clement XI. in 1721; and died Mar. 7, 1724. He was virtuous and devout, but unable to cope with the courts of Spain and France.

Revised by J. J. Keane.

Innocents' Day [in Old English, *Childermas*]: the day (Dec. 28) on which the Roman Catholic and Anglican Churches celebrate the massacre of the children at Bethlehem, who are called the *Holy Innocents* and considered as the earliest Christian martyrs, it being the teaching and belief of the Church that the shedding of blood for Christ takes the place of baptism. Among the Greeks this feast, known as that of the "14,000 holy children" (*τῶν ἁγίων ιδ' χιλιάδων νηπίων*), is observed on Dec. 29. A festival of the Holy Innocents is mentioned in the *Calendar of Carthage*, the date of which may be approximately ascertained from the fact that the latest martyrs whose names are included died A. D. 484. In the rule of Chrodegang (d. 766) this feast is placed among the "chief solemnities." The Society of Lincoln's Inn, London, used to choose a *King of the Cockneys* on this day; children were permitted to wear the clothes of their elders and exercise a mock authority; in the convents the youngest nun became lady superior for the nonce, etc. The Council of Basel (sess. xxii.) condemned the extravagances of this celebration. The mass on this day is said in purple vestments, probably because the innocents are not supposed to have entered into heaven immediately after their martyrdom, it being necessary that they should wait until Christ at his ascension opened the home eternal to "those who believe." On the Octave mass is celebrated in red, the usual color for martyrs. In some Roman Catholic countries the festival of the Holy Innocents is even now celebrated by playing practical jokes, precisely as in the U. S. Apr. 1 is reckoned *All Fools' Day*. In Spanish-American countries, after a practical joke has been played, the expression, equivalent to "April fool" is, *Qué la inocencia le valga*—i. e. "May your innocence protect you!"

Revised by W. S. Perry.

Inns of Court: colleges in London designed for the education of students for practice at the bar, and having at the same time the right to admit persons to practice. They do not govern attorneys, who are admitted to practice under the direction of the courts. They are four in number, having preparatory schools called Inns of Chancery. At the present time the Inns of Chancery are only used as chambers. The Inns of Court are the Inner Temple, the Middle Temple, Lincoln's Inn, and Gray's Inn. To the first of these are attached the Inns of Chancery, called respectively Clement's, Clifford's, and Lyon's Inn; to the Middle Temple, New Inn; to Lincoln's Inn, Furnival's, Thavie's, and Symond's Inn; while to Gray's Inn are added Barnard's and Staple's Inn. The Inns of Court are voluntary societies and unincorporated. They are thus described by Pearce: "They are voluntary societies, for ages submitting to government analogous to other seminaries of learning; from time immemorial enjoying the protection of the crown; at common law subject to the visitorial powers of the judges of the superior courts, who possess a domestic jurisdiction over these bodies, to whom an appeal lies in every case against orders affecting members of these societies, forming a university with power to grant degrees in the municipal law of England, which constitute indispensable qualifications for practice in the superior courts of law; no corporations, and possessing no charters from the crown; by the policy of the common law permitted self-government, subject to the qualifications mentioned in order to secure the independence of the bar." They were called inns, or in the Latin records *hospitia*, as distinguished from public lodging-houses (*diversoria*). Being unincorporated, the members have been obliged to resort to special methods to keep the title to the property in the society. The first grant was made to a select number in trust for the society at large. This select number forms the bench. As the members die, others are chosen from the society, and new conveyances are made from time to time, the succession having been thus kept up for hundreds of years. (*Shelford on Mortmain*, p. 33.)

These colleges existed at a remote period in English history. Fortescue, writing in the reign of Henry VI., gives a pleasing account of them as they existed in his time. The early modes of instruction in these institutions were disputations (or *moots*) and readings or lectures. The members were divided into four grades—benchers, utter barristers, inner barristers, and students. The government of the society was committed to the benchers, or seniors, the discussions and readings appertaining to the barristers. In the course of time the office of reader came to be attended with great expense. Stowe informs us that the reader in his day kept a splendid table for upward of three weeks, feasting the nobility, judges, bishops, principal officers of state, and sometimes the king himself, insomuch that it has cost a reader above £1,000—certainly a large sum of money at that day. The requisitions for admission to the society became nominal. After the student period had passed the requisites for admission to practice consisted mainly in the fact that the student had eaten a certain number of dinners in each year for a fixed number of years in the common hall. Latterly, the best professional sentiment has strongly tended in favor of making these institutions true seminaries of learning, and ample courses of lectures have been introduced, and opportunities to receive it given to those students who may desire careful instruction. The

rules adopted by the benchers provide for a preliminary examination, testing the student's general culture. It is quite certain that the result of the renewed interest in legal education will be to produce a class of lawyers not only versed in the rules of the common law, but well informed as to the principles of the Roman law and the doctrines of general jurisprudence.

The benchers not only have the power of admitting persons to the bar, but also of disbarring those whom they deem unfit to practice. From their decision no appeal lies to any court as such, but only to the judges, exercising a limited power of review in the character of visitors. By this means the general sentiment of the profession, as represented by the benchers, may exercise a most salutary control over delinquent members, while, owing to the supervision of the judges, there is but little danger that so great a power will be wantonly or capriciously exercised.

Reference may be made for further information to Herbert's *Antiquities of the Inns of Court and Chancery* (London, 1804); Pearce's *History of the Inns of Court and Chancery* (London, 1848); Ireland's *Inns of Court*; Wharton's *Law Dictionary*, title *Inns of Court*; Douthwaite's *History of Gray's Inn* (London, 1886). For information as to the inns of Ireland, see Duhigg's *History of the King's Inns in Ireland*. Revised by FRANCIS M. BURDICK.

Inns'pruck, or **Inns'bruck** [Germ., orig. the bridge of the Inn; cf. Mod. Germ. *brücke*, bridge]: the capital of the Tyrol, Austria (see map of Austria-Hungary, ref. 6-B). It is beautifully situated on the Inn at an elevation of 1,800 feet above the level of the sea, and is encircled by mountains from 6,000 to 8,000 feet high. The five suburbs which form the new part of the town are finely laid out and well built. The cathedral contains the celebrated monument of Maximilian I., of marble and bronze, and also that of Andreas Hofer. Innspruck has a university, a museum, a botanic garden, and extensive manufactures of cloth, silk, gloves, and stained glass. Pop. (1890) 23,326; with suburbs, 35,800.

Inuit: See ESKIMAUAN INDIANS.

Ino (in Gr. Ἰνώ): in Greek mythology, a daughter of Cadmus and Harmonia. Athamas, King of Orchomenos, in Bœotia, loved her and cast off his first wife, Nephele, in order to marry Ino. Ino hated Phrixus and Helle, the children of Nephele, and sought to bring about their destruction. She produced a famine by parching the seed-corn, and bribed the messengers to the oracle to bring back word that the famine would cease when Phrixus and Helle should have been offered up in sacrifice. At the critical moment Nephele snatched away her children. (See HELLE and GOLDEN FLEECE.) When Bacchus was born from the thigh of Zeus, the motherless infant god was carried by Hermes to Ino, his aunt, to nurse. Because of this service Hera visited both Ino and Athamas with madness, under the influence of which Athamas killed Learchus, one of his sons by Ino, but Ino fled with Melicertes, the other son, in her arms. She was so hotly pursued by Athamas that she sprang into the sea from an overhanging cliff S. of Megara. Poseidon saved both mother and son from death, and made Ino a goddess of the sea under the name of Leucothea. The son Melicertes was worshiped as Palæmon. In reality the name Melicertes is but the Greek form of Melkart, the Phœnician god. J. R. S. STERRETT.

Ino, CHUKEI: mathematician, astronomer, and cartographer; b. in the province of Shimosa, east coast of Japan, in 1744. He was originally called Jimbo, but changed his name on marrying into the Ino family and inheriting through his wife—a common Japanese custom. Not until his fiftieth year did he begin scientific studies, when he had retired from a successful career as a brewer. He went to Yeddo to prosecute his studies under Takahashi, the government astronomer, then engaged in revising the calendar. It was a son of this Takahashi who gave von Siebold on his first visit to Japan two maps which were discovered in the latter's baggage when he was shipwrecked. A sentence of death would have been passed on Takahashi had he lived—this was in 1830 A. D. In 1800 Ino was intrusted with the survey of Yezo (then little known), whence he proceeded to the northeastern coast, and finally included all the islands. His labors in the field came to an end in 1818, and he does not seem to have survived many years. The instruments he used were nearly two centuries out of date, but with them he achieved remarkably exact results that stand the severest modern tests. The length of one degree of latitude with Ino was 28·2 ri (= 2·4 miles) or 110·7 km., only $\frac{3}{10}$ km. short. The full results, compiled in 1823, were not published in book-form till 1870. An epitome of results was published in 1818, entitled *Ino's Tables of Latitudes and Longitudes*. Ino's work has formed the basis for all subsequent map-drawing in Japan. He has been called the Japanese Newton or Picard. In 1889 a monument to his memory was erected in the Japanese capital. J. M. DIXON.

Inocar'pus Edu'lis [Mod. Lat.; Gr. ἴς, *ἰνός*, fiber + *καρπός*, fruit; *edu'lis* (Lat.), edible, deriv. of *e'dere*, eat]: a stately evergreen tree of the Pacific islands, and of the family *Thymeleæaceæ*, producing a nut which after roasting is a palatable and important food. The tree puts out from its trunk curious plank-like buttresses, which are very convenient to the natives for use as natural boards. Some of these planks are 4 feet wide at the base.

Inoculation (of plants): See BUDDING.

Inoculation [from Late Lat. *inocula'tio*, ingrafting, deriv. of *inocula're*, ingraft; *in*, in + *o'culus*, eye, bud]: the transference of a disease from one individual to another by insertion of the virus of the disease into the tissues or fluids of the body. When used in its narrower sense it applies to the transference of smallpox in this way. It has been long known that in most of the infectious diseases, and notably in smallpox, one attack of the disease protects the individual from attacks in the future. Many people take no pains to prevent their offspring from coming in contact with measles and other of the milder diseases of children. Measles usually runs a favorable course in healthy children, and the parents have the belief that inasmuch as the children will inevitably have the disease, they might as well have it at one time as another. For similar reasons the custom of inoculation of smallpox was instituted. In the most ancient times, since it was known that one attack conferred immunity, even in the most severe epidemics, the disease was artificially produced under conditions which led people to suppose that it would have a light course. From this arose the method of inoculation or variolation, as it was called, by which the pure smallpox was produced artificially. Apparently the first people who inoculated were the Chinese, who used the natural way of conveying the infection, and placed the dried smallpox crusts in the noses of children or clothed them in garments which had been used by the sick. The methods of the East Indians were more carefully conducted, and consisted in an artificial inoculation with the disease. The Brahmans made superficial incisions in the forearm and placed the virus in these incisions. In other Asiatic and African lands the custom of inoculation had become general, but up to the beginning of the eighteenth century it was almost unknown in the Western world, or in any case it received no attention. At this time Lady Montague, the wife of the English ambassador in Turkey, became acquainted with the custom of inoculation which prevailed there among the Greeks and Armenians. She caused her son to be inoculated in 1717 in the East and afterward, in 1721, her daughter was inoculated in London. The method thus became known in the aristocratic circles of England, and after some experiments the children of the royal family were inoculated. Although in the beginning there was active opposition to the practice, the custom gradually spread over England in the latter half of the eighteenth century, and into other civilized lands. In the course of time the physicians employed a practice which essentially differed from the simplicity of the first inoculations. The cooler time of the year was selected, and the children were prepared for the procedure by a course of medication which was supposed to make them more susceptible to the infectious material. Extensive incisions were made in the skin, smallpox material placed in these incisions, and the places afterward suppurated for a long time. The whole procedure was by this made more dangerous and lasted for a longer time. Some physicians, among whom Gatti, of Paris, deserves especial mention, opposed this procedure. Some physicians acquired a special reputation for their success, among whom may be mentioned a physician named Sutton and his son. The course of the inoculation of smallpox generally differed from the natural disease. After a variable period of incubation there was an eruption, which first appeared at the point of inoculation, accompanied with fever, and after some days the eruption extended to the other parts of the body. Ordinarily about fifty single pocks appeared on the body; sometimes, however, the disease became more severe and equaled in intensity the natural disease, and was followed

by death. The mortality after the operation varied, but was usually recorded as $\frac{1}{300}$. In spite of this danger many underwent the operation, because it was found that few escaped the natural disease, and the mortality of this was very much greater than the mortality following the inoculation. In a given time of the eighteenth century, in the London smallpox hospital, only three died out of 1,500 inoculated, and out of 400 smallpox patients 100 died. The custom, however, had marked disadvantages. The method was costly and took up much time, and was in general not used by the poorer classes. Those who were inoculated and had the disease became sources of infection for the extension of the natural disease. In consequence of this the disease became spread and the general mortality from smallpox was increased. In some lands the disease never died out, and from time to time great epidemics appeared in which the mortality was very great. The custom of inoculation about this time was given up by the entire civilized world and was forbidden by law. The laws against inoculation were made in Great Britain in 1840, and as far back as 1835 its performance was prohibited in Prussia, and punished by three months' imprisonment. Outside of Europe, however, it is still sometimes performed. In China it is still carried out, and even in Algiers it is also in use to a limited extent. Its general disuse must be referred to the custom of vaccination, which has all of the good effects which followed inoculation without any of its dangers both to the individual and to the community. W. T. Councilman.

In'osite [from Gr. *ἴς, ἰνός*, muscle, fiber], or **Phaseoman'nite** [deriv. of *Phaseolus*, Mod. Lat. name of genus including kidney-bean, from Gr. *φάσηλος* (rarely *φασήολος*), kidney-bean]: a variety of glucose found in the heart, lungs, kidneys, liver, spleen, and brain, and in the urine in a case of Bright's disease; also in kidney-beans, common peas, cabbage, potato-shoots, asparagus, etc. It is soluble in water, insoluble in alcohol and ether; is not discolored by boiling with potassic hydrate; does not ferment in contact with yeast; undergoes lacteous fermentation under the influence of cheese, flesh, or decaying membrane and chalk. Evaporated nearly to dryness with nitric acid, treated with ammonia and calcic chloride, and again evaporated, it yields a characteristic rose tint.

Inouye, ĕē'noo'yā', Kaoru, Count: statesman; b. in the province of Choshu, in Western Japan, in 1839. A secret journey to Europe with Ito (*q. v.*) convinced both of the necessity that lay on Japanese patriots to adopt the infinitely more powerful Western civilization; and this policy the two on their return advocated at the risk of their lives. With short intervals Inouye has been in office continuously from the time of the restoration in 1868. He early inaugurated a policy by which Tokio should become a brick in place of a wooden city, and he caused the Ginza portion of the city, after one of the frequent disastrous fires, to be rebuilt in brick. This policy was abandoned on his resignation of office in 1873. In 1878 he succeeded Ito as Minister of Public Works, and was shortly afterward transferred to the foreign office, where he remained for seven years. A peerage was conferred on him in 1885. His retirement in 1887 was the result of the failure to carry treaty revision, and marks the beginning of the conservative reaction in Japanese politics, and the renewed distrust of foreigners. In 1892 Inouye was recalled to office as Minister of the Interior, the most important cabinet office under the minister president. J. M. Dixon.

In Personam: See In Rem.

Inquest of Office: a method of redressing an injury which the crown or state has received from a subject. At common law it was a prerogative mode of process, by which the crown procured a judicial determination of its right to lands, tenements, or chattels. The sovereign was not allowed to enter upon or seize any man's possessions upon bare surmises without the intervention of a jury. Hence if claim was made on behalf of the crown to lands by escheat or forfeiture, or to chattels, as in wreck, treasure-trove, and the like, an inquiry by a royal officer and a jury of indefinite number was instituted to determine the fact. The record of their finding, if for the sovereign, was called "office found." Its effect in cases of realty was to put the crown into immediate possession without formal entry, unless the land was held by a stranger. The subject could traverse the inquisition, or might apply for relief therefrom by petition of right. In most of the U. S. a writ of inquiry issuing out of a court of record or an action has been substituted for this common-law procedure, and the statutes of the several States must be consulted on this subject. Even while the common-law procedure was in force the State had the power by legislative act to reassert title to and resume possession of lands which had escheated or been forfeited to the State. "A legislative act directing the appropriation of the land, or that it be offered for sale or settlement, or any other legislative assertion of ownership, is the equivalent of an inquest of office at common law, finding the fact of forfeiture and adjudging the restoration on that ground." (*De Lancey* vs. *People*, 138 N. Y. 40.) A proceeding similar to that by inquest of office is provided for by the law of Mexico. It may be instituted either by the Government or by a private citizen. In the latter case it is called denouncement. Real estate titles in those portions of the U. S. acquired from Mexico may depend upon whether or not such a proceeding had been taken. (*Phillips* vs. *Moore*, 100 U. S. 212.) Stephen's *Com.*, 11th ed. vol. iii., 683; 3 Blackstone's *Com.*, 257.
Francis M. Burdick.

Inquisition [: Fr. *inquisition* : Span. *inquisición* : Ital. *inquisizione* < Lat. *inquisitio*, a searching into, deriv. of *inquirere*, *inquisitus*, search or inquire into; *in*, into + *quærere*, seek, search, inquire]: in law, a seeking for proof in support of an accusation; a legal investigation, involving the examination of the inquisitors and the inquisitorial process. In history, inquisition is first a process of investigation, then a tribunal under various forms and modifications, then a fixed institution of a twofold type, bearing the names *Inquisitio hæretica pravitatis*, *Sanctum Officium*, *Il Santo Officio*, *La Congrégation du Saint-Office*, *Glaubensgericht*, *Ketzergericht*, established in some parts of the Roman Catholic Church and states to protect the faith by searching out and bringing to penance or punishment heretics and unbelievers, and certain classes of offenders against morals and the canon law.

I. *Origin and Nature of the Inquisition.*—There was an inquisition, which was not a tribunal but a civil process, used by the Roman emperors, and out of it gradually rose, after the state had become Christian, the Diocesan Inquisition, but the tribunal known to us by this name is of much more recent date. It may be said to spring from the action of the pope, Innocent III. (1198–1216). The bishops were carrying on proceedings against heretics in the south of France too languidly, and the pope sent his legates thither to stir up the bishops and take charge of the crusade. The vigor with which this legatine inquisition had acted, the success of its mission, and the enormous pressure on the Church—which the old mode of procedure had allowed to increase, and of which the new measures had been but a local and temporary palliative—strengthened the tendency to give system and permanence to some institution which should furnish the specific relief required in the time of crisis. The official initiative in this work may be said to have been made by the Twelfth General Council, the Fourth Lateran (1215), Innocent III. presiding. It took the first steps in the direction of a permanent inquisition. It virtually gave something of the character of an inquisitorial tribunal to the synodal courts of the bishops. Provincial synods were to be held annually, and violations of the Lateran canons were to be rigorously punished. The punitive discipline was no longer to be a spontaneous and irresponsible matter, but the courts were to be under Church decree—by pre-eminence, courts for the searching out, trial, and punishment of heretics. The condemned were to be left in the hands of the secular power, and their goods were to be confiscated. The secular powers were to be admonished and induced, and, should it prove necessary, were to be compelled (*compellantur*) to the utmost of their power to exterminate all who were pointed out as heretics by the Church (*universos hæreticos ab ecclesia denotatos, pro viribus exterminare*). Any prince declining thus to purge his land of heresy was to be excommunicated. If he persisted, complaint was to be made to the pope, who was then to absolve his vassals from their allegiance and allow the country to be seized by Catholics, who should exterminate the heretics. Those who joined in the crusade for the extermination of heretics (*hæreticorum exterminium*) were to have the same indulgence as the crusaders who went to the Holy Land. Every bishop was to see to the carrying out of these provisions, under pain of canonical vengeance (*ultionis*). He was to be deposed for neglect to cleanse his diocese of the leaven of heretical pravity, and his successor was to be one who had both the will and power to destroy it. The method of proceeding against offenders was by accusation, denunci-

ation, and inquisition. (Carranza, *Summa Conciliorum*, Antwerp, 1556, 335, 336; ed. Schram, August. Vindelic., 1778, vol. iii., 36–39; Fleury, *Hist. Ecclésiastique*, Paris, 1840, v., 123.) The Council of Toulouse (1229) adopted a number of canons tending to give permanent character to the Inquisition as an institution. It was ordained that the bishop should make an annual visitation, and see to it that in all parishes one priest and three laymen of good repute should be appointed to devote their entire time to making the inquisition for heretics. The local magistracy was to unite in this search. Any one permitting a heretic to remain in his country, or who in any way shielded him, was to be punished by forfeiture of land, personal property, and official position. All heretics were to be handed over to the archbishop, bishop, or local authorities. The houses in which they were found were to be leveled with the ground. Heretics, and those under charge or suspicion of heresy, were to be excluded from medical attendance. Any one could make inquisition and seize heretics in the country of another. Genuine penitents were to be removed from the tainted neighborhood, were to wear two crosses on their clothing, different in color from it, till the bishop allowed them to be taken off. Their forfeiture of public rights could be removed only by a papal dispensation. Heretics driven to penitence by fear were to be imprisoned, so as to prevent their corrupting others. Men from the age of fourteen, and women from twelve, were to make oath, and renew it every two years, that they would inform on heretics. The laity were strictly prohibited from having the Holy Scriptures. Carranza-Schram, *Summa* (iii., 70–72); Harduin, *Acta Conciliorum* (Paris, 1714, xii., 173); Mansi, *Collectio* (Venet., 1778, xxiii., 192; Fleury, v., 214); Du Pin, *Thirteenth Cent.*

The organic establishment of the Inquisition dates from Gregory IX. (1227–41), who in Aug., 1231, placed the Inquisition in charge of the Dominicans, an order especially founded for the defense of the Church against heresy. Papal inquisitors of that order were appointed for Germany, Aragon, and Austria, and for Lombardy and Southern France. They were made formally free from all restrictive dependency on the bishops, and could even in certain cases summon the bishops themselves before them. In 1252 Innocent IV. sanctioned the use of torture against heresy. This torture was at the beginning applied by the civil authorities, but as the requisite secrecy was impossible with this arrangement, the Inquisition took the matter into their own hands, under the direction of Urban IV. (1261–64). The penalties inflicted were of various kinds, the forfeiture of ecclesiastical rights, confiscation of property, imprisonment or the galleys, sometimes for life, and capital punishment, usually by burning alive, although in mitigated cases the persons were first strangled and then burned.

The special sphere of the Inquisition in the period of its earliest organization was in Southern France, but in the fourteenth century it had died out there, and when an attempt was made in the sixteenth century to revive it against the Huguenots even such ardent opposers of Protestantism as Catharine de Medici resisted its restoration. The Inquisition was introduced also into a number of other countries. In Germany it was used to extirpate witchcraft in the fifteenth century, but its power was completely broken by the Reformation. Into Italy it was introduced by Gregory IX. (1235), but political complication prevented its assuming severity. It was formally abolished by Napoleon (1808); sanctioned again by Pius VII. (1814), but finally extinguished by the consolidation of the kingdom of Italy (Oct. 9, 1870). The efforts of the pope to introduce the Inquisition into England were futile.

II. *The Politico-ecclesiastical Inquisition, or the "Modern" or "Spanish" Inquisition.*—1. *Spain.* The ecclesiastico-political Inquisition had been fixed in Spain in Aragon, and its central inquisitor, Nicolaus Eymeric (d. 1399), wrote the *Directorium Inquisitorum*, which is a voucher for the substantial unity of the spirit and method of the Inquisition under its two forms. But the old Inquisition of Aragon is almost forgotten in the new Inquisition of Castile. The great theater of the most terrible form of this Inquisition and of its highest activity has been Spain. The whole purpose and strength of the Church and state has never been so centralized as there, in the repression of what was regarded as a common evil threatening the life of both. A vigorous absolutism on the throne found a congenial mind in the Church, for state and Church were welded together in Spain in a theocratic conjunction almost without parallel in modern history. The primary reasons of all these facts are connected with the entire earlier history of that land and with civil and religious necessities, largely real, and always plausible, which rose out of that history. The long struggle with the Moors had been one in which the antagonisms of races had been vivified by the antagonisms of religions. The Moors had been beaten in the field, but their conquerors felt that there could be no abiding security for Spain till the vanquished accepted the faith of the victors. The Jews had from an ancient period been a numerous, active, and influential element in Spain. As between Christianity and Mohammedanism, they had been more sympathetic with the latter than with the former. Jew and Mohammedan had been compelled toward the end of the fourteenth century (1391) to make a profession of Christianity. These reluctant converts, Moorish and Jewish, were more than suspected of clinging in secret to the faith they had publicly renounced. They were charged with atrocious acts and dangerous designs involving the government and the Church. A compulsory fidelity is the natural sequence of a compulsory profession. Of this compulsion the Inquisition became the organ. One of the earliest distinctive movements in this direction was made by Cardinal Pedro Gonzales de Mendoza, Archbishop, first of Seville and afterward of Toledo, who (1470) gathered together the legal maxims and regulations by which a sifting of these pretended converts might be made. This collection was circulated among the clergy to arouse and give precision to their efforts to repress the imminent mischief and peril. As this measure lacked the cogency in which relief alone could be found, the cardinal proceeded (1477) to punish in Seville a number of persons of Jewish origin who were charged with maintaining in secret the laws and usages of their fathers. He then submitted to the government the sketch of a permanent ecclesiastical court, in which the early vigor of the older Inquisition, which had been allowed to languish, should be restored, but which should possess larger powers and more effectual methods. In short, it was to be the Inquisition reformed. The plan met with the approval of Ferdinand and (after a temporary hesitation) of Isabella. At the cardinal's suggestion, which was all-potent (he was called "third king of Spain"), the plan was submitted to the Cortes at Toledo (1480), and, despite the opposition of a number of the states of the kingdom, was adopted. The king and queen loved the Church and loved their people. They meant to strengthen the throne by the altar, and the altar by the throne. They meant to serve the Church and to use the Church. They wished to secure the good will of the pope, and to gain by it. In their motives were mingled fear, piety, patriotism, absolutism, and ambition. Heresy was to be repressed; the dangerous races were to be kept under; the arrogance of the hereditary nobility and of the clergy was to be held in check; and the royal wealth and prerogative enlarged and made sure. In no permanent forms of persecution has there ever been a complete separation of political from religious motives. On petition of the sovereigns, Sixtus IV. had issued a bull (Nov. 1, 1478) authorizing them to appoint and depose inquisitors, and to possess themselves of the property of the condemned for the royal treasury. The Inquisition assumed the character of a predominantly, though not exclusively, state institution, in which the throne was largely allowed to define for itself how it would use the Church, yet under such bonds of fealty to the Church as made it questionable which would be master if their councils should ever be divided. The papal permission was not formally acted upon till Sept. 17, 1480, when the king and queen nominated as inquisitors two Dominicans, Morillo (previously inquisitor in Aragon) and St. Martin. With them was conjoined as assessor Medina, the queen's counselor, and as procurator-fiscal, Lopez, her chaplain. This court began its official work (Jan. 2, 1481) by the publication of an edict which gave directions in regard to the arrest of heretics. These were for the most part the "new Christians" (Jews who had professed conversion). The entire body of nobles was threatened with loss of title and estate if they neglected the orders of the Inquisition. Numbers of Jews were accused. Four days after the first edict, six of the condemned were burned, seventeen more in March, and by Nov. 4 278 persons had been sacrificed in the autos-da-fé of Seville. The dead were accused and convicted, and their remains dug up and burned. Many of the convicts were of high position. Wealth seemed rather to invite than turn aside the stroke. The plague caused the Inquisition to adjourn to Aracena, but did not relax its energy. In that year (or, according to one interpretation of Mariana (xxiv., 17), within several years) the total number burned alive is com-

puted at 2,000. Many more were burned in effigy; 17,000 were reconciled—that is, had the capital sentence commuted to imprisonment for life, confiscation, and other penalties. The Jews fled in great numbers. Some bore their sorrow to the pontiff himself. Sixtus IV. (1481) wrote to Ferdinand rebuking the inquisitors for their severity, and threatened them with deprivation. But in 1483 he quieted the scruples of Isabella, and encouraged Ferdinand and her to continue the work. In this same year (1483) he appointed Thomas de Torquemada, a Dominican prior, inquisitor-general of Castile and Aragon. This man was confessor of the queen, and had prepared her mind to shake off its womanly aversion to the extirpation of heresy by force. He was now invested with full powers to give the completest unity, method, and efficiency to the holy office. Some Protestant writers estimate the number burned alive during his administration at 9,000 or over. Overawed by the grand inquisitor, the Spanish sovereign signed the edict for the expulsion of the Jews (Mar. 30, 1492). Fearing because he had made himself to be so feared, guarding against poison at home and against assassination when he went abroad, the "confessor of sovereigns" died in quiet at the age of seventy-eight (1498). (See Prescott's *Ferdinand and Isabella*, i., 255–268, and Wetzer u. Welte's *K. L.*, v., 651.) Diego de Dega, a Dominican friar, the friend of Columbus, Archbishop of Seville, Ferdinand's confessor, and preceptor of his son John, succeeded Torquemada as grand inquisitor (1499). He issued statutes or instructions for the regulation of the tribunals (1500–04). An insurrection excited by the extreme measures of the inquisitors led to his removal (1506). Under his administration 1,664 were burned alive, 832 in effigy, and 32,456 punished in other ways. The third inquisitor-general was Cardinal Francis Ximenes de Cisneros (1507–17). The Inquisition in Spain long maintained its original rigor. Philip II. (1555–98) used it with effect to crush out Protestantism.

When the various formalities had been gone through the Auto-da-fé (*q. v.*) was held. The most appalling feature of this, and the most attractive to the thousands whom it brought together, was the burning to death of the condemned. But the autos-da-fé were not exclusively scenes of death. In some there were no executions. Relief was brought to burdened hearts by the announcement of release or penance, or of punishments short of death, and the tenderer passions, as well as the fiercer, drew crowds together. The autos-da-fé were a climax to the solemn autos of the religious drama. They were dramas of awful realities, and seemed to the people an epitome and anticipation of the terrors and pardons of the last judgment. In the seventeenth, and yet more in the eighteenth, century these "acts of faith" became rarer. The material had been relatively burned out. But, more than this, wiser opinions as to the right mode of dealing with error had become more general. The penalties were executed privately. The tribunal lost more and more of its most dreadful characteristics, and finally came to fight with books rather than with men. Charles III. (1759–88) imposed legal restrictions on it. No final sentence could be passed without the concurrence of the king, and no new regulations could be established without his sanction. The grand inquisitor was relegated (1762) to a monastery for condemning a book contrary to the wishes of the king. Count Aranda, Minister of State, limited the powers of the Inquisition still further in 1770. Though Aranda was overthrown in 1773 by the influence of the clergy, public opinion sustained the spirit in which he had acted toward the Inquisition. The pope himself ordered various restrictions of its powers. By an edict of Joseph Bonaparte, issued from Madrid Dec. 4, 1808, it was abrogated as prejudicial to the civil government. From the period of its introduction in its later form into Spain (1481) to the time of its abrogation (1808) the Inquisition, according to the estimate of Llorente, had burned alive 31,912 of those whom it had tried, had burned in effigy 17,659, and had inflicted severe punishments of other kinds on 291,456 persons. Roman Catholic writers, on the other hand, assert that the number of those burned did not exceed 4,000. On the return of Ferdinand VII. to the throne (1814) he restored the Inquisition. In the revolution of 1820 one of the first objects of the popular fury was the Casa Santa, the palace of the Inquisition at Madrid. The tribunal itself was again abolished by the Cortes. The clerical or "apostolic" party considered the restoration of the Inquisition a matter of vital necessity, and labored energetically to bring it about. In 1825 a junta favorable to the Inquisition came in, and in 1826 the Inquisition was re-established in Valencia. After the death of Ferdinand VII. (1833), the law of July 15, 1834, again abolished it, and by a royal edict of 1835 its property was confiscated and devoted to the payment of the public debt. In the new constitution of 1855 the Roman Catholic religion is established by law, private freedom of faith is protected from persecution, but liberty of worship is not granted. In spite of this, in 1857 very active proceedings were entered into against all persons and books suspected of the taint of Protestantism. By the constitution of 1869 the nation binds itself to sustain in good faith the Roman Catholic worship and the Roman Catholic clergy. Foreigners of other confessions resident in Spain are tolerated in both the private and public rights of religion, limited only by the general rules of morality and law. Spaniards who forsake the Roman Catholic faith are tolerated under the same general provision.

2. *The Netherlands.*—From Spain, where the Inquisition had been so efficient an instrument of the state, Charles V. (1516–56) and Philip II. (1556–98) endeavored to transfer it to the Netherlands, to be used against the Reformation. "The number of Netherlanders burned, strangled, beheaded, or buried alive in obedience to the edict of Charles V. . . . has been placed as high as 100,000 by distinguished authorities, and has never been put at a lower mark than 50,000. Charles was no fanatic. It was political rather than religious heterodoxy which the despot wished to suppress." (Motley, *Rise of the Dutch Republic*, i., 114.) The result of the policy of which the Inquisition was a pre-eminent part was the revolt of the Netherlands. After an eighty years' war, in the course of which millions of lives were sacrificed, the country almost depopulated by the savagery of Alva, the remnant of the people condemned to death in a mass by the Inquisition, the institution of horror was rooted from the land, and the land itself lost for ever to Spain. See Prescott, *Philip II.* (1855), and his edition of Robertson's *Charles V.*; Brandt, *History of the Reformation in Holland* (1671); Motley; Puigblanch.

3. *America.*—Soon after the discovery of America the Spaniards introduced the Inquisition into it. Mexico, Cartagena, and Lima were the principal seats of its jurisdiction. See Prescott's *Mexico* and *Peru*.

4. *Portugal.*—The Inquisition was introduced into Portugal under Spanish domination (1557) after a protracted resistance. Its supreme court was in Lisbon. The grand inquisitor was nominated by the king and confirmed by the pope. John IV. of Braganza, after the liberation of his country from the Spanish "sixty years' captivity" (1640), was anxious to abolish the Inquisition, and withdrew from it the right of confiscation. John himself was put, after his death (1656), under the ban, and not for some time was a solemn absolution pronounced over his body. The Portuguese Inquisition exhibited special severity in India; Goa was its center. Pombal (1750–82) repressed or used the Inquisition as might best promote his political reforms. Nevertheless, by his influence the Inquisition was obliged to state the charge and give the names of the witnesses to the accused, who was entitled to the choice of a lawyer as his advocate, and had the right of conferring with him. No sentence could be executed until it was confirmed by the royal council. John VI. (1792–1826) abolished the Inquisition both at home and in the colonies. Don Miguel (1828–34) showed a strong disposition to restore it, but was not able to do so.

Bibliography and Literature.—The bibliography, direct and collateral, of the Inquisition is large. Lists of the most important works will be found in Lipenius, *Bibl. Jurid.* (1679, 234); *ib.*, *Bibl. Philos.* (1681, i., 133); *ib.*, *Bibl. Theolog.* (1685, ii., 100); Walch, *Bibl. Theol. Sel.* (1758–62, ii., 119; iii., 737); Nösselt, *Anweis zu. K. Bücher* (1800, s., 350); Fuhrmann, *Handwörterbuch Relig. u. Kirchengeschichte* (1828, ii., 458); Winer, *Handbuch Theolog. Literat.* (1838, i., 696); Grässe, *Lehrb. d. Literärgeschichte* (1840, ii., 1, 3); Clericus, *Biblical Student's Assistant* (Edinburgh, 1844, 48); Danz, *Univers. Wörterbuch* (1848, 451); Poole, *Index to Period. Lit.*; Denis, Pinçon, Martonne, *Nouv. Man. de Bibliogr. Universelle* (1857, ii., 39); Pierer, *Univ. Lexik.* (1859, viii., 928); Pérennés, *Dictionnaire de Bibliographie Catholique* (1859, iii., 545, 571); Brunet, *Manuel du Libraire* (1865, vi., 1164). Among the most important works may be mentioned—(1) those which are documentary, embracing rules, methods of procedure, and instructions. *Quæstiones* (Fifteen Questions for the Inquisition) prepared by Cardinal Falcodi, afterward Clement IV. (1265–68), edited with the annotations of Carrera, and his treatise of the mode of procedure in the holy office (1641), with the *Praxis inquisito-*

rum of Pegna, and additions by Carrera (1669). Clement V. (1305–14) presented to the council at Vienne (1311–12) special instructions for the inquisitors. These form a part of the *Clementines*, v., iii., 1, 2, 3 (*Corpus Juris*, Colon. Mun., 1730). Eymeric, for forty-four years inquisitor-general of Aragon (d. 1399), wrote the *Directorium Inquisitorum*. The first part gives the ancient Church laws and decretals; the second part, the papal laws concerning heretics and inquisitors; the third part details the methods to be observed by the inquisitors; first published 1503, with commentary of Pegna, 1578. Simanca, *Praxis hæreseos* (Venice, 1568–73); *ib., De Catholicis Institutionibus* (1575); Reuss, *Sammlung* (*Collection of Instructions from the Spanish, collected by order of Cardinal Maurique*), with a sketch by Spittler (1788). (2) Histories: *Nigrinus* (1582); Paramo (1598); Marsollier (1613); Limborch (best of the old works, 1692). Memoirs: 1716, Baker, Tiffensee, Baumgarten, 1741; Cramer (1784); *Raisonn. Erzähl.* (1784); *Causes Célèbres étrangères* (1827); Rule's *History of the Inquisition from its Establishment in the Twelfth Century to its Extinction in the Nineteenth* (1874). The French Inquisition, de la Mothe-Largon (1829); the Venetian Inquisition. Paul (Sarpi), 1638; the Spanish Inquisition, Gonsalvi (1567); Arnold (1609); Ursinus (1611); Bebel (1692); *Inquisition in Spanien u. Achtenstücken* (Leipzig, 1810); Puigblanch, *Inquisition Unmasked* (tr. by Walton, 1816); Llorente (1815, 1818, 1820); de Maistre, *Lettres sur l'Inquisition Espagnole* (1822); Hefele, *Ximenes* (2d ed. 1851; transl. by Dalton, 1860). The Portuguese Inquisition (Herculano, 1858); at Goa (Dellon, 1668). The histories of the heretics, councils, martyrs, the papacy, the religious orders are of importance here. The best general Church histories are also useful. Among those of the most importance on the history of the Inquisition are Bzovius, Spondanus, Raynaldus, and Fleury among the Roman Catholic writers, and Mosheim and Schröckh among Protestant Church historians. Some of the monographs on special eras and particular nations are also important: Brandt's *Netherlands*, Milman's *Latin Christianity*, MacCrie's histories of the *Progress and Suppression of the Reformation in Spain and in Italy*, Ranke's *Popes*, the works of Prescott and Motley. Prescott's statements in regard to the Inquisition have been reviewed by Archbishop Spalding, *Miscellanea* (1866). A thorough and impartial history of the Inquisition drawn from authorities approved by the Roman Catholic Church has been greatly needed. Henry Charles Lea has supplied it in his *History of the Inquisition of the Middle Ages* (3 vols., New York, 1887–88). For other works, see the following article.

Revised by S. M. Jackson.

In passing judgment on the Inquisition and its treatment of heretics, it is proper to remember that the men of the Middle Ages were governed by standards that differed widely from ours in religion, no less than in matters social, political, and literary; and it is manifestly unfair to judge the acts of a bygone age by the spirit and the criteria of our own. To them the one, true faith was the most precious possession of society. The teachings, sentiments, and discipline of Catholic Christianity had so profoundly interpenetrated the various strata of European humanity, and affected so seriously all public and private relations, that any attempt to modify or overthrow them was equivalent to an attack upon society and the state. On the other hand, the Catholic Church, being the depositary, witness, and interpreter of divine revelation, could never admit that religious truth was manifold, or left to individual subjective control and criticism. From the Catholic point of view there was therefore but one true religion, the solicitude for which rested chiefly upon the infallible Church, and of whose tenets and discipline she was the authorized and final judge. It was in a society which accepted in their broadest significance these principles that the Inquisition, as a general Church institution, arose. It was nothing new, since the care for the purity of the faith had always been one of the principal duties of the episcopate. In the earlier Middle Ages the Inquisition was carried on in a sporadic way, where needed, by the means of excommunication, exile, confiscation, and the help of the civil arm. In its *principle* it is essential to the ecclesiastical system, and as such was a weapon in the hands of the early reformers no less than in those of the mediæval Church. In the *application* of the principle the Middle Ages acted with a directness and severity which shock our modern feelings, but are quite natural and intelligible in a period when heresy was a political crime, a revolutionary act, and as such punished with all the consequences of high treason. The Inquisition flourished especially in the thirteenth century, because at that time there existed a marvelous recrudescence of most dangerous heresies, some of which, like the Cathari and the Albigenses, struck at the very roots of society by their doctrines concerning marriage, the family, and property; while others, like the Waldenses, cherished views concerning oaths and civil authority which seemed monstrous to the mediæval world. (Döllinger, *Kirche und Kirchen*, p. 51; Hergenroether, *Kirche und Staat*, p. 438.) The number of these heresies, their gnostic and Manichæan character, their dissolvent influence in a society whose chief bond was the voluntary one of a common faith, and whose life and culture rested on that basis, were the reasons for the sudden growth of this powerful institution. It is worth noticing that the canon law contains no death penalty against heretics, that the procedure of the Inquisition contemplated repentance, several delays, and a graduated system of punishments or penances, the main object being always the conversion or recantation of the delinquent. How profoundly the principle of the Inquisition was rooted in mediæval society may be seen from the example of Frederic II., the arch-enemy of the papacy, and perhaps of the Christian idea, in whom, says Freeman (*Essays*, i. 315), the Christian heretic found a persecutor as cruel as the most enthusiastic Dominican turned loose upon the victims of the elder Montfort.

The Catholic is not bound to defend every act of the mediæval Inquisition any more than he feels compelled to excuse the Berserker rage with which the Visigothic kings entered upon the conversion of the Jews or the Teutonic fury of Charlemagne against the obstinate Saxons. On the other hand, he understands that any religious society based upon a firm faith must, by its very nature, exercise a strict discipline. The procedure and penalties of the Inquisition were better than those of the age in which it arose, and which visited with the penalty of death crimes that we punish today very lightly. Sheep-stealing was a capital crime in England until the end of the eighteenth century, and transportation the sanction of very light offenses. Sir Edward Coke maintained that heresy was high treason against the divine majesty, a moral pestilence. For the extreme cruelties practiced upon the Catholics in England and Ireland in the reign of Elizabeth, see Cobbett's *History of the Reformation* and Moran's *Persecutions of Irish Catholics*. Calvin urged the execution of Servetus and Gruet for their opinions. Beza recognized the justice of the act, as did Melanchthon. In 1687 the jurists of Kiel and the theologians of Wittenberg recommended the beheading of the Socinian Guenther. (Hergenroether, *Kirche und Staat*, p. 441–442.) The views of Luther on the treatment which ought to be meted out to the Anabaptists, the Jews, and the Zwinglians are too well known to be repeated. When their "Catholic Majesties" expelled the Jews from Spain, they only applied the principle of the Treaty of Westphalia, *Cujus regio, illius religio*, by virtue of which the electors of the palatinate alternately drove out their Lutheran or Calvinist subjects. It is impossible that the Catholic Inquisition can be any guiltier than its Protestant counterpart. Both were based upon the convictions of the Middle Ages, on strong positive belief, and the idea of a state in which should reign perfect unity of faith and religious discipline. The Protestant writer Schack says that the number of unfortunate women burned as witches in Germany during the seventeenth century far surpasses all the Jews, Moors, and heretics ever executed in Spain. One may add that the cruelties practiced upon the former unfortunates are too shocking for recital. See Janssen's *Geschichte des deutschen Volkes*, and Gams's *Kirchengeschichte Spaniens* (1879, iii., pp. 76–77).

The Spanish Inquisition has been judged as severely by non-Spanish Catholic writers as it has been warmly defended by the Spaniards themselves. The latter point to the fact that at the end of the fifteenth century it arrested the wholesale persecution and murder of the Jews, and conducted the popular movement into legal channels. At the same time they call attention with the Protestant author Huber to the frightful social, religious, moral, and political condition of a large part of Spain at the same period, "a chaotic, seething mass of corruption, made up of bad Christians, bad Jews, and bad Mohammedans," given over to the most immoral luxury, and made still more dangerous by the infusion of a strong dose of passionate and sensual African blood. (*Ueber Spanische Nationalität und Kunst*, Berlin, 1852.) The Spanish writers point to the splendid renaissance of letters and arts which fills the sixteenth cen-

tury, and makes it the golden era of literature, schools, science, discovery, and wealth for Spain, when her language was the court tongue of Europe, and her costumes and manners the envy and model of other nations. Nor can any one contradict them when they exhibit the great freedom of the stage and the press at this time, a freedom larger in some respects than that enjoyed in some modern states, which went so far as to permit the publication of grossly libelous attacks on the clergy and of such bold teachings as those of Mariana concerning the murder of tyrants. The contemporary life of Spain was as manifold and joyous, as intense and free, as it has usually been painted somber and hushed beneath the scowl of the grand inquisitor. (Friedrich von Schack, *Geschichte der dramatischen Literatur und Kunst in Spanien*, vol. ii., Frankfort, 1854.) On the other hand, modern Catholic writers like Gams and Weiss do not spare the Spanish Inquisition. To them it is no less an abomination than to Protestant writers, but for different reasons. The Dominican Weiss (*Apologie des Christenthums*, iii., p. 608; 2d ed. Freiburg, 1891) calls it "a genuine bit of ecclesiastico-civil particularism," "worse than Gallicanism or Josephism," "a docile courtier decked out in church vestments," etc. The Benedictine Gams agrees with him. (*Kirchengeschichte Spaniens*, 5 vols., Regensburg, 1862–79, iii., p. 93; see also *American Catholic Quarterly Review*, Oct., 1883, p. 637.) It was a state institution according to de Maistre, Hefele, Gams, Weiss, Ranke (*Fuersten und Voelker von Sued—Europa im 16. und 17. Jhdt.*, part i., p. 242–48), Leo (*Weltgeschichte*, ii., 431), and Guizot (*Cours d'histoire moderne*, Paris, 1828). Externally, it is true, it was a Church institution; the popes had the confirmation of the grand inquisitor, but it is well known that Sixtus IV., Alexander VI., and other popes were extremely displeased with the harsh methods and the absolute control of the civil authorities in this nominally ecclesiastical tribunal. The attempt to introduce it into Naples and Milan failed before the popular opposition; it was as much disliked in non-Spanish lands as it was popular in Spain. Grisar, *Zeitschrift für Katholische Theologie* (1879, iii., 569); Havemann, *Darstellungen aus der Geschichte Spaniens* (p. 237).

Most modern writers base their false or exaggerated descriptions of the Spanish Inquisition on Llorente, once its secretary, whose work published at Paris, 1817, swarms with willful errors and fanatical misstatements. For a refutation of this work the reader may consult Hefele (*The Life of Cardinal Ximenes*, London, 1860, pp. 276–381). According to his fanciful calculations, accepted by Buckle and many others, which are by no means based upon solid statistics, there were over 114,000 victims under Torquemada alone, and in all 341,021 (!). The fact is that, according to the very fair calculation of Gams (*Kirchengeschichte Spaniens*, iii., pp. 70–76), about 2,000 in all suffered death by the Inquisition from 1481–1504. The Protestant historians Peschel and Maurenbrecher accept this figure, which is that of Mariana, falsely applied by Llorente to Seville alone. From 1504 to 1758 Gams calculates that as many more may have suffered—in all, about 4,000. When we recall the ease with which human life was sacrificed in European courts of justice, notably in England, up to the end of the eighteenth century for comparatively slight causes, and that in course of time the Spanish Inquisition took cognizance of many matters beyond the immediate scope of heresy, and with merely an indirect relation to it; when we remember that private vengeance compassed the death of some, and the public welfare of Spain demanded the death of plotters and conspirators under the cloak of religion, this number, sadly large as it is, will not appear striking in an age which saw the slaughter of Drogheda and the butcheries of Geneva. The prisons of the Inquisition were more cheerful than the ordinary prisons, the food and treatment better, and the criminal process more just and regular. The autos-da-fé were not such cannibal-like sights as they are portrayed; they were scenes of public abjuration and reconciliation, symbolic and pompous as suited the mediæval, and especially the Spanish mind. The san benito (*saccus benedictus*) or penitential garment worn by the convicted was odd and ridiculous, according to our taste, but it was only one of the signs of infamy which the Middle Ages used as a punishment, and was therefore not a horror special to the Inquisition, nor an unusual punishment. (See U. Robert, *Sur les signes d'infamie portés au Moyen Âge*, Paris, 1891.) The use of the rack was only too common in all courts of justice, and it is not so long since it disappeared from enlightened Europe; its application was surrounded by many safeguards in the Inquisition, which knew nothing of such cruel appliances as the Scavenger's Daughter, the Virgin, quartering and disemboweling, slicing off the tongue, the ear, the nose, etc., all of which were in use throughout Europe until the middle of the eighteenth century, without awakening any outcry of indignation. The names of the witnesses were kept secret lest they should suffer from the relatives and friends of the accused, not with the intention of surprising the accused, who could reject those known to be inimical to him and whose interests were confided to an advocate, while the decisions and acts of the minor officers had to be reviewed by the grand inquisitor, usually a man of experience and learning, though too often appointed and guided by royal influence, which found in the Inquisition a way to side-track in many matters the nobles and the estates, as well as to keep in awe the rebellious spirits of the time. The confiscation of the goods of the condemned was a cruel measure, and there are not wanting Catholic writers who accuse the Spanish kings of avaricious motives in their management of this dreaded tribunal. But the orphan children were cared for by the state; frequently the estate of the victim was left to his family, or they received a pension from it; the innocent wife of a condemned person got back her dower, etc.

LITERATURE.—Hefele, *Cardinal Ximenes* (Eng. transl. London, 1860); Gams, *Kirchengeschichte Spaniens* (Regensburg, 1862–79, vol. iii., pp. 1–93); Hergenroether, *Kirche und Staat* (Eng. transl. Freiburg, 1873); C. Douais, *Les sources de l'histoire de l'Inquisition dans le midi de la France au 13e et au 14e siècle*, in the *Revue des Questions Historiques* (vol. xxx., Paris, 1881); Wetzer und Welte, *Kirchenlexikon* (2d ed. 1889, vol. vi., art. *Inquisition*); Weiss, *Apologie des Christenthums* (Freiburg, 1891, vol. iii.). Among the older Catholic works the best is Paramo, *De origine et progressu officii sanctæ Inquisitionis* (Madrid, 1598). There are two modern Spanish works on the question, F. J. Rodrigo, *História verdadéra de la Inquisición* (3 vols., Madrid, 1876), and Orti y Lara, *La Inquisición* (Madrid, 1877). The work of de Maistre, *Lettres à un gentilhomme russe sur l'Inquisition Espagnole* (1822), maintains its worth. See also the article of Bouquillon in *The American Catholic Quarterly Review* on Henry C. Lea as an historian; Muzzarelli, *Il buon uso della logica* in *Materia di religione* (ed. Florence, 1822, vol. v., p. 63). JOHN J. KEANE.

In Rem [Lat., against the thing or property]: a legal term used in conjunction with *in personam* (against a person) to describe a right, a proceeding, or a judgment. Rights *in rem* are those which are available over their object against everybody, while rights *in personam* are available against a definite person or persons. The owner of a horse has the right to its exclusive enjoyment. Though it may be stolen and sold for its full value to an innocent purchaser, the owner can lawfully recapture it without incurring any liability to such purchaser. If the owner sells the horse, his right to the purchase price is *in personam*, against a definite individual, the buyer. Rights *in rem* include those of personal security, of personal liberty, of private property, of immunity from fraud, and of the society and control of one's family and dependents.

The breach of a right, whether *in rem* or *in personam*, is usually redressed in an action *in personam*. Although commentators are not entirely agreed as to the *actio in rem* of the Roman law, it seems to have included proceedings brought to establish a right *in rem*, even where that right was contested by a definite individual, but against whom no personal judgment was sought, and also proceedings to recover a specific thing. In English law, the term is generally confined to proceedings against property alone, treated as responsible for the claims asserted by the plaintiff. In such cases the property is the defendant, and its forfeiture or sale is sought for the wrong it has been instrumental in committing, or for the debts or obligations to which the law subjects it. The court acquires jurisdiction by seizure of the property and by public citation to the world, of which any person interested in the property may avail himself and become a party to the proceeding. Such a proceeding is to be distinguished from an action of replevin (see REPLEVIN) or from attachment process, which is brought against a definite person, although its object is to regain a specific thing or to subject it to a sale for the plaintiff's benefit. (*Certain Mahogany Logs*, 2 Sumn. 592.) Such a proceeding is often spoken of as *quasi in rem*, where it is carried on for the sole object of having the thing sold or disposed of for the satis-

faction of the claimant's demands. It may be instituted by substituted service of process, as by the publication of a summons or citation. If a personal judgment is sought against the pretended or the real owner of the thing replevied or attached the proceeding is *in personam*, and jurisdiction for such purpose can be obtained only by personal service of process within the state or by his voluntary appearance.

A judgment *in rem* may be rendered in an action *in personam*. In a suit for divorce the defendant is a definite person, but if the decree dissolves the marriage bond it is a judgment *in rem*, as it declares the status of these parties. Such a judgment has been defined "as an adjudication against some person or thing, or upon the status of some subject-matter which, wherever and whenever binding upon any person, is equally binding upon all persons." See JUDGMENT; see also Wapples, *Proceedings In Rem* (Chicago, 1882). FRANCIS M. BURDICK.

Insanity [from Lat. *insa'nitas*, deriv. of *insa'nus*, insane, liter., unsound; *in-*, un- + *sānus*, sound]: a manifestation of disease of the brain, accompanied by a general or partial derangement of one or more functions of the mind, in which, while consciousness is not abolished, mental freedom is perverted, weakened, or destroyed. An essential feature of the definition here given is that insanity depends upon a diseased condition of the brain. The relation of body and mind in this and other connections is being actively investigated by specialists in physiological psychology.

Many classifications have been made of the various phenomena met with in insanity. Obviously, a reasonable arrangement would be one based on the actual brain-lesions but in the present state of our knowledge it is impossible to make such a one. We can not say, for instance, that when an individual has a delusion, such or such a part of his brain is affected, nor that when he is melancholic another part is involved. We are obliged, therefore, either to arrange the symptoms into groups without any philosophical basis, or to classify them according to the relation which they bear to the several functions of the mind. Following this latter plan, we have: I. *Perceptional insanity*, characterized by the tendency to the formation of erroneous perceptions, either from false impressions of real objects (illusions), or from no external excitation whatever (hallucinations). II. *Intellectual insanity*, characterized by the existence of delusions. III. *Emotional insanity*, characterized by the uncontrolled or imperfectly controlled predominance of one or more of the emotions. IV. *Volitional insanity*, in which there is an inability to exert the full will-power, either affirmatively or negatively. V. *Mania*, characterized by the union of two or more of these forms in the same individual. VI. *General paralysis*, a peculiar form of insanity attended with progressively advancing loss of mental and motor power. VII. *Idiocy and dementia*, the first due to the fact that there are original structural defects in the brain; the second resulting from the supervention of organic changes in a brain originally of normal power.

The character and import of certain important symptoms of mental disorder must be clearly understood. These symptoms are illusion, hallucination, delusion, incoherence, and delirium. An illusion is a false interpretation in perception of a real sensorial impression. Illusions of all the senses, but especially of sight and hearing, are met with in insanity, and particularly in those acute forms characterized by the presence of delirium. A hallucination is a false perception without any objective material basis, and is central in its origin. It is more, therefore, than an erroneous interpretation of a real object, for it is entirely formed by the mind. See ILLUSION.

Delusion.—Illusions and hallucinations may exist, and the individual be perfectly convinced that they are not realities. In such cases the intellect is not involved. But if he accepts his false perceptions as facts, his intellect participates, and he has delusions. A delusion, to be indicative of insanity, must be such a belief as would not be entertained in the ordinary normal condition of the individual, must relate to a matter of fact, must have been formed without such evidence as would have been necessary to convince in health, and must be held against such positive testimony as would have in health sufficed to eradicate it. Insanity may exist without delusions at any time being present. Thus there may be emotional insanity, the main feature of which consists of mental depression with an unreasoning tendency to suicide; or there may be volitional insanity, characterized by an inability to refrain from setting fire to neighbors' houses or from committing homicide.

Incoherence.—A person is said to be incoherent when the words he utters are without proper relation to each other, or when his language is not in accordance with his ideas. Incoherence is a prominent feature of delirium, and is sometimes met with in the chronic insane. It is directly due either to the impossibility of keeping the attention sufficiently long on one idea for its full consideration, or to a like difficulty in co-ordinating those parts of the brain concerned in the formation and expression of thoughts.

Delirium.—Delirium is that condition in which there are illusions, hallucinations, delusions, and incoherence, together with a general excess of motility, an inability to sleep, and an acceleration of pulse. In acute delirium these phenomena are well marked; in the low and chronic forms they are less strongly indicated. Sometimes one or the other of these elements notably predominates. Delirium is present in the earlier stages of acute mania, and may exist as an accompaniment of certain diseases of the brain which do not ordinarily cause insanity, such as cerebral congestion or anæmia. It is also common in fevers and in several other disorders of the system.

I. *Perceptional Insanity.*—In uncomplicated perceptional insanity those parts of the brain only are disordered which are concerned in the formation of perceptions. It constitutes the primary form of mental aberration, and of itself is not of such a character as to lessen the responsibility of the individual or to warrant any interference with his rights. It consists entirely in false perceptions, and if the intellect is for a moment deceived, the error is immediately corrected. As already stated, these are either illusions or hallucinations. In some cases the erroneous perceptions may coexist in the same individual. They may be related to all the senses, but are especially common as regards sight and hearing. Illusions, as already mentioned, are not necessarily due to any central difficulty, though such an origin is common. Thus it is an illusion if a person on looking at an object sees two images. This result is due to some cause destroying the parallelism of the visual axes, and may be produced by a tumor of the orbit or by paralysis of one or the other of the ocular muscles. Even in such a case, if the paralysis were due to central lesion the higher ganglia of the brain might escape implication. Illusions are often excited by emotional disturbances, and are then probably directly due to some derangement of the cerebral circulation. The false perceptions called hallucinations are of more importance than illusions in the symptomatology of insanity in general. In the purely perceptional form of mental aberration they are also exceedingly interesting, and are very often troublesome symptoms. In one instance a man saw images of various kinds as soon as his head touched the pillow, though they were never present when he was standing or sitting. Like illusions, the immediate cause of hallucinations is generally derangement of the cerebral circulation, either as regards quantity or quality. As is well known, they are frequently produced by alcoholic liquors, opium, belladonna, Indian hemp, and other drugs. They may also result from mental exertion and emotional disturbances, from an overloaded stomach, or may occur in the course of various diseases, especially those of a febrile or exhausting character. Perceptional insanity may make its appearance suddenly, the first evidence of its presence being the illusion or hallucination. Usually, however, there are prodromata indicating cerebral derangement. These are pain in the head, irritability of temper, suffusion of the eyes, noises in the ears, a general restlessness, and some febrile excitement. The skin is generally dry, the mouth parched, the bowels costive, and the urine high-colored and scanty. If not arrested, it may pass into one or the other of the following types of mental aberration.

II. *Intellectual Insanity.*—The essential feature of intellectual insanity is delusion. It may be developed suddenly, or, as is generally the case, is preceded by evidences of cerebral disorder, which, though at the time of their occurrence not attracting particular attention, are called to mind by the observers after the disease has become fully developed. In the first stages of intellectual insanity it is not often that the delusions are fixed, and they may succeed each other with such rapidity that the patient resembles one affected with mania. They may be based on illusions or hallucinations, or may arise from the reasoning of the patient from purely imaginary premises not connected with the senses. Sometimes they are spontaneous, and at others they appear

to come from dreams. When rapidly following each other, delusions are clearly spontaneous, are not the result of any series of thoughts, but come on the spur of the moment and upon very slight suggestions. As they are readily formed, they are not fixed in character. For instance, a lady, after receiving some very sorrowful news relative to her husband, imagined that she had lost her eyesight. For a few hours she remained with her eyes shut, alleging that there were two deep cavities behind the lids. Suddenly she opened them, said she saw perfectly well, but that the top of her head had been cut off; and this was almost immediately changed to the belief that she was perishing with cold; and so on, no one delusion lasting longer than a few minutes. In many cases like this the erroneous beliefs are excited by sensations in various parts of the body, but this was not so in the present instance.

The connection between dreams and insanity is very close. Most of us have at times had such vivid dreams that they have been removed from our mind with difficulty. There appears to be no doubt that many of the delusions of the insane have dreams for their cause. The delusions of the insane are in a great majority of cases connected more or less directly with themselves. Thus a person believes that his leg is made of glass, that his head is reversed on his shoulders, that he is some great personage, that a large fortune has been left to him, or that some misfortune has deprived him of his property or his friends. He will often reason logically and forcibly from the premises he has assumed, and will give no evidence of insanity outside of his delusion. Such cases are embraced under the term "reasoning mania," and the skill and acumen exhibited by persons thus affected are often surprising. When it is important, in their estimation, for them to conceal their delusion, they will often do so for a long time, and stratagems of various kinds are necessary to their speedy detection. Sooner or later, however, the delusion comes out.

The designation *monomania* can properly be applied to many of the cases of intellectual insanity. In the uncomplicated form of the disease it is rare, after it is fully established, that more than a single object or a small class of objects is the subject of the delusion. The delusions of the insane may be comprehended under two categories—those which are of a pleasant or exalted character, and those which are unpleasant or morbid. These usually leave their impress on the countenance of the patient, and his actions and manner are in accordance with them. It would be strange if this were not the case. The only guide which man has for his actions is his reason. He weighs arguments and motives, and determines according to the bearing which they may have on his mental processes. A delusion is, in many cases, simply a false premise; the conclusions which the individual draws from it are entirely logical.

Intellectual insanity is often uncomplicated by any other form of mental derangement. There are no illusions, no hallucinations, no overpowering influence of the emotions, and no loss of control over the will. Even when the delusion is of such a character as apparently to be connected with some one of the senses, and thus to be based upon a false perception, full inquiry will often show that there is no error of the sensorial processes, central or peripheral. Thus a lady had the delusion that she had lost her palate, as she called it. A mirror was held to her face, and while she opened her mouth the fact was pointed out to her that all the parts were present. "Yes," she replied, "I see all that; the form is there, I know very well, but the substance is gone"; and no arguments could convince her to the contrary. Persons affected with uncomplicated intellectual insanity may go through the world without giving any considerable evidence of mental derangement unless the subject of their delusion be touched upon. Still there is no telling to what extremes a delusion may carry its subject. Such a person, for instance, imagines that he is the Emperor of Russia. At first he does not comprehend the full importance of his supposed position, and if of moderate reasoning power, possessing deficient information, and naturally of a quiet disposition, he may never go further than dressing himself in some tawdry finery and strutting pompously through the wards of the hospital. But under other circumstances he reflects upon the greatness of his station, and thus from time to time conceives new ideas of his powers and importance, and may thus become a very troublesome patient. He comes to believe, perhaps, that he has the power of life and death, and may attempt to exercise his imaginary prerogative. Delusions in regard to relatives and friends are very common, and hence the conduct of the person entertaining them is changed as it relates to the objects of his erroneous ideas. It is a usual thing, therefore, for such an insane person to disinherit those who would naturally be heirs to his property. This point is of importance in its medico-legal relations.

Delusions may be of such a character as to affect the emotions secondarily. A very common delusion is that of having committed the unpardonable sin, and accordingly the patient suffers great emotional disturbance. This influence upon the emotions is perfectly natural and logical, for if the person really has committed a sin for which there is no hope of pardon, and has thus incurred the punishment of eternal damnation, it would be strange if the emotions of sorrow and despair were not excited into activity. Such cases, however, are not to be embraced under the head of emotional insanity, and though at first sight they may appear to be of that type, inquiry will reveal the fact of the pre-existence of the delusion.

III. *Emotional Insanity.*—The emotions are at all times difficult to control, but they may acquire such undue prominence as to dominate over the intellect and the will, and assume the entire mastery of the actions in one or more respects. This effect may be produced suddenly from the operation of some cause capable of disturbing the normal balance which exists among the several functions of the mind, or it may result from influences which act slowly, but with gradually increasing effect. In either case there is not necessarily either delusion or error of judgment, but it very generally happens that the intellect sooner or later becomes involved. Emotional insanity may be produced without there being any discoverable cause, and without the patient being able to allege a motive. Some emotions are more frequently disordered than others. Those of a sorrowful character are pre-eminent in this respect, and when they are affected the type of insanity called melancholia is the result. This may be either acute or chronic in its course. The first is rarely uncomplicated, and hence will be more properly considered under the head of *Mania*. Homicide, suicide, and other crimes may be the result of emotional insanity as well as of intellectual insanity. The most common of these is undoubtedly suicide, the individual committing self-destruction in order to escape from the depressing influences which act upon him. A person, for instance, to cite the example previously given, imbibes the delusion that he has committed the unpardonable sin or that God has deserted him, and in consequence passes into a condition of settled melancholy, during which he may attempt self-destruction to escape from his harrowing thoughts, or commit a homicide in order that the same end may be accomplished by his being hanged for murder. Other emotions may of course be excited into morbid activity by derangement of the intellect. Delusional jealousy, anger, hatred, or love may thus urge their unfortunate victim to the perpetration of crime, plunge him into a depth of unhappiness from which there is no escape, or lift him into an ecstasy of bliss far exceeding that derivable from the realization of all his wishes.

Under the head of moral insanity Dr. Pritchard described a form of mental derangement which embraces several species which are now more properly placed under other heads. Several of these are clearly emotional in character, and most of them relate to altered modes of feeling or of the affective life, and therefore, in the largest sense of the word, may also be called emotional. Careful and thorough inquiry will, however, often show that the primary difficulty is one of defect, not of aberration or exaggeration, and that, therefore, these instances of deficient moral sense, leading the subjects to the perpetration of crimes of various kinds, should be classed under the head of imbecility. Many cases of what are called temporary insanity, mania ephemera, transitory mania, and morbid impulse are really instances of emotional insanity. That such a condition exists there can be no doubt, and it is important, both as regards the subject and society, to be able to recognize or to disprove its presence. A few words, therefore, on this point will not be out of place. The state with which transitory emotional insanity is most apt to be confounded is that which has been designated "heat of passion." Passion is emotional activity. It refers to that mode of the mind in which certain impressions or emotions are felt, and which is accompanied by a tendency or impulse, often irresistible, to act in accordance with these impressions or emotions irrespective of the intellect. An act performed in the heat of passion is

one prompted by an emotion which for the moment controls the will, the intellect not being called into action. It is an act, therefore, performed without reflection. The passions are, to a certain extent, under the control of the will, and this power of checking their manifestations is capable of being greatly increased by self-discipline. Some persons hold their passions in entire subjugation; others are led away by very slight emotional disturbances. The law recognizes the natural weakness of man in this respect, and wisely discriminates between acts done after due reflection and those committed in the midst of passion and excitement.

The acts performed during temporary emotional insanity, in their more obvious aspects and when viewed isolatedly, resemble those done in the heat of passion. But they are so only as regards the acts themselves. Thus a person entering the room at the very moment when one man was in the act of shooting another would be unable to tell whether the homicide was done in the heat of passion or under the influence of an attack of temporary insanity; he would be equally unable to say whether it was committed in malice aforethought or in self-defense. The act, therefore, by itself, can teach us nothing. We must look to the attending circumstances and to the antecedents of the perpetrator for the facts which are to enlighten us as to the state of mind of the actor. Now, the conditions of temporary emotional insanity are so well marked that the act which indicates the height of the paroxysm may almost be disregarded, for it is always preceded by symptoms of mental aberration, while acts done in the heat of passion are not thus foreshadowed. And as regards the subsequent state of the individual the distinction is equally apparent. The one who has committed a criminal act in the heat of passion soon subsides to his ordinary condition of equanimity, and generally begins to think of his safety. The one who has perpetrated a similar act during an attack of temporary emotional insanity never thinks of escape, nor even avoids publicity. He may even boast of his conduct or deliver himself into the hands of the law. What is, however, of greater importance is the fact that though he may subside into a condition of comparative sanity, the evidences of disease are still present, and remain in him for days, weeks, or even months and years. These symptoms are generally those of cerebral congestion, to which attention has already been directed. In the heat of passion the act follows immediately on the excitation of which it is the logical sequence. In temporary insanity the act is the culmination of a series of disordered physical and mental manifestations, and may or may not be in relation with the emotional cause. The distinction is therefore clear and precise. See CRIME.

IV. *Volitional Insanity.*—In uncomplicated volitional insanity there are no delusions and no emotional disturbances, but solely an inability to exert the will in accordance with the intellect. This condition, known as *aboulia*, however, usually involves a lack of mental power, of synthesis or co-ordination of ideas. Many cases of morbid impulse are instances of volitional insanity, in which an idea suddenly flashes across the mind and is immediately carried out by the individual, although his intellect and his emotions are strongly exerted against it. Thus a person who previously has not exhibited any very obvious symptoms of mental derangement—though careful inquiry will invariably show that slight evidences of cerebral disease have been present for some days—instantaneously feels a morbid impulse to commit a murder or perpetrate some other criminal act, and is forced to yield, notwithstanding all the efforts he may make. Numerous cases of this kind are on record. Thus Esquirol relates the case of a man thirty-two years old, of a nervous temperament and quiet disposition, who had been well educated and who was fond of the fine arts. He had suffered from a brain disorder, but had been several months cured. After being in Paris for about two months, during which time he led a perfectly regular life, he one day entered the Palais de Justice and attacked an advocate with great fury. The next morning when seen by Esquirol he was perfectly tranquil and composed, showed no anger whatever, and had slept well all night. The same day he designed a landscape. He recollected what he had done the previous day, and spoke of it with coolness. He declared that he had entertained no ill-will against the advocate, had never even seen him before, and had no business with him or any other lawyer. He could not understand, he said, what had actuated him to make the assault. Subsequently he exhibited no indications whatever of being insane. Many instances of so-called moral insanity may properly be placed under the head of volitional insanity, for they are characterized by an inability so to exert the will as to refrain from the perpetration of acts known to be crimes. Of such are cases of kleptomania, dipsomania, pyromania, etc. The will in insanity is often secondarily affected through disturbance originating in the intellect or the emotions, and acts are hence performed which give evidence of the existence of mental aberration. In mania of all kinds, and especially in dementia and general paralysis, there is either a loss of volitional control or an inability to exert the normal will-power.

V. *Mania.*—In mania the mind is affected in several, generally all, of its parts. There are illusions, hallucinations, delusions, emotional disturbance, and loss of volitional power or control. The patient is either morbidly excited or depressed, and is often violent in his language and actions. Acute mania is the more common species of mental aberration, and in its two types of exaltation and depression constitutes the form most commonly met with.

Acute mania with exaltation has its prodromatic stage, the symptoms of which are very similar to those which precede an attack of fully developed cerebral congestion. These, in the main, are pain and fullness in the head, confusion of ideas, increased irritability of the mind, and, above all, wakefulness. In addition, there are restlessness of body and a singularity of behavior which strikes those thrown into intimate relations with the subject, and causes them to suspect that something is wrong with him. The character and disposition undergo a change, and it is very common for unfounded prejudices to be formed against persons formerly highly esteemed. Before very long there are illusions and hallucinations. At first the patient struggles against them, but eventually he accepts them as true, and hence becomes subject to delusions. These are rarely fixed in the earlier stages, and may not be so through the whole course of the disorder. With these symptoms there are derangements in other organs besides the brain. Thus the appetite is lessened, the bowels are torpid, the kidneys fail to eliminate the normal quantity of urine, the heart becomes irregular in its actions and beats with increased frequency—a certain sign of a weak and excited nervous system—and the skin is either bathed in perspiration or is dry and hard. With the full development of the disorder the patient becomes incoherent and rambling, showing a great disposition to talk, to laugh, and to sing, and to indulge in antics of various kinds. His delusions mainly have reference to himself; he imagines that he is some great personage, that he has suddenly become very rich, or that he has been specially singled out for some other piece of good fortune. Not unfrequently he is exceedingly troublesome, destroying the furniture of his room, tearing his clothes, attacking those around him, and making all kinds of attempts to escape from restraint; but at the same time there is rarely any serious effort to do great bodily harm either to himself or others. Sometimes, however—and this fact should always be borne in mind by the attendants—there is a disposition to perpetrate acts of extreme violence, and such a tendency, even when not previously manifested, may very suddenly be developed. As a rule, patients with acute mania lose all sense of decency, and become exceedingly filthy in their habits and obscene in their language and conduct. At times such lunatics exhibit a surprising degree of cunning, and are able to exercise great control over their conduct when they have an end to accomplish. They may thus deceive the young and inexperienced physician, and induce him to forego the idea of putting them under permanent restraint, or they may so impose on him as to induce him to relax his vigilance, and thus allow of their committing some outrageous act. It must be remembered that acute mania is not suddenly cured, but runs a definite and allotted course. It is rare that the memory of the patient suffers to any considerable extent in acute mania. The patients are perfectly conscious of their surroundings, and are seldom deceived by the subterfuge so frequently and so unjustifiably employed that they are to be taken to a hotel or a country-seat when about to depart for an asylum. If the stratagem does for a moment impose upon them, they recollect the fraud, and will not again repose confidence in those who have perpetrated it. Their appetites are generally unchanged. If in the habit of smoking or drinking, they still want their tobacco and their wine, and are usually able to eat a full allowance of food. After their entrance into the asylum the main object of their lives is to get out again as soon as possible. They often recognize their condition, and will call attention to any indications of improvement they may exhibit. They

are not for a moment deceived by the delusions of their fellow lunatics. It is rarely the case that the sleep is regular and sound. Often they will lie awake at night talking over their plans, or else will annoy their attendants in every conceivable way. Although having usually uncomfortable feelings in the head, they rarely suffer from acute pain in that part of the body.

Acute Mania with Depression.—The acute melancholia of many authors is a very terrible form of mental aberration. Like that just described, it is generally preceded by prodromata, which indicate by their character the type of insanity which is about to be developed; but it often appears with great suddenness. In the case of a woman, the first evidence of mental disorder was a violent scream, due to the fact that an idea had instantaneously flashed through her mind that she had committed the unpardonable sin, and had consequently lost all hope of saving her soul. For several days she continued, with scarcely an intermission, to scream, to cry, and to sob, at the same time showing the greatest terror from apprehension that the devils were approaching her. Gradually this extreme state became less violent, but she still continued to be actuated by intense fear, and paced the floor night and day, wringing her hands, weeping, and exclaiming: "Lost! lost! lost for ever!" Of all the forms of insanity, this is the one in which illusions and hallucinations of the senses are most common. These are particularly so as regards sight and hearing, and do not, as a general thing, refer to the body of the patient, although generally in direct relation with his delusion. In all cases of acute mania, with depression, too great care can not be taken to prevent self-injury or suicide. It must be constantly kept in mind that the idea is a very common one with this class of patients, and that frequently they manifest great astuteness in concealing it till they are ready to make the attempt.

VI. *General Paralysis.*—The affection known as general paralysis was first described by Delaye in 1822, by Bayle in the same year, and, with much more thoroughness and exactness, by Calmeil in 1826. It is a very common form of mental derangement, and, aside from the implication of the mind, presents the very striking feature of a gradually advancing paralysis, which derives its name from the fact that it involves, sooner or later, nearly every muscle of the body. This paralysis may show itself at the same time that the insanity is manifested, it may precede the mental derangement, or it may be subsequent thereto. The latter is much the more usual order. The mental symptoms differ in several important respects from those which occur in other forms of insanity. The first indication of disease is generally an excessive anxiety in regard to matters which are really of no great importance. Of the cases which have come under my care, one was first made apparent by a morbid apprehension on the part of the patient that he was not managing some trust funds in the best possible way; another, by the idea that he was constantly wounding the feelings of his friends; and another was constantly changing his mind about the most trivial things, and apparently thinking that the world watched, with great anxiety, all his movements. At first, the general mental type is that of depression. The emotions are easily excited, and the delusions which soon make their appearance are of the melancholic form. The idea of propriety in the everyday acts of life seems to be lost, and the patient will commit all kinds of indecent acts without appearing to be aware that he is doing anything unusual. His memory fails rapidly, and his intellectual vigor declines from the very first. Hence he is not able to argue in defense of his delusions, but attacks with physical force those who venture to differ with him. His acts are in other respects eccentric and absurd. He spends money on things which are of no manner of use to him, and at the same time refuses to pay his small debts; he harasses in every possible way those who are about him, gives them impossible orders, and then abuses them if they are not at once obeyed; he is whimsical at the table, and drinks voraciously, or declares that nothing is cooked to suit him, and leaves the table in a rage. Gradually the form of his mental aberration changes—he becomes more cheerful, forms all kinds of impossible schemes for suddenly acquiring great wealth, and these are quickly abandoned for others equally impracticable. Thus delusion after delusion rapidly succeeds each other, and these, in the great majority of cases, relate to the grandeur, the wealth, the physical strength, or some other great quality of the patient, constituting the *délire des grandeurs* of the French. The symptoms connected with sensation are equally well marked. In the early stage headache is often very severe—so much so that, as Westphal has remarked in his excellent monograph on the subject of general paralysis, the patient often dashes his head against the wall. At other times the feeling in the head is that of fullness or tightness, and these sensations are often accompanied with vertigo. Neuralgia in various parts of the body is common, and some of my patients have complained of the different degrees of numbness, especially in the hands and feet. But still more strongly manifested are the disorders of motility, due to the progressive paralysis. One which is very often observed before any mental derangement is perceived is a slight defect of articulation, due to paralysis of the lips. At first this is scarcely perceptible; there is merely a little trembling—an action such as that seen in persons who are endeavoring to restrain their emotions—but it is sufficient to give indistinctness to the utterance of those words which contain labial letters. The tongue is the next to be affected. Examination shows that there are fibrillary contractions of the muscles, and the organ is moved with less facility. The articulation is slovenly, words are slurred over, and there are both stammering and stuttering. The patient notices these difficulties, and in endeavoring to obviate them makes matters worse by his inability to be exact, contrasting strongly with his efforts. The paralysis of the tongue gradually becomes more complete, and at last this organ can only be moved with great difficulty. The other facial muscles participate, and a blank, somewhat sorrowful, expression is constantly present. The voice loses its fullness, and there is great difficulty of swallowing. The muscles of the eye are also generally involved, producing ptosis from paralysis of the levator palpebræ superiosus, diplopia from implication of the internal rectus, and contraction of the pupil; all of these effects, except the last, being due to lesion existing at the point of origin or in the course of the third nerve. The pupils are often unequal, and Austin declares, with all seriousness, that contraction of the right pupil is associated with melancholic delusions, and contraction of the left pupil with elation. Further investigation has not confirmed this theory. The gait of patients affected with paralysis is very peculiar, and is of two distinct kinds. In the one it is similar to that of a person suffering from sclerosis of the posterior columns of the spinal cord (locomotor ataxia). The feet are lifted high, and are thrown down with a great deal of force, the heel striking the ground first. As Westphal remarks, patients with this gait can not stand with the eyes shut and the feet close together. In the other kind, the feet are scarcely lifted from the ground, but are shuffled over it, and the action is somewhat like that of a person attempting to balance himself on a tight-rope. Patients with this gait can not without difficulty stand with the eyes shut. As regards the upper extremities, the fingers lose their strength and delicate co-ordinating power. The handwriting is shaky, and there is awkwardness in buttoning the clothing. The grip of the hand is still strong, but there is an impossibility, as shown by the dynamograph, of maintaining a continuous muscular contraction for even a few seconds. The senses, with the exception of sight, do not often become materially affected. Atrophy of the optic nerve causes amaurosis or amblyopia. Ophthalmoscopic examination will very generally detect this condition of the papilla at a very early stage of the disease, together with retinal and choroidal anæmia. Convulsive seizures occur, and these are generally epileptiform in character, though occasionally they are of the nature of apoplexy. They vary greatly in character, sometimes resembling the *petit mal* of epilepsy, at others characterized by strong convulsive movements or coma. Besides these, there are attacks of complete paralysis of certain muscles, which, however, rarely leave any permanent effects, the usual degree of power being regained in a few days.

The course of general paralysis is often marked by periods of great improvement, and the patient's friends imagine that he is certainly recovering. The symptoms, mental and physical, all abate in violence, and may even disappear to such an extent as not to be evident to general observers. But the physician must not be deceived, for the amelioration is merely temporary, and sooner or later the disease regains its former ascendency. At no time, even during the height of the remission, is the mind of the patient in such a condition as to admit of any considerable intellectual exertion. There may be an absence of delusions, but mental weakness still exists. Progressively, this decline in the force of the mind becomes more strongly marked, until at last a condition of extreme dementia is reached. Simultaneously, the

physical power diminishes, until, finally, the patient—unable to walk, to stand, or even to sit—is confined to his bed for the rest of his existence. Bed-sores form, and deglutition becomes more and more difficult. From this cause the food may become impacted in the fauces, and thus death be produced by interruption of the respiratory process, or the food may enter the larynx. The sensibility of the lining membrane of the cheeks and fauces is notably diminished, and hence the patient in eating goes on filling his mouth, not knowing that he is doing so. When he at lasts attempts to swallow, the mass of food is greater than can pass down the œsophagus, and, unless some one is near to assist him, he chokes to death. Death may otherwise take place from a gradual cessation of the respiratory process, or from sheer exhaustion. The duration of general paralysis is variable. Sometimes death results in a few months, and in others it may be deferred for five or six years. The average period is about three years. General paralysis is not likely to be confounded with any other affection than chronic alcoholic intoxication, from which the history of the case and its general progress will suffice to distinguish it. With lead-paralysis it has scarcely any features in common. General paralysis is almost invariably fatal. A few cases of recovery have been reported, but there is room for doubting that most of them were actual cases of the disease, and the others were probably, as Griesinger suggests, instances in which the remission was long.

VII. *Idiocy and Dementia.*—In idiocy there is such an abnormal organization of the nervous system or arrest of development that deficiency of mind results as a natural consequence. Many idiots are possessed of less intellectual force than well-trained dogs or other animals. Occasionally idiots show an excessive development of some one mental faculty, which has appeared to grow at the expense of all the rest. This is especially seen as regards the capacity for appreciating and remembering musical tones and for acquiring the ability to perform automatically, as it were, upon some musical instrument. There is scarcely an idiot whose mental status can not be elevated by systematic and appropriate education, though where the cranial development is small no very material progress is to be expected.

Dementia.—Dementia may be primary, but such is very rarely the case, it being in the vast majority of instances the consequence of an acute attack of insanity or incident to old age. The characteristic feature of dementia is mental weakness, and this is shown as regards the emotions, the intellect, and the will. The former are not held under control; slight matters bring them into inordinate action, and tears are shed and laughter excited when there is no adequate cause for the one or the other. The intellect is affected in all its parts. The power of application or of fixing the attention is materially lessened; and this is doubtless one reason why imperfect ideas are formed of very simple matters, and why it is so difficult to conceive a series of connected thoughts. The memory, especially for recent events, is weakened to an extreme degree, and the delusions of the patient, if still present, are constantly undergoing change from the impossibility of recollecting them. Volition is almost entirely abolished. The patient is altogether controlled by others, the idea of offering opposition to their wishes never entering his mind. The facial expression of a patient affected with dementia is not always characteristic, and this mainly for the reason that the physical health is generally good. The deficiency of mental power is, however, readily perceived in the majority of cases when the attempt is made to excite the brain to action. The failure of the face to respond to the ideas sought to be conveyed becomes very evident.

Causes.—Among the causes inherent in the individual none is so powerful in its action as hereditary tendency. This may show itself not only by the fact that ancestors have been insane, but that insanity in the descendants may have resulted from hysteria, epilepsy, catalepsy, or some other general nervous affection in them. It often happens, too, that the disease, like many others known to be hereditary, skips a generation. Insanity is more common in males than in females, though the difference is not so great as many suppose. The period of life between twenty-five and forty-five is that at which insanity is most liable to make its appearance. Cases are on record of infants having manifested unequivocal symptoms of mental aberration, but the affection is not often met with under the age of puberty. The civil condition of the individual as regards marriage or celibacy exercises an effect over the causation of insanity. Statistics show that celibates of both sexes are more liable than the married. So far as males are concerned, this result is probably due to the fact that in celibacy, as a rule, the mode of life is less regular. Insanity is assuredly more common among civilized than uncivilized nations, but, as regards the different classes of individuals who go to make up a civilized community, it is very certain that the refined, educated, and wealthy classes are not so liable to insanity as the lower orders. The exciting causes are both moral and physical. Of the former, emotional disturbance, grief, terror, disappointed affection, anxiety, great joy, etc., stand first in influence. It is doubtful if moderate intellectual exertion ever, of itself, causes insanity. It is only when the brain is worked night and day, to the deprivation of sleep and without sufficient change, that insanity results from mental labor. Continual thinking on one subject is the most effectual way of producing insanity by the action of the brain. Among physical causes, drunkenness, the use of opium and other narcotics, excessive sexual indulgence, blows on the head, exposure to severe heat or cold, the puerperal state, and certain diseases may be referred to.

Other points in the natural history of insanity, such as the diagnosis, the prognosis, the morbid anatomy, and the treatment, would lead too much into the domain of medical science to warrant consideration here.

Prevalence of Insanity.—The question whether insanity is or is not on the increase has for many years been discussed, but with no very definite result. The weight of evidence, however, appears to be to the effect that, although the number of the insane reported in official documents is greater every year, this increase is apparent only, and is due to the facts that the registry is constantly becoming more complete, that cases of insanity are, through the advance of medical science, more readily recognized, and that through the same cause there are fewer deaths, and that hence the same cases are counted every year. Thus, in a paper read before the Medico-Psychological Association of Great Britain by Dr. Maudsley in Dec., 1871, it is shown that in 1844 there were in England and Wales 20,611 registered insane persons, including idiots, or 1 in 802 of the population; on Jan. 1, 1859, the total number was 36,762, or 1 in 535; in 1865 the number was 45,950, or 1 in 434; and on Jan. 1, 1871, the total number was 56,755, or 1 in 400.

Dr. Maudsley drew the following conclusions: "(1) There is no satisfactory evidence of an increase in the proportion of cases of insanity to the population; and no evidence, therefore, of an increased liability to insanity. (2) It is not necessary to assume such an increase in order to account for the undoubted great increase in the number of registered insane persons. (3) The difference between 1 insane person in 812 of the population in 1844 and 1 in 400 in 1870 is mainly, if not entirely, owing to the fact that in the former year the returns included only half the existing insane persons in the country, while in the latter year nearly all of them were registered. (4) Some part of the difference is owing to the fact that certain patients are registered as lunatics who would never have been thought so in times past. (5) A lower rate of mortality and a lower percentage of recoveries may account for a part of the increase in the total amount of insanity. (6) The proportion of admissions to the population, which represents approximately the occurring cases of insanity, does not, when the necessary allowances are made, yield evidence of any serious increase."

The number of insane in England in 1889 was 84,345, or 29·07 in every 10,000, and in Scotland 11,954, or 28·9 in every 10,000.

In the U. S. similar conditions have existed, and like results have been obtained. Thus in 1860 the total number of the insane, including idiots, was—of males 22,841, and of females 19,983, being a total of 42,824; while in 1870 the numbers were—for males 30,505, and for females 29,772—total 59,677. Now, in 1860 the total population was 31,185,744, giving a ratio of insane to the population of 1 in about 728; in 1870 the population was 38,115,641, or 1 in about every 637. Here the apparent ratio is not to be ascribed to any actual increase, but to the fact that the researches were more thorough in 1870 than in 1860, and that hence a greater number of the insane were discovered than in the previous census. There is no reason for believing that insanity is more common in England than the U. S., though a superficial consideration of the foregoing statistics would lead to this conclusion; but it is very certain that the registry in the former country is much more thorough. But, as will readily be admitted by all neurologists, there are periods

during which insanity is more common than at others, and hence it is not safe to take any statistics which do not extend over a long series of years. If, for instance, the number of insane in France for the year (1869) before the war with Germany be compared with the number existing in the year after the war, the latter will be found to be much the greater; and the like is true of the civil war in the U. S., and of all other periods of political excitement. Still, taking the civilized world as a whole, it will be found that the exciting and restraining influences about balance one another, and that insanity is not more frequent than it was at any former period during which records have been kept.

In 1880 the total number of insane in the U. S. (excluding 76,895 idiots) was 91,959 in a population of 50,155,783. In 1889 the total number of insane persons treated in both public and private institutions was 97,535.

Care of the Insane.—In every State of the Union, with the exception of Delaware, Florida, and Nevada, there are suitable asylums for the reception and treatment of cases of insanity. All the States, with the exception of those named, have one or more public institutions, and in addition there are a number of private asylums. It is not to be doubted, however, that the provision is not so full as it ought to be, and this is especially to be noted as regards the pauper insane, who in many States are still kept in the county poorhouses or boarded out. The advocates of entire non-restraint—which in reality does not exist—have gone so far as to recommend the establishment of colonies of the insane in villages; and one such has been for some time in operation at Gheel, in Belgium, with but moderate success.

The United Kingdom has 135 public asylums and 117 private asylums. The largest in England is Colney Hatch (2,250 patients). At Caterham and Leavesden are two for incurables, each accommodating 2,000 patients. A "registered hospital" for private patients at Cheadle, near Manchester, contains 280 patients. The Royal Edinburgh Asylum at Morningside contains over 800 patients.

Whether or not the insane should be treated in separate and distinct institutions, or in general hospitals more or less isolated from the other patients, is a subject well worthy the fullest consideration. At a time when insanity was considered to be a disease more of the mind than of the brain asylums were well enough, for the treatment thought to be necessary could be more advantageously carried out by metaphysicians than by physicians; but more practical and far more scientific notions are prevalent, and it is beginning to be a recognized principle that insanity is not to be treated from any very different therapeutical standpoint than that proper for gastritis or intermittent fever. Hence the insane require medical treatment; and the more thoroughly educated the physician is in his science as a whole, the higher will be his qualifications for ministering to the unfortunate class of beings under consideration. So far as curative influences extend, it is not to be denied that the insane may be better treated in their own homes than in asylums. But owing to the character of the insanity, or to the impossibility of providing the necessary restraint and care, a certain number of lunatics absolutely require sequestration.

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Revised by J. Mark Baldwin.

Insanity before the Law: As a medical term insanity has as many meanings as there are theories of insanity; and it is only with the greatest difficulty, if at all, that a definition can be phrased which shall include all the cases included under the term in any one theory and not include cases not classed as cases of insanity under the theory defined. As a legal term, its definition varies with the facts required by the law of any particular jurisdiction to be proved to establish such a grade or kind of mental disorder as will diminish or destroy legal capacity or responsibility. No other form of insanity than that which springs from bodily disease is known to the law. Hence it can take no cognizance of any forms of moral disorder, regarding them purely as varieties of depravity until they are shown to be the offspring of physical disease. Then, and then only, it considers them in their bearing upon questions of intention and responsibility. It is true that in medical investigations into the symptoms of insanity moral acts are allowed much weight, as tending to show the progress rather than the existence of the disease; but in medicine no more than in law are such acts, *per se*, considered *prima facie* evidence of mental disorder.

Classification of forms of Insanity.—Insanity, both in medicine and in law, is used in a restricted sense referring to those extreme cases of mental aberration seen in the maniac, the lunatic, and the idiot; and also in a wider sense including besides these the less marked phases of derangement or lack of activity of the mental functions. These different phases have been variously classified at different periods and by different writers, both according to their form of manifestation and according to their supposed origin; and, although modern authors recognize that they pass imperceptibly one into the other, the classifications are not without convenience in many cases, and one will be found in the preceding article. The phrase "mental unsoundness" is not infrequently used as a term implying or rather including a lesser degree of derangement of the mental functions than the terms insanity, lunacy, idiocy, mania, imbecility, etc., and a person having any degree of mental unsoundness which diminishes or destroys his legal capacity or responsibility with reference to any particular act is now called *non compos mentis*, although this term appears to have formerly implied what was called by Lord Coke (*Coke upon Littleton*, 246 *b.*, 246 *a.*) entire loss of memory and understanding, or what is now often spoken of as "complete loss of reason."

The law, however, takes no special cognizance of acute stages, as set opposite to chronic, or of any other classification of the phases of insanity except as they are pertinent to the problem to be solved in each case as to whether the person was or is in such a mental condition as to be legally responsible for, or capable of, the act in question, or to be subject to the operation of certain laws. Thus, if the question be one of responsibility for criminal acts, the form of insanity is of no consequence as affecting the responsibility and liability for punishment, but the question as to whether the insane condition was brought on (as by drink) with the intent of committing the crime in that condition is of the first importance. On the other hand, when the question is as to place or method of confinement or treatment under statu-

tory provisions, the question of the form of insanity may be the only thing considered.

Proof of Insanity.—Owing to the essential nature of the thing to be proved—namely, the state of another's mind—the proof of insanity is beset with the greatest difficulties, and different experts, equally skilled in their specialty, may honestly come to opposite conclusions with respect to the same persons, and upon practically the same data, and still more easily where their opinions are based upon observations taken at different times and under different circumstances. No evidence of the moral responsibility of the subject can be received. A judge in charging a jury can not enter into this question, but must tell them that the only question is as to whether the person referred to is responsible or is not responsible, according to the law of the land, although he can not, of course, prevent the members of the jury being influenced in the rendering of a verdict by the consideration of the person's moral responsibility according to their views. But to allow the introduction of evidence to show that a man who is legally responsible is not morally responsible, is, in effect, to countenance the jury in rendering a verdict contrary to law.

Insanity as a Defense in Criminal Actions.—The question as to whether a person is sane or insane has been held in some cases to be a question of law and in other cases to be a question of fact; but these apparently conflicting decisions can be largely reconciled by taking into consideration that the terms employed are either used inexactly or with different meanings. In effect it is held by the best authorities and the preponderance of authority that it is a question of law as to what shall constitute such a condition of mind as to be a defense in a criminal action, and a question of fact, to be submitted to the jury, as to whether a person at the time of the commission of a criminal act is or is not in such a mental condition; that in every case there must be a legal definition of the term insanity, which may or may not coincide with the state of medical knowledge then existing (but must, in the nature of things, be largely dependent upon it); and that it is for the jury in every case to decide, from all the evidence submitted to them, whether the accused was in a state of insanity, as defined by law.

The knowledge which sane people have of the workings of their own mind is at best extremely imperfect, and their power of expressing that knowledge still more imperfect; and when we undertake to ascertain the mental condition of another, and to judge whether he is capable of understanding and appreciating things as understood and appreciated by a sane mind, and, what is vastly more difficult, to determine whether he was at any particular instant capable of resisting an impulse to do an act committed by him, and known by him to be a violation of the law of right and wrong (which in some jurisdictions is a defense to a criminal action), we undertake a task the difficulties of which can not well be overestimated. Moreover, it is recognized that no distinct border line can be drawn between sanity and insanity; that we can not say exactly when the transit occurs from mere eccentricity to loss of mental equilibrium, exactly when weakness of mind passes into confirmed imbecility. Signs, symptoms, and acts must be grouped, evidence must be cumulative and plenary before any judgment can be safely pronounced, since in no department of human evidence is there such a field for debate and contention over premises, over the relative weight of facts, and over the conclusions which can logically be deduced from them. It is here that most commonly occurs the fallacy of commuting the subjective with the objective, of thinking as we feel, and, reasoning alone from one's own consciousness, of judging another by the rule of one's own life and the standard of one's own feelings; and thus it is that each may judge erroneously. Thus, according to the standard by which the miser regulates his conduct, the extravagant are insane; according to the opinion of the extravagant, the miser is insane. This being the case, the largest latitude is allowed in the introduction as evidence of the acts, sayings, habits, physical characteristics, and antecedents and environments of the subject of examination; and experts skilled in diseases of the mind and body are employed to give their opinions as to whether such a person as the evidence shows the accused to have been is sane or not.

The real question in any case, however, resolves itself into whether the accused was capable of a criminal intent at the time of his act. The object of the law at any stage of development is to protect from punishment as criminals those who, according to the state of knowledge then existing, were incapable of a criminal intent. Accordingly, in the early legal authorities and cases on this subject, we find it there treated in a way as crude as the notions of the nature and causes of insanity were then meager and erroneous. It is no doubt true that many insane persons were formerly convicted and punished for alleged crimes, and that some are still so convicted and punished, but this is never intended. It is attributable to the difficulty inherent in the nature of the acts, and to the difficulties in discriminating between mental disease and criminal perversion, to difficulties in testimony and infirmities in tribunals. "Such results are the misfortune and accident of criminal administration."

The undeveloped state of the law on this subject in the early authorities is illustrated by the fact that Lord Coke mentions the subject of madness only in the most casual and fragmentary manner, and Lord Hale (Hale *On Pleas of the Crown*, 29–37) has a chapter upon it in which he makes a distinction between total and temporary insanity, and says, "It is very difficult to define the invisible line that divides perfect and partial insanity; but it must rest upon circumstances duly to be weighed by judge and jury, lest, on the one side, there be inhumanity toward the defects of human nature, or, on the other side, too great an indulgence given to great crimes"; and later on he says, "The best measure I can think of is this: such a person, as laboring under melancholy distempers hath yet ordinarily as great understanding as ordinarily a child of fourteen years hath [fourteen years being the age of presumed capacity of criminal intent], is such a person as may be guilty of treason or felony." This crude conception of the nature of insanity, shown by a comparison of the workings of a mind "laboring under melancholy distempers" to the healthy mental activity of a boy of fourteen, is again shown at the trial and conviction (in 1723) of one Arnold, in which the judge, in instructing the jury as to what constituted insanity, said: "It is not every kind of frantic humor, or something unaccountable in a man's actions, that points him out to be such a madman as is exempted from punishment. It must be a man that is totally deprived of his understanding and memory, and doth not know what he is doing, no more than an infant, than a brute or a wild beast—such a one is never the object of punishment." (16 *State Trials*, 695.)

Tracing the development of the law from this case to the present time in the statements of the law as made by judges in charging the jury (which, to be sure, must be read with due allowance for the circumstances of the case in which the charges were made, and the difficulty of exact expression), we can trace a gradual abandonment of the earlier and harsher doctrine in accordance with the increasing knowledge of the subject of insanity. Owing to this gradual change and the lack of a recognized authority, the practice of the courts of England was without actual uniformity until the trial in 1843 of McNaughten, who mistook a Mr. Drummond for Sir Robert Peel, and shot him under influence of an insane delusion that Sir Robert Peel was one of a number of persons following him everywhere, blasting his character, and making his life wretched. McNaughten had transacted business a short time before, and had shown no obvious symptoms of insanity in his ordinary conduct; he was, however, acquitted on the ground of insanity. Much discussion took place in consequence, and the House of Lords put to the judges certain questions respecting insanity as criminal defense, and received in reply certain answers which have been accepted and acted upon ever since they were given, although some eminent judges question their authority.

These answers in effect were: (1) That a person laboring under an insane delusion, but otherwise sane, is criminally responsible if he knew that the act he was performing was contrary to the law of the land, or if a sane person would be responsible in a state of facts the same as those imagined to exist by the person under the influence of the delusion. (2) That every man is presumed to be sane, and to possess a sufficient degree of reason to be responsible for his crime, until the contrary be proved to the satisfaction of the jury; and that to establish a defense on the ground of insanity, it must be clearly proved that at the time of committing the act the accused was laboring under such a defect of reason from disease of the mind as not to know the nature and quality of the act he was doing, or if he did know it, that he did not know that he was doing wrong.

Under these rules, which may be taken as outlining the law on this subject in a large number of the U. S., the defense of irresistible impulse to do what is known to be mor-

ally wrong and what is legally a crime can not be set up, for "if the accused was conscious that the act was one which he ought not to do, and if that act was at the same time contrary to the law of the land, he is punishable."

This denial of the right of a person who knows the wrongfulness of an act to set up as a defense that he was under an insane and irresistible impulse to do it, has given rise to bitter denunciation of the law by medical writers, who are practically agreed that such a condition of the mind may, and not infrequently does, exist, and who maintain that a person in such a condition is as helpless to refrain from his act, and as irresponsible for it, as is a person who commits a crime under irresistible physical compulsion. Acting upon the assumed truth of this proposition, the courts of Scotland and those of a number of the U. S. have recognized this as a defense in criminal actions.

Responsibility of the Insane for their Torts.—Insane persons, as well as other incompetent persons, have always been held responsible for damages resulting from their tortious acts, and all of the usual remedies have been afforded against them. There may be some appearance of hardship in holding a person afflicted with mental weakness or alienation responsible in damages for the results of his acts by which the rights of another are invaded, but which for want of control of his reason he was unable to avoid or to foresee the natural consequences of. The question of liability, however, in these cases is one of public policy, which is settled by consideration of what, on the whole, is for the best interests of the community. The injured party to whom the law gives damages is no less innocent than the demented tort-feasor, and there seems to be no more propriety or justice in making them bear the loss or injustice resulting from his acts than there would be in calling upon them to pay the expenses of his confinement when his estate is sufficient to defray them. There are, however, many cases in which the responsibility of an insane person for his torts is not co-extensive with that of persons who are incompetent. These are those in which a malicious intent can be made the basis of punitory or vindictive damages for an act done by a sane person, and those in which a malicious intent is a necessary ingredient to constitute a tort. Here the insane person is held responsible only for the actual damages suffered by the injured party; he being held incapable of having a malicious intent, as in the case of false imprisonment where no vindictive damages can be recovered. So he is held incapable of malicious prosecution or libel, as the malicious intent is a necessary ingredient of these torts.

Insanity as Affecting Contractual Capacity.—The essence of a contract is the "meeting of the minds" of the contracting parties, and in order to render a person incapable of making a binding contract there must be, at the time of contracting, such a state of insanity or mental weakness as to make him incapable of comprehending the nature and consequences of his act, and therefore disqualify him from transacting business and managing his property. The contracts of such persons are voidable and not void, except as provided by statute.

When a contract is entered into between a person of unsound mind and another who deals with him *bona fide*, not knowing his weakness, and for a valuable consideration, the contract can not be rescinded either by the lunatic or his successors unless the parties can be put in *statu quo*. Where one deals with such a person knowing his incapacity fraud is conclusively presumed, and the contract is voidable at the option of the incapable person. When a person has been legally adjudicated to be a lunatic or incompetent, and a guardian or committee appointed, this act is in the nature of a proceeding *in rem*, and in the U. S. all persons are conclusively held to have constructive notice thereof, but in England an inquisition is only presumptive evidence as to third parties.

The question of capacity being as to whether the person was competent to do the act in question with an understanding of its nature and effects, the degree of intellectual capacity which will suffice to enable a person to perform an act legally valid varies with the nature of the subject-matter, and so it has been held that a person may be competent to make a will who would not be competent to enter into a contract where he would have to guard against being overreached by the other party. A contract is not voidable because of the presence of delusions, unless it is found that the delusion affected the making or disposition of the contract.

A person who is intermittently insane may bind himself by contracts during his lucid intervals, unless he has been adjudicated a lunatic, in which case he is incapacitated from all ordinary contractual dealings, but may make a valid will, if actually lucid at the time of execution. The preponderance of authority is that a lunatic is liable for necessaries furnished to him, similarly to an infant, but the laws of different jurisdictions on this and other points relative to the rights of the parties under an executed contract are not clearly settled, and a review of the cases here is precluded by the lack of space.

Custody and Care of the Persons and Property of the Insane.—At common law in England the sovereign by its prerogative as *parens patriæ* has a right to the care and custody of the persons and estates of the insane ("lunatics and idiots"), but from early times this right was exercised by delegating his authority to some great officer, usually the Lord Chancellor (*q. v.*). In the U. S. the care of these persons, aside from statutes, therefore, is in the courts of chancery or equity. In Great Britain (53 Vict., c. 5), however, and in most of the U. S., this matter is now regulated by statutes prescribing the conditions under which and the methods by which a person shall be deprived of his personal liberty or the management of his property by reason of mental incapacity.

A person's power over his property, and much more over his own person, will not be taken from him until it is abundantly shown that its further exercise is incompatible with personal safety or pecuniary welfare.

The subjects of a state, not being necessarily dangerous to themselves or to the community, it would be wrong to deprive them of their liberty or the control of their property from the simple fact of mental unsoundness, until it was first shown that some form of guardianship was necessary for their well being, and the law will always secure to them their personal rights to the fullest extent commensurate with their ability to enjoy them, and with the best interests of the community, taking into consideration in deciding any given case the variable factors of age, health, previous education, employment, future exigencies, etc., which bear upon his relation to the public welfare.

For a fuller treatment of the subjects here touched upon, see the authorities referred to in the article Jurisprudence (Medical), and see Stephen's *History of the Criminal Law of England*; the works of Wharton, Bishop, Archibald, and others *On Criminal Law*; Maudsley *On Responsibility in Mental Disease*; Spitzka's *Manual of Insanity*; Ordronaux *On the Judicial Aspects of Insanity*; Brett's *Commentaries on the Present Laws of England*; Cooley *On Torts*; Pollock *On Torts*; Broom and Hadley, *Commentaries on the Laws of England*; Parsons *On Contracts*; Anson's *Principles of the Law of Contracts*; Jarman *On Wills*; and the text-books on the various special subjects.

F. Sturges Allen.

Inscriptions [from Lat. *inscrip'tio*, inscription, liter., a writing in or on; deriv. of *inscri'bere*, write on or in; *in*, on, into + *scri'bere*, write, whence Eng. *scribe*, *scribble*, *Scripture*]: language inscribed, sculptured, written, painted, or impressed upon stone, clay tablets, mortar, wood, metal, or materials other than the fragile ones commonly used for books. Rocks are the earliest, stone the principal, material employed, and most civilized nations of antiquity used inscriptions for official and other records and as a means of publication. Extant inscriptions occur in all the varieties of writing, from the primitive picture-writing and its derived hieroglyphic (mixed symbolic and syllabic) to the syllabic and alphabetic. In the East the oldest inscriptions are probably the Babylonian, dating pretty certainly as far back at least as B. C. 1200. These exhibit the breaking down of the hieroglyphic into the syllabic, but mainly exist in the cuneiform—a syllabic writing used also for the Assyrian, Median, Persian (here nearly or quite alphabetic), and other languages on the confines of Armenia. See the article Cuneiform Inscriptions.

The Egyptian inscriptions, which begin about as early as the Babylonian, are in hieroglyphics, together with a derived and later hieratic and demotic, and continue till about the Christian era. The key to these was found in the Rosetta Stone (second century B. C.), now in the British Museum, containing a decree of priests at Memphis, written in hieroglyphic, demotic, and Greek; and later in the Tanis Stone, or Tablet of San (third century B. C.), containing a like trilingual decree of priests at Canopus. The conspicuous use of inscriptions in Egypt was more extensive than elsewhere, the walls of tombs, temples, and other buildings being

covered with them. The Egyptian, like the cuneiform, inscriptions form a vast body of invaluable literature. Though the key was discovered in 1822, it was not till after 1860 that satisfactory general decipherment was attained.

Hieroglyphic inscriptions also occur in those called by the provisional name of Hittite, found at Aleppo, Carchemish, Marash, etc., but no real decipherment has yet been made.

Picture-writing, on rocks and trees, was practiced by the North American Indians, was a familiar fact to the early settlers from Europe, and is hardly gone out of use. Specimens on rocks are still extant. Actual hieroglyphs exist on stone and other monuments in Mexico and in Central and South America, but probably do not date much earlier than the discovery of America.

From the Egyptian hieroglyphs probably, though the matter is still contested, sprang the Phœnician alphabet, which is the demonstrated parent of nearly all known alphabetic writing. Inscriptions in this character, but in several languages, occur, sometimes as bilingual with Greek and other languages, all the way from Mesopotamia to Spain, and on both sides of the Mediterranean; those of Egypt and Mesopotamia being generally older, and in an Aramaic language; those of Sidon and the Phœnician coast, Cyprus, Carthage, Sicily, France, and Spain, in the Phœnician language, and later than the Aramaic above; while the shores and islands toward the west of the Mediterranean furnish also a degenerate Neo-Punic form. The oldest inscription in this character is the Mesha inscription, on the famous Moabite Stone, found at Dhiban. This, with the later Siloam inscription, cut in the rock of the Siloam tunnel at Jerusalem, of the time probably of Hezekiah, are substantially Hebrew, and almost the only Hebrew inscriptions earlier than the Christian era. The earliest Aramaic inscriptions in this character are dockets on clay cuneiform tablets of the time of Tiglath-Pileser II., with some legends on gems and other Mesopotamian objects. The longest Phœnician inscription proper, and the most important monument of the language, is on the sarcophagus of Eshmunazar (fifth or sixth century B. C.), found at Sidon, and now in Paris. The Phœnician inscriptions are usually mortuary, proprietary, dedicatory, or official; their importance being especially great for the history of writing, though invaluable in other respects. The body of Phœnician inscriptions, however, is comparatively small in extent; so much so that great uncertainty exists with respect to the lexical and grammatical details of the language. They continue till about the Christian era. Bilinguals, chiefly Phœnician and Greek, furnished the key to the language. Among other Semitic inscriptions are to be mentioned the Palmyrene (first century B. C. and later), mostly mortuary, in a character approaching the square Hebrew; found at Palmyra, but also in Africa, Rome, and even in Great Britain. Inscriptions in the old Syriac character have been found at Zebed, near Palmyra, and among early Christian tombs at Edessa. Aramaic, of various shades and dates, in characters varying from the old Phœnico-Aramaic to the Syriac, have been found in Syria and Arabia; Nestorian-Syriac in China (bilingual with Chinese, eighth century); Cufic and Arabic throughout the regions where Mohammedanism has prevailed; Himyaritic in South Arabia, along with a few Ethiopic; and a few, undeciphered, in a character resembling the Himyaritic, at Jedda. Here, too, are to be mentioned the peculiar graffiti, intermediate between the Phœnician and Himyaritic, in the desert of Safa, S. E. of Damascus, shown to have been the work of Thamudite Roman soldiers; also the various graffiti in the Wady Mokatteb and other wadies of the Sinaitic Peninsula, mostly the work of pilgrims or travelers, in various languages, but principal among which are the Nabatean, not older than 300 B. C.

The inscriptions of India are very numerous and of great variety. Those of Asoka, on rocks and pillars, and in caves, formerly supposed to be vastly older, are now known to belong to the third century B. C. Following them are the inscriptions of the Indo-Scythic kings, about the time of the Christian era; then a succession of short ones, down to Mohammedan times. The Mohammedan inscriptions in India are not numerous, but are useful in settling dates and for kindred matters.

Chinese inscriptions go back at least to 1200 B. C.; those of Indo-China and Japan are more recent.

With rare exceptions, all the other inscriptions of Asia, except Asia Minor, belong within the Christian era. In Asia Minor exist the inscriptions of Lycia and other provinces, of which the alphabet has been partially deciphered from the Greek proper names; but the languages themselves are not yet mastered. A nearly similar remark applies to the very numerous Etruscan inscriptions. In Cyprus have been found a large number of inscriptions in a syllabic character, called Cypriote, of which the most numerous collection was obtained by Gen. L. P. di Cesnola, and is now in New York. Their language is a peculiar dialect of Greek, the key having been found in a bilingual inscription, Cypriote and Phœnician, of Melekyathon, King of Citium and Idalium, discovered at Dali, and now in the British Museum. They date from about 900 B. C. down nearly to the Christian era—the bilingual inscription being of the fourth century B. C.; the bronze tablet of Dali, now in Paris, the most important monument of the writing, dating from the Persian wars; and the Cesnola inscriptions belonging mostly to the fourth century B. C. The Cypriote inscriptions occur on stone, pottery, metal, and gems, and are usually public documents, or dedicatory, mortuary, or proprietary.

More important than any others, however, are the Greek and Roman inscriptions; the Greek embodying not only matters pertaining to Greece proper, but those of the Roman empire in its widest and later sway. Both the Greek and Roman exhibit the progress and gradual changes of their alphabets from the Phœnician, and often give decisive clews to their age from the form of the letters employed. While the Romans usually engraved their laws and other public documents in bronze, which therefore have mainly perished, the Greeks used chiefly marble, and the remains are much richer. A few inscriptions on bronze, lead, and gold have come down to us, but multitudes of the sort must have perished through war, fire, or plunder. Excluding legends on vases, coins, and small articles, it is estimated that about 30,000 Greek inscriptions are known; so that Boekh's famous *Corpus*, which contains 10,000, though invaluable and not to be superseded, covers but a fraction of the ground.

Greek inscriptions were usually set up in temples, theaters, by the side of roads, and other conspicuous places. At Delphi and Olympia were immense numbers, both dedicatory, public, and governmental; e. g. at Delphi the decrees of the Amphictyonic Council, at Olympia international documents concerning the Peloponnesian cities. The Parthenon and Acropolis at Athens were crowded with laws and treaties concerning the Athenian confederation. The Artemision at Ephesus, and indeed every sanctuary, abounded with decrees and other inscribed public records. The Ancyrean marble, the edict of Diocletian, and kindred documents, were duplicated and set up in various places, so that the complete texts have been restored from fragments found in widely diverse regions of the empire. "Every temple and theater was a muniment-room." Walls also, perhaps built for the purpose, recorded the Cretan laws in earlier times. The inscribed records were cited continually as evidence and authority by the Greek orators and historians, as we cite books. The inscriptions, too, are often seen to be the direct source of matter given by a historian, even though not formally cited by him.

The oldest Greek inscriptions seem to date from the seventh century B. C. The famous one on the leg of a colossal statue at Abu Simbel can not possibly be later than 590 B. C., and may be much older. A complete account and discussion of Greek inscriptions would embody scarcely less of Greek history and its underlying documents than is contained in the extant historians themselves, to say nothing of matters religious and of private life, and the study of Greek dialects. The finest collection of Greek inscriptions is at Athens; but those of the museums of Western Europe, especially England, are of value second to none; nor are those in the U. S. without importance.

Roman inscriptions, beside those incidentally mentioned above, have been found in vast numbers throughout the extent of the Roman empire, especially in the west, though the bulk of them are preserved in museums and other collections. Some are preserved only by copies in publications of the sixteenth and seventeenth centuries. Less mention of ancient inscriptions is made by Roman than by Greek authors. The alphabet used by the Romans was identical, so far as it went, with that of the Chalcidian colonies in Southern Italy. Later inscriptions, especially the Christian ones, are rendered difficult to read by reason of the abbreviations. Some of the latter are among the very hardest to decipher among known inscriptions. In some abbreviations the feminine gender is marked by a reversal of the letters. In the publications embodying Latin inscriptions, the arrangement followed, and the most natural,

is the geographical, a grouping of subjects being hardly practicable, except under such heads as "Christian," under which we have many collections, some of them most ably wrought out.

The oldest Roman inscriptions (in the stricter sense, excluding legends on coins and small objects) are the sepulchral, either on tombs or crematory urns; and in these the oldest and simplest form of legend remained down to Christian times, the more elaborate epitaph generally coming in later, and increasing in length and matter as time rolled on. The number of Latin mortuary inscriptions is immense. Inscriptions dedicatory and commemorative, the latter especially for bridges, roads, aqueducts, public works and buildings, boundary stones, wills, deeds, laws, edicts, treaties, and the various matters grouped under the head of *instrumentum* —these form the bulk of the rest. The latter sort are mostly preserved only in fragments, and require great skill and experience for their correct interpretation. The date of the *instrumenta* is mostly early; and, even in their mutilated form, they are of indispensable importance for general Roman history and the proper understanding of private life and antique remains.

In numismatics, the inscription means the letters in the area; not the legend round the device nor in the exergue, the space below it. In modern times inscriptions are mostly sepulchral, dedicatory, or commemorative, printing having superseded them for purposes of publication. For palæography, history, chronology, geographical sites, the understanding of social and municipal conditions and relations, the determining of the relative antiquity of ancient remains, and, in short, for almost everything relating to the past, inscriptions are of the highest importance. Isaac H. Hall.

Insect Fertilization: the fertilization of flowers by the agency of insects. One of the most significant modern discoveries in the domain of vegetable physiology is that the services of insects are indispensable for the fertilization of numerous kinds of flowers, which are so constructed that the pollen can not pass without external aid from the stamens to the pistils of the same plant, much less to those of other plants. Hence these flowers are provided with a nectar which attracts insects, and is so placed that to reach it they must first come in contact with the stamens, from which the pollen adheres to the insect's body, and is communicated in the same manner to the pistils of the same or of other flowers. The popularization of these facts is chiefly due to Charles Darwin, who, in his monograph on the *Fertilization of Orchids* (1862), exhaustively traced the operations of insects in relation to a single botanical family. See also his *Different forms of Flowers in Plants of the same Species*; *Effects of Cross and Self-fertilization in the Vegetable Kingdom*; Asa Gray's *How Plants Behave*; and Hermann Müller's *The Fertilization of Flowers*.

Revised by Charles E. Bessey.

Insecticide: a material used for destroying insects. Since 1870 there has been a remarkable increase in the number of insecticidal substances and compounds, and a noteworthy popularizing of knowledge relating to insect friends and enemies. This is especially true in horticulture, where every effort must be made to destroy those insects which defoliate the plants and injure the fruit. The increased need of attention to insect pests has developed several new or improved devices and methods for fighting them. The chief advance is the advent of the spray-pump and the application of poisonous substances in a water-mist. In fact, spraying for insects and fungi undoubtedly marks a new era in horticulture. (See Fungicide.) The U. S. lead the world in the invention of competent means to combat insect enemies. The arsenites, in the form of Paris green and London purple, are now the most prominent insecticides for biting or chewing insects, as beetles and caterpillars. For the sucking insects, as the true bugs, the various kerosene emulsions are commonly used, especially for the plant-lice or aphides. The scale insects are combated by various sulphur and soap washes. In the greenhouse the plant-lice are the most serious insect pests, and they are usually kept in check by fumigations of tobacco, although various emulsions may be used to advantage. For flies in the dwelling-house, pyrethrum is perhaps the most common remedy. A new means of fighting insects has been employed with success in the importation of predaceous or parasitic species to prey upon the noxious ones. The introduction of the Australian ladybird beetle (*Vedalia cardinalis*) into California has resulted in the destruction over large areas of a serious orange-tree scale insect. The possibilities of this method of fighting insects are undoubtedly very great. The leading insecticides now in use are the following:

Paris Green.—An aceto-arsenite of copper. When pure it contains about 58 per cent. of arsenic, but the commercial article usually contains less, often as little as 30 per cent. The following may be considered an average analysis: Arsenic, 47·68 per cent.; copper oxide, 27·47; sulphuric acid, 7·16; moisture, 1·35; insoluble residue, 2·34. It is applied in either a wet or dry condition, but in any case it is usually much diluted. For making a dry mixture, plaster, flour, air-slaked lime, road-dust, or sifted wood-ashes may be used. The strength of the mixture required depends upon the plants and insects to which it is to be applied. The strongest mixture recommended is 1 part of poison to 50 of the diluent, but if the mixing is very thoroughly done, 1 part to 100 or even 200 is sufficient. With recent machines, which distribute the material very thinly, Paris green is sometimes applied to potatoes without dilution.

Paris green is practically insoluble in water. When mixed with water the mixture must be kept in a constant state of agitation, else the poison will settle and the liquid from the bottom of the cask will be so strong as to do serious damage, while that from the top will be useless. For potatoes, apple-trees, and most species of shade-trees, 1 lb. of poison to 200 gal. of water is a good mixture. For the stone fruits, 1 lb. to 300 gal. of water is a strong enough mixture. Peach-trees are very apt to be injured by arsenites, and for them the mixture should be no stronger than 1 lb. to 300 gal. In all cases the liquid should be applied with force in a very fine spray. At some seasons of the year foliage is more liable to injury than at others.

London Purple.—An arsenite of lime, obtained as a by-product in the manufacture of aniline dyes. The composition is variable. The amount of arsenic varies from 30 to over 50 per cent. The two following analyses show its composition: 1. Arsenic, 43·65 per cent.; rose aniline, 12·46; lime, 21·82; insoluble residue, 14·57; iron oxide, 1·16; and water, 2·27. 2. Arsenic, 55·35 per cent.; lime, 26·23; sulphuric acid, ·22; carbonic acid, ·27; moisture, 5·29. It is a finer powder than Paris green, and therefore remains longer in suspension in water. It is used in the same manner as Paris green, but is sometimes more caustic on foliage. This injury is due to the presence of much soluble arsenic. London purple should not be used on peach-trees.

Combinations of Arsenites and Fungicides.—The arsenites may be used in connection with some fungicides, and both insects and plant-diseases in this manner may be combated at the same time. An ounce of the arsenites may be added to 10 gal. of Bordeaux mixture for potatoes, and other combinations will occur to the operator. The arsenites are also sometimes added to soap and other washes.

The addition of lime to Paris green and London purple mixtures prevents injury to foliage, and, as a consequence, they can be applied several times stronger than ordinarily used when combined with Bordeaux mixture. The free lime in the mixture combines with the soluble arsenic, which is the material that injures the foliage, and the combination is thus made harmless.

Bisulphide of Carbon.—A thin liquid which volatilizes at a very low temperature, the vapor being very destructive to animal life. It is exceedingly inflammable, and should never be used near a lamp or fire. It is used for many root insects. It is poured into a hole, which is immediately closed up, and fumes permeate the soil in all directions. In loose soils it is very destructive to insects. It is also inserted in tight receptacles, to kill such insects as pea-weevil and museum pests.

Kerosene Emulsion.—1. Soft soap, 1 quart, or hard soap —preferably whale-oil soap—½ lb.; 2 quarts hot water; 1 pint kerosene. Stir until all are permanently mixed, and then dilute with water to one-half or one-third strength. A good way to make the emulsion permanent is to pump the mixture back into the receptacle several times. This makes a permanent emulsion with either hard or soft water.

2. Hard soap, ½ lb.; boiling water, 1 gal.; kerosene, 2 gal. Churn or pump the ingredients vigorously for fifteen or twenty minutes. Dilute ten times when using. This is the Hubbard or standard emulsion for scale of the orange. Two oz. balsam of fir added to the above appears to increase its efficiency, and it causes it to adhere to foliage better. Half a pint of spirits of turpentine is sometimes added.

3. Pyrethro-kerosene emulsion. In the place of pure kerosene in the above emulsions, use a kerosene decoction

of pyrethrum, made by filtering 1 gal. of kerosene through 2¼ lb. of pyrethrum. Valuable.

Kerosene and Milk Emulsion.—Sour milk, 1 gal.; kerosene, 2 gal.; warm to a blood heat and mix well. Dilute ten times with water. For scale insects and plant-lice.

Kerosene and Condensed Milk Emulsion.—Kerosene, 2 gal., or 64 per cent. of the entire mixture; condensed milk, four cans of ¾ pint, or 12½ per cent.; water twice the quantity of milk, or 25 per cent.

Lye Wash.—One lb. concentrated lye, or potash 1½ lb., to 3 gal. of water. On an average, 1 bush. of good wood-ashes contains about 4 lb. of potash. For scale insects and the bark-louse of the apple.

Common home-made lye is often diluted with water and applied to apple-branches with a brush as a remedy for the bark-louse. It is also recommended as a remedy for the cabbage-worm, being sprinkled on the cabbages with a watering-pot. If concentrated lye is used, a pound should be diluted with a barrel of water.

Pyrethrum.—A very fine light-brown powder made from the flower-heads of species of pyrethrum. It is scarcely injurious to man. Three brands are sold: *Persian insect-powder*, made from the heads of *Pyrethrum roseum*, a species now cultivated as an ornamental plant. The plant is native to the Caucasus region. *Dalmatian insect-powder*, made from *Pyrethrum cinerariæfolium*. *Buhach*, made in California from cultivated plants of *P. cinerariæfolium*.

When fresh and pure, all these brands appear to be equally valuable, but the home-grown product, or Buhach, is usually considered most reliable. Pyrethrum soon loses its value when exposed to the air. It is used in various ways:

1. In solution in water, 1 oz. to 3 gal.
2. Dry, without dilution.
3. Dry, diluted with flour or any light and fine powder. The poison may be used in the proportion of 1 part to from 6 to 30 of the diluent.
4. In fumigation. It may be scattered directly upon coals, or made into small balls by wetting and molding with the hands and then set upon coals. This is a desirable way of dealing with mosquitoes and flies.
5. In alcohol. (1) Put 1 part of pyrethrum (Buhach) and 4 parts alcohol, by weight, in any tight vessel. Shake occasionally, and after eight days filter. Apply with an atomizer. Excellent for greenhouse pests. For some plants it needs to be diluted a little. (2) Dissolve about 4 oz. of powder in 1 gill of alcohol, and add 12 gal. of water.
6. Decoction. Whole flower-heads are treated to boiling water and the liquid is covered to prevent evaporation. Boiling the liquid destroys its value.
7. Water extract. Pour 2 quarts hot water through about a half pound of pyrethrum, held in a coarse bag, and then add cold water enough to make 2 gal.; it is well to stir in the powder itself. For aphis and cabbage-worms. It will keep but a few days. Or the extract can be made as follows: Make a paste of two tablespoonfuls of pyrethrum by adding water. Stir this into 2 gal. of water and apply with a fine nozzle. This is recommended for the rosechafer.
8. Pyrethro-kerosene emulsion. See under *Kerosene Emulsion* above.

Sulphide of Soda Wash (Hilgard's).—Dissolve 30 lb. of whale-oil soap in 60 gal. of water, by heating the two together thoroughly. Then boil 3 lb. of American concentrated lye with 6 lb. of sulphur and 2 gal. of water. When thoroughly dissolved it is a dark-brown liquid, chemically called sulphide of soda. Mix the two—the soap and the sulphide—well, and allow them to boil half an hour. Then add about 90 gal. of water to the mixture, and it is ready for use. Apply it warm by means of a spray-pump. Used warm, its effect is better and less material is required than when cold. For scale on deciduous trees in summer. (Californian.)

Sulphur.—Fumes of sulphur are destructive to some insects, but should be carefully used or plants will be injured. The sulphur should be evaporated over an oil-stove until the room is filled with the vapor. The sulphur should never be burned, as burning sulphur kills plants. In greenhouses it is often spread upon the heating pipes, but more as a fungicide than insecticide.

Tobacco.—Used in the following ways:

1. Tobacco-water, used with whale-oil soap.
2. Dust.
3. Fumes. Burn dampened tobacco stems.
4. Nicotyl. Steep tobacco-stems in water and evaporate the water.
5. Tea, or common decoction. Boil the stems or dust thoroughly, and strain. Then add cold water until the decoction contains 2 gal. of liquid to 1 lb. of tobacco.

Whale-oil Soap.—One lb. of whale-oil soap to 5 gal. of water. For mealy bugs and similar insects. It will injure some tender plants.

White Hellebore.—A light-brown powder made from the roots of the white hellebore plant (*Veratrum album*), one of the lily family. It is applied both dry and in water. In the dry state it is usually applied without dilution, although the addition of a little flour will render it more adhesive. In water 1 oz. of the poison is mixed with 3 gal. Hellebore soon loses its strength, and a fresh article should always be demanded. It is much less poisonous than the arsenites, and is therefore substituted for them when an insecticide is needed on fruits or vegetables which are nearly mature.

L. H. Bailey.

Insectiv'ora [Mod. Lat., neut. plur. of *insecti'vorus*, insect-eating, insectivorous; *insec'tum*, insect + *vora're*, eat, devour]: an order of ineducabilian placental mammals whose anterior as well as posterior limbs are primarily adapted for walking, although they may be secondarily modified for other purposes. The carpal bones of the proximal as well as distal rows, and the metacarpal as well as phalangeal bones, are normally differentiated and developed; the ulna and radius are more or less distinct; clavicles are always present and well developed; the hind limbs are normally related to the pelvis, and their elements to each other; no calcar or spur-like appendage above the ankle is developed; the lower jaw has well-defined condyles, which are more or less transverse, and are received into special glenoid pockets. The teeth are diphyodont, and are of three kinds (i. e. canines, molars, and incisors), but are more or less aberrant from the typical forms; the molars in the most familiar types have sharp-pointed cusps. The placenta is deciduate and discoidal. The order is divisible into two sub-orders—(1) *Dermoptera*, including the *Galeopithecidæ*, or flying lemurs; and (2) *Bestiæ*, including all the other members of the order. These sub-orders are chiefly based on modifications of the anterior members and of the dentition. (1) The *Dermoptera* are insectivores with members modified for flight or progression in the air, the limbs being much elongated and very slender, and connected by an extension of the skin which involves the wrists and ankles and advances forward to the neck, and backward inclosing the tail; the condylar portion of the lower jaw extends outward; the incisor teeth of the lower jaw are palmate and deeply pectinated, while those of the upper jaw, as well as the anterior molars of both jaws, are compressed, and have multicuspid crests. (2) The *Bestiæ* are insectivores with members modified for walking or progression on the ground, the limbs being comparatively short and robust and free; the condylar portion of the lower jaw does not extend outward; the incisor teeth of the lower jaw are conical and not pectinated; those of the upper jaw, as well as the anterior molars of both jaws, more or less conic, and with unilobate crowns. The *Bestiæ* are divided into eight families—viz. *Tupayidæ*, *Macroscelidæ*, *Erinaceidæ*, *Talpidæ*, *Soricidæ*, *Centetidæ*, *Potamogalidæ*, and *Chrysochloridæ*. These types are limited to the northern hemisphere, Asia, and Africa, only one (*Centetidæ*) being represented in Cuba and Haiti, and none in South America or Australia.

Theodore Gill.

Insectivorous Plants, or **Carnivorous Plants** [*insectivorous*, from Lat. *insectum*, insect + *vorare*, devour; *carnivorous*, from Lat. *caro*, *carnis*, flesh + *vorare*, devour]: plants which feed or subsist on insects or other small animals. It has long been known that many plants have devices by means of which they capture insects, but not until within a comparatively short period has it been known that in many cases these captures are actually used as food by the plants. One of the most remarkable of the insect-catching plants is the Venus's fly-trap (*Dionæa muscipula*) of North Carolina, whose leaves close instantly, like miniature rat-traps, when certain irritable hairs upon their upper surface are touched. The captured fly is held until its soft parts have been digested and absorbed by the leaf, when the latter opens again. (See Dionæa for description and figure.) *Aldrovandra*, a tiny floating plant of Central Europe, India, and Australia, is essentially a miniature *Dionæa*, with leaves closing in the same way, thus capturing minute water insects, crustaceans, etc. The sundews (*Drosera*, of 100 species of all parts of the world) are notable insect-catchers.

Their leaves are studded with glandular hair-like tentacles, which, in addition to secreting an extremely viscid, clear substance, are sensitive, and capable of considerable movement. When an insect comes in contact with the sticky

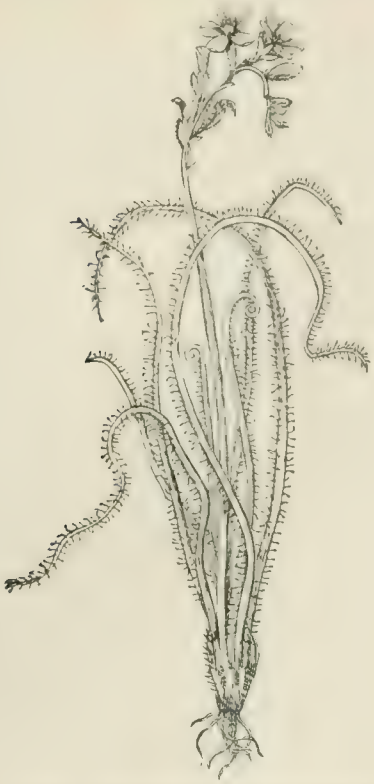


FIG. 1.—Sundew (*Drosera filiformis*) of the Eastern U. S.

tentacles they soon bend toward it, and this is followed by the bending of others, so that within a short time the insect is completely covered by the infolded tentacles. In the species with narrow leaves (Fig. 1), as the tentacles bend the leaf bends also, and finally becomes rolled around the captured insect.

The butterwort (*Pinguicula vulgaris*), a little plant found in wet, rocky places in Northern Europe, Canada, and the northern parts of the U. S., has thickish ovate or elliptical radical leaves, which curl inward from their margins when insects become attached to certain viscid glands of their upper surfaces. We have here a cruder structure of the kind so perfectly developed in the Venus's fly-trap.

Of quite a different kind are the various pitcher-like appendages to the leaves of many species of plants, the most familiar of which is the pitcher-plant (*Sarracenia purpurea*) of the bogs and swamps of Eastern North America (Fig. 3). The hollow leaves contain water, which in some species is, at least in part, a secretion by the plant. Above the opening the "hood" of the pitcher is covered with short, stiff bristles, which point downward, and the interior is itself lined for some distance with similar bristles. In some species drops of a sweet, honey-like exudation are found in a trail on the "wing" of the leaf from the ground to the mouth, inside of which are more scattered drops. Insects are thus lured to the region of sharp, downward-pointing hairs, which they cross to their destruction. The California pitcher-plant (*Darlingtonia californica*) attracts insects by a sweet secretion on a brightly colored appendage which hangs from the opening (Fig. 4). In the East Indian pitcher-plants (*Nepenthes*, thirty-one species) flies and other insects

FIG. 2.—Butterwort (*Pinguicula vulgaris*).

are caught and devoured in great numbers. This is also the case with the Australian pitcher-plant (*Cephalotus follicularis*) of the bogs of West Australia (Fig. 6).

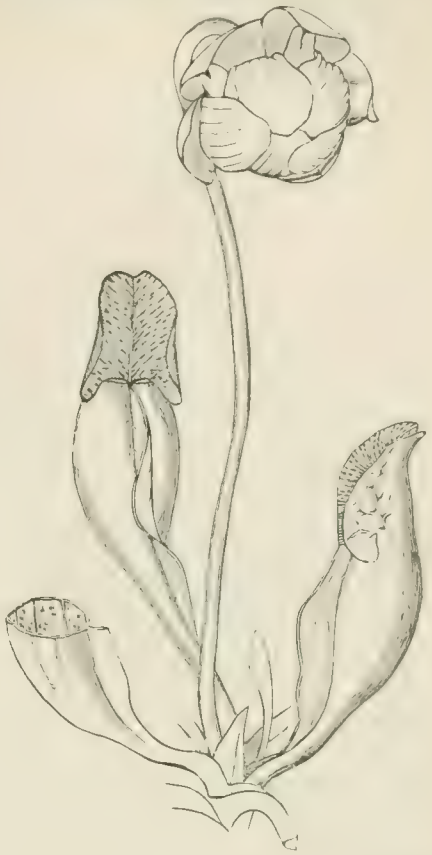


FIG. 3.—Pitcher-plant (*Sarracenia purpurea*), reduced.

Brief mention only need be made of the cups formed in some plants by the union of the bases of opposite leaves, as in the cup-plant (*Silphium perfoliatum*) of the Western prairies of the U. S. Dead insects are commonly found in the water in the cups, and Dr. Halsted has shown that they are probably digested and absorbed by the plant. The

FIG. 4.—California pitcher-plant (*Darlingtonia californica*).

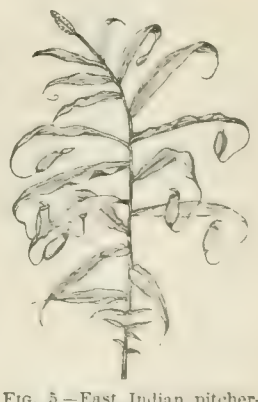


FIG. 5.—East Indian pitcher-plant (*Nepenthes phyllamphora*).

teasel (*Dipsacus*) has a similar structure, and probably is insectivorous also. The aquatic bladderworts (*Utricularia*, 160 species) bear curious little sacs ("bladders") on their dissected leaves, which float in the water (Fig. 7). The mouths of these are lined internally with bristles, which allow easy ingress to minute insects and other aquatic animals, but effectually prevent their egress. Many tiny crea-

tures are thus trapped, and it has been shown that the substance of their decaying bodies is absorbed and used by the plant. Many plants have belts of a sticky substance upon their branches, as in the catchfly (*Silene antirrhina*, etc.)

FIG. 6.—Australian pitcher-plant (*Cephalotus follicularis*).

and in a wire-grass (*Sporobolus heterolepis*), in which minute insects are captured in considerable numbers. It is noticed, finally, that the glandular-hairy stems and leaves of many plants, as the petunia, tomato, etc., are frequently

FIG. 7.—Bladderwort (*Utricularia*): A, fragment of a leaf; B, a bladder, enlarged.

covered with small insects. Whether in these cases the plants absorb nourishment from their captures is not known.

LITERATURE.—Gray's *How Plants Behave*, chap. iii. (1872); Charles Darwin's *Insectivorous Plants* (1875); *Darwiniana*, arts. x., xi. (1876); Halsted's, *Is the Cup-plant Insectivorous?* (1886). CHARLES E. BESSEY.

Insects: See ENTOMOLOGY, and the names of the orders and of important species of insects.

Insesso'res [Mod. Lat., plur. of *inses'sor*, percher, liter., one who sits upon, from Lat. *insede're*, *inses'sum*, sit upon; *in*, upon + *sede're*, sit: Eng. *sit*]: an ornithological term, variously used. By Vigors it was applied to those perching birds (other than the birds of prey) which have three toes in front and one behind. The group thus designated was artificial, including many of the *Picariæ*. The term is little used, and when used is synonymous with Passeres. F. A. L.

Insolvency [< Sp. *insolvéncia* < Lat. *in*, not + *solvere*, to pay]: popularly, the insufficiency of the entire property and assets of an individual to pay his debts. As generally used in statutes and legal proceedings the term expresses the inability of a person to pay his debts as they mature in the ordinary course of business. Hence one's debts may greatly exceed his assets, and yet, if his credit enables him to retire or renew his obligations as they fall due, he may not become liable to insolvency or bankruptcy proceedings.

In Great Britain.—Formerly a sharp distinction was made by the law of England between bankruptcy and insolvency. The former described the legal status of a trader who had been adjudicated a bankrupt; the latter was applied to persons who had been brought within the jurisdiction of the insolvent statutes. (*Queen* vs. *Saddlers' Company*, 10 House of Lords, cases 404, 454.) Such acts of Parliament had for their original object the discharge of the person of the debtor from arrest and imprisonment, but left his future acquisition still liable to the creditor. Later they provided for his discharge from indebtedness. Since 1861 all debtors have been allowed the advantages of the bankruptcy statutes and subject to their provisions, and the insolvency laws have been repealed. The distinction between the two terms has thus become obsolete. In England the Bankruptcy Act of 1883 (46 and 47 Vict., c. 52), as amended in 1890 by 53 and 54 Vict., c. 71, in connection with the Debtors' Act of 1869 (32 and 33 Vict., c. 62) and the Deeds of Arrangement Act of 1887 (50 and 51 Vict., c. 57), covers the entire field of insolvency and bankruptcy. By these acts any debtor not under legal disabilities, whether an English subject or denizen or a foreigner domiciled in England, may be adjudicated a bankrupt. Whether an infant or a lunatic is subject to such adjudication appears doubtful. The acts of bankruptcy recognized by this legislation are of eight classes, viz.: (1) A general assignment for creditors. (2) A fraudulent conveyance of property. (3) A fraudulent preference. (4) Absenting himself with intent to defeat or delay his creditors. (5) Levy of an execution on his goods. (6) Filing a declaration of his inability to pay his debts, or presenting a bankruptcy petition against himself. (7) Failing to comply with a bankruptcy notice to pay a judgment against him. (8) Notice to any creditor of suspension of payments. A discharge under the English act is pleadable in bar in any British court, although the statutes above enumerated do not generally apply to either Scotland or Ireland. Each of these members of the British empire has a bankruptcy and a debtors' act of its own. Chapter 79 of 19 and 20 Vict. (1856), c. 34 of 43 and 44 Vict. (1880), and c. 22 of 44 and 45 Vict. (1881) are the principal statutes on this subject relating to Scotland, while c. 58 of 35 and 36 Vict. (1872), amending c. 60 of 20 and 21 Vict. (1857), and the Debtors' Act of 1872 (c. 57 of 35 and 36 Vict.) govern bankruptcy and insolvency proceedings in Ireland. Each of these legislative schemes extends its bankruptcy provisions to all debtors not under legal disabilities, and in Scotland a minor or a lunatic is subject to its terms. Scotch law still distinguishes insolvency from bankruptcy. It defines the former with respect to creditors as the insufficiency of a debtor's estates, when fairly estimated, to meet his liabilities. A person in that condition can not make a gratuitous alienation of his property, nor grant preference to his creditors. He may, however, enter into composition contracts with them, or convey his property by a trust deed for their benefit, or may institute a cessio in the sheriff's court or in the court of the debtor's ordinary domicile. A debtor in cessio may obtain a judicial discharge from his debts, if he has paid or secured to his creditors five shillings per pound of his debts, or can show that his failure to pay this amount has arisen from circumstances for which he can not justly be held responsible. A notour bankrupt, as distinguished from an insolvent, is one who, being insolvent, has committed any of the enumerated acts of bankruptcy. These are substantially the same as those described in the English act. The effects of bankruptcy extend in Great Britain beyond the seizure and distribution of the property of the debtor to his disqualification for sitting or voting in the House of Lords, or for election as a peer of Scotland or Ireland in that house, or for election or membership in the House of Commons, or for office of justice of the peace, or of mayor, alderman, or councilor, or for certain other offices. This disqualification ceases if the adjudication is annulled, or if he obtains a discharge declaring that his bankruptcy was caused by misfortune without misconduct on his part.

In the United States.—No such distinction between bankruptcy and insolvency has been made in the U. S. as was formerly observed in England, and the terms are frequently treated as synonymous. However, bankruptcy is often applied to proceedings under federal legislation to distinguish them from proceedings under State insolvency laws. Prior to the adoption of the Constitution of 1787 the several States

had sovereign authority over this subject, but by Art. 1, § 8, sub. 4, the power to establish a uniform system of bankruptcy was granted to the Federal Congress. This power has been sparingly exercised (see BANKRUPT), and most of the legislation in the U. S. upon insolvency has been on the part of the States. Even the enactment of a federal bankrupt law does not annul a State statute on the same subject, nor does it prevent a State from passing such a statute; it only suspends the operation of the latter so far as that is in conflict with the federal law. Upon the repeal of the act of Congress the State statute is in full force. (*Tua* vs. *Carrieve*, 117 U. S. 201.) Art. 1, § 10, sub. 1, of the Federal Constitution forbids a State from passing a law impairing the obligation of contracts. Therefore a State statute can discharge persons from such debts only as are contracted after its passage. But a State law releasing one from liability to imprisonment for debts previously incurred is valid as it affects the remedy merely and not the obligation.

State Insolvency Laws.—No attempt will be made to give the provisions of the various State statutes on this subject. A brief outline of the general principles applicable to such legislation must suffice. The debtor may institute the proceedings when the insolvency is called voluntary, or they may be begun by his creditors and are then styled involuntary. From the time he is adjudicated an insolvent, and under some statutes from the date of instituting the proceedings, his control of his property, save such as the statute exempts, ceases, and his debtors can not discharge themselves by payments to him. An assignee, generally chosen by the creditors, takes the property, pays the expenses of the proceedings, and distributes the balance among the creditors. As insolvency legislation has no extra-territorial force, the assignee may not be able to obtain the property of the insolvent which is in another State. If it is land, the title will not pass to the assignee by virtue of the assignment; and even if the property is personal the assignee acquires title thereto only by the comity of nations, and when such title does not conflict with the laws or the public policy of the State where the property is situated, or with the claims of its citizens, or of creditors irrespective of domicile pursuing their rights against such property in accordance with its laws. Moreover, such assignee is not a purchaser for value of the insolvent's property, and therefore takes title subject to all equities against the insolvent. He is generally empowered, however, in the interest of creditors, to bring suits to set aside fraudulent conveyances by the insolvent, although such may be binding on the latter. As a State law has no force beyond the State boundaries, it can not discharge a debtor from obligations to citizens of other States, unless they voluntarily become parties to proceedings under such law. See 6 *Harvard Law Review*, 349, for criticism of this doctrine.

Composition with Creditors.—Insolvent debtors often obtain a discharge from their creditors by a composition, or voluntary arrangement under which the creditors release their claims in consideration of their mutual promises and of the payment of a part of his indebtedness by the insolvent or by a third person. The present bankruptcy law of England provides for and encourages such an arrangement between the bankrupt and his creditors, as did the U. S. law of 1867. Under the English statute a majority in number, representing three-fourths in value of all the creditors who have proved, may enter into a composition with the bankrupt, which will bind all the creditors within the jurisdiction if approved by the court, and thus discharge the debtor even against the will of the minority. A common-law composition binds only those creditors who choose to become parties to it. It need not be by deed, and even where a deed is employed no particular form is necessary. The utmost good faith is required on the part of the debtor. He must make a truthful statement of his financial condition; he must not secretly stipulate to give preferences to any of his creditors, and he must perform his part of the arrangement strictly.

Assignments for the Benefit of Creditors.—These are often resorted to by debtors for the purpose of securing a distribution of their property among their creditors, but they do not operate as a discharge from debts. The debtor, whether insolvent or not, may select his assignee and transfer to him a part or all of his property, with directions as to the manner in which it is to be divided among his creditors. It was early held by the English courts that such assignments were valid, even though giving preferences to favored creditors, and made to prevent others from reaping the fruits of their diligence in instituting legal proceedings. The same doctrine prevails in the U. S. In Great Britain these assignments are acts of bankruptcy, and therefore rarely employed. In the U. S. they are frequent. Many of the States have statutes upon this subject which regulate the mode of making the assignment, define the duties of the assignee, declare whether preferences may be given, and subject all the proceedings pertaining to such transfers to the summary control of the courts. See Williams's *Law of Bankruptcy* (London, 1891); Murdoch's *Law of Bankruptcy in Scotland* (Edinburgh, 1886); Kisbey's *Irish Bankruptcy Practice* (Dublin, 1884); Bishop on *Insolvent Debtors* (New York, 1884); Burrill on *Assignments* (New York, 1894).

FRANCIS M. BURDICK.

Inspiration [M. Eng. *inspiracioun*, from O. Fr. *inspiration* < Lat. *inspira'tio* (deriv. of *inspira're*, breathe into; *in-*, into + *spira're*, breathe), trans. of Gr. ἔμπνευσις, a breathing into, inspiration, deriv. of ἐμπνεῖν; ἐν-, into + πνεῖν, breathe]: The words *inspiration* and *inspire* are employed in technical theological usage to translate the terms *inspiratio* (inbreathing) and *inspirare* (to breathe into) in theological Latin, which rests, through the medium of the Patristic Latin, on the Latin Bible. Their meanings in technical theological usage, therefore, are grounded upon such passages in the Latin Bible as Job xxxii. 8, where *inspiratio* stands for the Hebrew *n'shâmâh*, and above all 2 Tim. iii. 16, where the Greek word θεόπνευστος is translated *divinitus inspirata*. This Greek word first appears in literature in this passage, and may have been coined by Paul, as expressing the fact that the inbreathing with which he had to do was from God more explicitly than the current terms, such as ἔμπνευστος (ἐμπνέω), which he might have adapted to his purpose. Its application to the Hebrew Scriptures apparently describes those Scriptures as having been breathed into by God in the process of their origination, in such a manner that they have been clothed with divine qualities and breathe out God to every reader. It is in this sense that the word inspiration has been applied to the Bible.

DEFINITION OF INSPIRATION.—In its theological usage, the word inspiration was at first employed to express the entire divine agency operative in producing the Scriptures. In the process of theological analysis, however, the various modes in which the divine has entered into the production of the Scriptures have been more clearly distinguished. Throughout the whole preparation of the material to be written and of the men to write it; throughout the whole process of gathering, and classification, and use of the material by the writers; throughout the whole process of the actual writing: divine influences of the most varied kinds have been at work, extending all the way from simply providential superintendence and spiritual illumination to direct revelation and inspiration; and entering into and becoming incorporated with the human activities producing Scripture in very various ways—natural, supernatural, gracious, and miraculous. In distinguishing thus between the various modes in which the divine enters into the production of Scripture, the several terms formerly used synonymously to designate the entire process have acquired each a distinct sense, connoting one element in the process. The general question of the "divine origin of the Scriptures" is now distinguished from the special questions of revelation and inspiration. "Revelation" and "inspiration" are sharply distinguished from each other; the former being used to denote the divine activity in supernaturally communicating to certain chosen instruments the truths which God would make known to the world; while the term "inspiration" is reserved to denote the continued work of God by which—his providential, gracious, and supernatural contributions being presupposed—he wrought within the sacred writers in their entire work of writing, with the design and effect of rendering the written product the divinely trustworthy Word of God.

Exact writers no longer use the term inspiration either in so broad a sense as to make it inclusive of all the divine activities operative in the production of the Scriptures, or in a sense synonymous with or inclusive of revelation; but confine it to the definite and fixed sense of the particular divine activity exerted in securing a trustworthy record. Discussion of the subject is, however, very greatly confused by the persistence of the older and more inexact usage of the word in many, even recent, works; together with the recent introduction of a newer usage by a special school of thinkers, who would make inspiration merely the correlate of revela-

tion, expressing the divine preparation of the mind of the prophet for the reception of the revelation destined for him, or in some way the subjective factor corresponding to the objective revelation in the case of the recipient of a revelation.

The following are some recent definitions: "Inspiration was an influence of the Holy Spirit on the minds of certain select men, which rendered them the organs of God for the infallible communication of his mind and will." (C. Hodge, *Systematic Theology*, i., 154.) "By the inspiration of the Scriptures we mean that special divine influence upon the minds of the Scripture writers, in virtue of which their productions, apart from errors of transcription, and when rightly interpreted, together constitute an infallible and sufficient rule of faith and practice." (A. C. Strong, *Systematic Theology*, 95.) "Defining inspiration positively, it may be described as the influence of the Holy Spirit upon a human person, whereby he is infallibly moved and guided in all his statements while under this influence." (W. G. T. Shedd, *Dogmatic Theology*, i., 88.) "Revelation is that direct divine influence which imparts truth to the mind. Inspiration is that divine influence that secures the accurate transference of truth into human language by a speaker or writer, so as to be communicated to other men." (B. Manly, *The Bible Doctrine of Inspiration*, 37.) "The specific question with reference to the inspiration of the Bible presupposes a revelation as given, and asks whether the *record* of that revelation be inspired. . . . It has special reference to the Sacred Scriptures, and it thus embraces much of history, fact, and detail which is not a matter of direct revelation, but which came to the writers from other sources, from personal experience or testimony. . . . It is a special divine influence for a special purpose. Its object is the communication of truth in an infallible manner, so that when rightly interpreted no error is conveyed." Henry B. Smith, *The Inspiration of the Holy Scriptures*, pp. 8, 9.

The Doctrine of Inspiration.—The formation of a doctrine of inspiration in the Christian Church was conditioned by the circumstance that a specific doctrine on this subject was commended to it by the fact that it was held by the writers of the New Testament and by Jesus as reported in the Gospels. The Jews at the time of the rise of Christianity looked upon their Scriptures as in such a sense the utterances of God that every word of them was divinely guaranteed to be true, and was clothed with plenary divine authority. With characteristic exaggeration, this idea was given most startling expression by some of the rabbis, and extreme inferences were drawn from it. The writers of the New Testament and Jesus, as reported by them, without committing themselves to these extremer inferences, yet obviously shared the fundamental conception from which they were drawn; and looked upon the Old Testament as divinely safeguarded in even its verbal expression, and as divinely trustworthy in all its parts, in all its elements, and in all its statements of whatever kind. That this is the state of the case with reference to the New Testament writers is generally recognized by competent scholars of all schools of thought, not only by those who accept the authority of the New Testament in delivering this doctrine to us, but also by those who, whether of evangelical or of unevangelical convictions, reject this particular doctrine. This will be shown by such references as the following: Tholuck (*Old Testament in the New* in the *Bibliotheca Sacra*, xi., 612), Rothe (*Zur Dogmatik*, 177), Farrar (*Life of Paul*, i., 49), Sanday (*Inspiration*, 407), Stuart (*Principles of Christianity*, 346), Pfleiderer (*Paulinism*, i., 88), Schultz (*Grundriss der evangelischen Dogmatik*, 7), Riehm (*Der Lehrbegriff des Hebräerbriefes*, i., 173, 177), Reuss (*History of Christian Theology in the Apostolical Age*, i., 352), Kuenen (*Prophets*, 449).

It is this fact which accounts both for the immediateness of the adoption of this doctrine by the Christian Church, and for the tenacity of its hold upon it. From the very beginning, and unbrokenly since, this has been distinctly the vital belief of the Christian people as well as the formal doctrine of the organized Christian Church, as to the divine character of their Scriptures. It is this doctrine that was held and taught by the Church throughout the whole patristic age (see John Delitzsch, *De Inspiratione*, etc., and the catena of passages in Appendix B of Westcott's *Introduction to the Study of the Gospels*) and throughout the whole mediæval age; and that was given expression by the Church of Rome in the Tridentine deliverance that God is the author of the Scriptures and that they were written *Spiritu sancto dictante*. The same doctrine was held and taught by all the Reformers, and underlies all the creeds of the Protestant Churches, finding its fullest expression in the later creeds of the Reformed Churches, such as the *Westminster Confession* and the *Formula Consensus Helvetica*. (See on the doctrine of the Reformed Creeds, A. A. Hodge, *Presbyterian Review*, 1884, p. 282, and on the Westminster Confession, B. B. Warfield, *Presbyterian and Reformed Review*, Oct., 1893, p. 582, and *Presbyterian Quarterly*, Jan., 1894, p. 19.) Despite great divergences of opinion among recent theological writers, it is this same Church doctrine that remains not only the confessional doctrine of the Church at large, but the fundamental conviction of the body of Christian people.

That this doctrine, as confessed by the Church of all ages, pertains as much to the New Testament as to the Old, is not due merely to a natural extension to the New Testament writings of the inspiration which the New Testament writers themselves accorded to the Old. This extension itself is rooted in the authority of the apostles. And that, not alone in the sense that it was simply on the authority of the apostles, embodied in their writings, that the Church received the doctrine of the inspiration of the Old Testament, so that the inspiration of the former underlay that of the latter; but also in the sense that the New Testament writers claim for themselves the same inspiration which they attribute to the Old Testament. They did not for a moment allow that they, as ministers of a New Covenant, were less sufficient than the ministers of the Old; they asserted that the Holy Spirit was the author of their teaching, both in matter and in form; they demanded entire credit and claimed divine authority for all their deliverances; they placed one another's writings in the category of that Scripture, the whole of which they asserted to be inspired of God. It is thus simply on the authority of the apostles that the Church doctrine attributes this complete inspiration to the entire Bible.

In the whole history of the Church there have been only two lines of influence making for a lower doctrine of inspiration which are of sufficient importance to require notice in a general review:

(1) With forerunners among the Humanists (e. g. Erasmus), the Socinians introduced a method of thought which sought to distinguish between inspired and uninspired elements in the Scriptures. This was taken up by the Arminians (e. g. Grotius, Episcopius) and culminated in Le Clerc (*Sentiments de quelques théologiens*, etc., 1685, and *Défense des sentiments*, 1686). Le Clerc's views were introduced into England by the publication in 1690 of *Five Letters Concerning the Inspiration of the Holy Scriptures, Translated out of the French*; and called forth a number of replies, in which a lower view of inspiration was conceded in the effort to defend matters of even greater importance (e. g. in Lowth's *A Vindication of the Divine Authority and Inspiration of the Old Testament*, 1692). In Germany, George Calixtus (d. 1656) had enunciated opinions essentially identical with the lower view which was thus propagating itself in England, but with little effect until they were reannounced by Baumgarten (1725). Since the beginning of the nineteenth century great vogue has been obtained for such opinions; chiefly in the two forms which affirm, the one that only the *mysteries* of the faith—i. e. things undiscoverable by the unaided reason—are inspired, and the other that the Bible is inspired only in *matters pertaining to faith and practice*. But though appearing in a great number of writers, and affecting the thought of large and perhaps increasing numbers of Christians, this view has failed to supplant the common Church doctrine either in the creeds of the Church or in the hearts of the people.

(2) Thinkers of a mystical type have in all ages tended to erect the "inner light" which they seemed to themselves to enjoy from the direct work of the Holy Ghost in their hearts, to a position co-ordinate with or superior to the external light afforded by the divine revelation in the Scriptures. Hitherto thinkers of this type have stood somewhat outside the ordinary currents of Christian doctrine, and when advocating extreme views have tended to form separate sects. But in the nineteenth century, through the genius of Schleiermacher, a strong stream of essentially mystical thought entered into and affected more or less profoundly the whole body of Protestant theology. From this point of view man is conceived of as having, either as man or as Christian man taught by the Holy Ghost, a divine source and criterion of truth in himself, to the test of which every "external revelation" is to be subjected. Accordingly, the whole contents of the Bible, religious and ethical as

well as historical and scientific, the "mysteries" of faith as well as "rational" facts, such as are attainable by the unaided action of the human understanding, are subordinated to the judgment of human reason under such names as "the spiritual instinct," "the Christian consciousness," "the witness of the Holy Spirit in the heart," and the like. Adherents of this type of thinking define inspiration not as an activity of God rendering the Scriptural writings as such infallible and authoritative, but as the correlate of revelation in the process of the attainment of truth by the prophet himself—the subjective factor in the conception of divine truth by this chosen instrument of God. This tendency of thought has naturally assumed many forms and exists in various stages of development; sometimes it appears as only an undefined tendency, sometimes in a form distinguishable from vulgar rationalism only in the terms employed. It has become very widespread and influential in recent theological literature: but it has neither affected creed expression nor supplanted the ordinary Church doctrine in the convictions of the Christian people.

The effect of both of these attempted modifications of the Church doctrine of inspiration is to reduce the authority of Scripture. The former confines its authority to certain specified subjects—the undiscoverable mysteries of faith, or specific matters of faith and practice. The latter, in principle, sets aside its authority altogether in the general subordination of all "external authority" to "internal authority." The Church doctrine looks upon the Bible as throughout a divine book, and as such authoritative in and of itself, in all its declarations of whatever kind.

Theories of Inspiration.—It will be impossible to enumerate here all of the divergent theories of inspiration which have been enunciated, especially in the nineteenth century, even by writers of name and influence. The attempt to frame a conspectus of even the more important of them is greatly complicated by the differences that exist even among modern writers in their definition of terms. Some sort of order may be introduced into the enumeration by separating the theories into three classes, according to the attitude they take concerning the relation of "inspiration" to the production of the actual books which constitute our Bible. Those points of view which deny that there is any specifically divine element in the religion of the Bible may, of course, be left out of account; they deny all "inspiration," and can not take a place among theories of "inspiration." Among those, however, who allow that the religion of the Bible is in some sense from God some confine the divine agency, which they call "inspiration," to the origin and growth of the biblical religion itself, and deny that it was active in the actual production of the writings (our biblical books) in which that religion has come to literary expression and record; others allow that God was in some way and to some extent concerned in the production of the writings themselves which compose our Bible, but deny that he was so concerned in their production as to become the responsible author of all their contents; while still others maintain that the biblical books themselves have been in such a sense written under the inspiration of God as to be constituted in themselves the Word of God written, to every word of which divine truth and authority attach. Most of the theories of inspiration will be found to take their places naturally in one or another of these classes.

I. Theories which confine inspiration to the divine agency in the production of true religion, denying that it directly enters into the production of the biblical books as such. In this class is included a great variety of theories very different from one another in everything except the one common tenet, that although they attribute a divine origin to the biblical religion, they look upon the biblical books, as such, as the product of unaided human powers. Writers of this class therefore deny inspiration altogether in the more exact and proper sense of that word; and for the most part define it as the correlate of revelation—as in one way or another a part of the process of revelation, the subjective factor in revelation, the preparation of the mind of the "prophet" to receive or assimilate the revelation, and the like. Thus Morell makes it merely the elevation of the religious consciousness, involving an increased power of spiritual vision by which religious truth is apprehended: "Revelation and inspiration indicate one united process, the result of which upon the human mind is to produce a state of spiritual intuition." And thus Rooke makes it "the inward spiritual preparation of a man to know and to feel what God chooses to communicate of his divine thought and will"; inspiration and revelation being "correlative terms, twin factors of knowledge in some human consciousness, inspiration being the subjective factor and revelation being the objective factor."

Theories of this class differ from one another therefore according to their conceptions of the nature and processes of revelation; and these are largely determined by the philosophical preconceptions which underlie them. They range all the way from theories which differ from pure pantheism in little more than words, to theories which form the transition between the present and the higher classes afterward to be enumerated. They are all characterized by speaking of inspiration as "personal" and "non-biblical"—i. e. as belonging to the prophet and not to the book. And in even their highest form the nearest they can approach to speaking of "inspired *Scriptures*" is to say that an inspired man will of course write (as he does everything else) as an inspired man—i. e. any books he may write will bear the impress of his character and attainments. The following are some of the leading forms which this general conception has taken:

1. The lowest form reduces the divine influence exerted in inspiration to something which is essentially common to all men, and has received the names, appropriate to its several modes of expression, of the *natural*, the *intuitional*, or the *providential* theory. According to this point of view, the inspired man is simply the religious *genius*, and differs from his fellow men only in the degree in which his religious insight or susceptibilities have been excited under influences common to all, or only providentially different from those enjoyed by his fellow men. Sometimes this is so expressed as to be indistinguishable from pantheism. All life and thought are said to be divine—"the unfolding of the Life and Thought of God within the world." All human thought of God is therefore divinely inspired. "God is everywhere immanent and everywhere expressive; and expression, as soon as recognized, becomes revelation." (Whiton, *Gloria Patri*, 138.) At other times it takes forms of expression which are not only theistic, but make inspiration dependent on providential contact with Christ, and therefore tend to confine it to Christ's immediate followers. In one of its lower forms it is taught by F. W. Newman and Theodore Parker, and it grades upward to such teachers as Morell and Scherer (in one of his stages of development).

2. It is a higher form of the same general position which identifies inspiration with those influences of the Holy Ghost which are common to all Christians, and which has received the names, therefore, of the *gracious* or the *illumination* theory. According to this point of view, the inspired man is simply the Christian man of special spiritual attainments, and inspiration is nothing other in kind than *spiritual discernment*. This is the view of the more evangelical wing of the followers of Schleiermacher and of the followers of Coleridge. "To us, as to the holy men of old," says F. W. Farrar, "the Spirit still utters the living oracles of God." This is the view of such writers as Tholuck and Neander, as Arnold, Hare, F. W. Robertson, Maurice.

3. It is still but a higher form of the same general position, when the peculiarity of the prophetic office is recognized, so that revelation and its correlate, inspiration, are confined to a special body of chosen men; but a sharp distinction is drawn between the revelation given by the inspiration of God and the record of that revelation which has been left to unaided human powers. One form in which this point of view is presented is represented by Mr. T. George Rooke, who calls it the "theory of sufficient knowledge." He teaches that God by revelation communicates sufficient knowledge to every biblical writer to enable him to produce the portion of Scripture committed to him, in which case "these writers could be trusted to express themselves in appropriate words, and there was no need for the Holy Spirit to supply the form as well as the matter of their utterance in every case, or even to superintend and check that utterance in its spoken or written form." (*Inspiration*, 158.) It is more common for writers of this class, however, simply to say that after God had communicated his will to the prophet, the prophet was left "to express in human language the divine conception, with which he was inspired, as well as he could." (So, De Witt, *What is Inspiration?*, p. 82.) It is a somewhat higher point of view when Leonard Stählin (*Neue kirch. Zeitschrift*, 1892, No. 71) represents the Holy Spirit as not only by his inspiration communicating to the recipients of revelation the matter to be expressed, but as by the same act "fitting" them "to

express that which they say, exactly in those particular words which appear in their writings." Thus God's preparation of the sacred writers for writing was specific, but it only provided a basis for their writing; the writing itself was "free," and was not *accompanied* by any superintending or directing activity of God.

II. Theories which teach that God was directly concerned in the production of the biblical books, as such, so that it is true to say that the Bible contains the Word of God, and is therefore, as such, of divine origin; but which confine inspiration to certain portions or elements in the Bible, and thus deny that God is the responsible author of the whole book. Writers of this class are agreed that inspiration is the peculiar property of certain chosen instruments of the revelation of God's will, and that it attaches to their written product, the biblical books. But they usually define inspiration as synonymous with or the inseparable accompaniment of revelation, and are thus led to deny inspiration to all parts and elements of the Bible which are not direct "revelations." They differ from one another in the matters and elements which they severally determine to be inspired or uninspired in the Scriptures. Three well-marked sub-classes may be distinguished:

1. *The Theory of Partial Inspiration.*—This holds that some distinct and separable *portions* or *parts* of the Bible are inspired and others not. Sometimes the line is drawn broadly between the Old and the New Testament. Sometimes (as, e. g., by Coleridge, in some of his utterances) an inspiration is attributed to the Law and the Prophets which is denied to the rest of the Bible. At other times the larger portion of the whole book is thought of as inspired. Dr. G. T. Ladd thinks "a large proportion of its writings inspired" (*Doctrine of Sacred Scripture*, i., 759), and with reference to the New Testament, that it is inspired "in nearly all its extent" (ii., 508). R. F. Horton has even undertaken to go through the Bible and point out generally what is inspired and what not (*Revelation and the Bible*); and W. Fr. Gess has carried out this process in such detail that he is prepared to separate the inspired and uninspired portions down to the very sentences and clauses (*Die Inspiration der Helden der Bibel und der Schriften der Bibel*). "In the blessing of Jacob," he says, for example, "only the prophecy concerning Judah is a real word of God" (p. 426).

2. *The Theory of Limited Inspiration.*—According to this point of view, the Bible is inspired indeed throughout, but only in certain of its *elements*; in other of its elements it is not from God. (*a*) Some limit inspiration to what they call the *mysteries*, i. e. to things not discoverable by unaided human powers, while what man could come to know by his natural faculties rests only on human authority. Walter R. Browne (*The Inspiration of the New Testament*) argues that the "supernatural element" in Scripture alone is inspired, since, on the principle of economy, God will give only such aid as is *necessary*. (*b*) Others limit inspiration to what they call *matters of faith and practice*, i. e. to religious doctrines to be believed and moral precepts to be obeyed, while in the whole sphere of philosophical, scientific, and historical fact the writers are said to have been left to their unaided powers, either absolutely or with the exception of such of these facts as are inseparably involved in "matters of faith and practice." This, as has already been pointed out, is a very common theory, especially among apologetical writers seeking to mark out the *minimum* to be defended. (*c*) Others limit inspiration to the *ideas, thoughts, concepts*, while the writers are held to have been left to their unaided powers in bringing these "concepts" into expression. It is obvious that this theory passes very readily into the one enumerated above under I., 3; it is differentiated from it in that it posits the continued operation of the Spirit in the whole process by which the material to be written is thought out by the sacred writers, and leaves them to themselves only in the actual "wording." This seems to be the theory of Dean Alford; and many others hold it somewhat confusingly in conjunction with other conceptions.

3. *The Theory of Graded Inspiration.*—According to this point of view the Bible is indeed inspired in all its parts, but some portions of it are more inspired than others. This mode of statement originated in the Jewish schools and has had large popularity, especially among English writers of a generation or two ago, such as Daniel Wilson, Philip Doddridge, John Dick, Enoch Henderson. It is obvious that it is the result of the confusion—common to the writings of this whole class II.—between inspiration and the other processes by which a divine element has entered the Bible. If we are to subsume all the divine influences, providential, gracious, and supernatural alike, revelation as well as inspiration in its stricter sense, under the one name of "inspiration," then it is undeniable that some portions of the Bible are more inspired than others. More of these processes have been operative in the production of some portions of the Bible than others. Writers of this type need not differ therefore from those of class III. otherwise than in definition. Most of them have, however, become confused in their distinctions, and have thus been the means of propagating a lower view of inspiration than that held by class III.

III. Theories which maintain that God was in such a sense concerned in the production of the biblical books, as such, that his providential, gracious, and supernatural activities attending the preparation of the matter to be written and the men to write it, were supplemented by his co-operation in the very writing of the books themselves; so that he is the responsible author of the Scriptures in all their parts, in all their elements, and in all their statements of whatever kind; and they are the Word of God written, and as such are infallibly true and divinely authoritative in all their declarations. It is evident at once that this theory is identical with the Church doctrine of inspiration. It has received the name of the doctrine of *plenary* inspiration, in contradistinction from the several theories of incomplete inspiration enumerated under II.; and in contradistinction from that form of the theory of limited inspiration, which confines inspiration to the thoughts, ideas, or concepts, and denies that it extends to the choice of the words in which these thoughts, ideas, and concepts are expressed (II., 2, *c*.), it has received the name of the doctrine of *verbal* inspiration. It exists in two forms, which differ in their conception of the mode in which the divine activity has worked in the production of Scripture. These are:

1. *The Theory of Dictation.*—According to this mode of conception the whole of Scripture has been dictated by God to the human writers, who thus are to be thought of not as authors but as amanuenses, penmen, or even, as some writers affirm, merely pens, blind instruments in the divine hand, acting mechanically in the production of the resultant writing. From this point of view God alone is the author of the Scriptures. Its characteristic contention is that the human writers have contributed no quality of their own to the product, save as a musical instrument may contribute a quality to the music played upon it. It "excludes the working of the natural faculties of man's mind altogether, . . . so that both the understanding and the will of man, as far as they were merely natural, had nothing to do in this holy work save only to understand and approve that which was dictated by God himself unto those that wrote it from his mouth, or the suggesting of his Spirit." (John White, *A Way to the Tree of Life*, p. 60.) The obvious marks of human authorship in the biblical books, as, for example, the differences in vocabulary, style, and the like, have led to modifications of the stringency of this contention; until, as Dr. Henry B. Smith says, "there is little room left for objection," and the dispute between this form of the doctrine and the next to be mentioned "becomes a verbal one." (*The Inspiration of the Holy Scriptures*, p. 24.) An instance of this moderate manner of stating the theory may be found in Rohnert, *Die Inspiration der heiligen Schrift*, etc., p. 46. While he is sure that "in the act of inspiration the self-moving activity of the holy men of God entirely receded," yet he is equally sure that "the dictation of the Spirit was not a mechanical repeating of words for mechanical record," but that the persons who wrote were used *as persons* and not as dead utensils, and acted as the willing instruments of the Spirit's activity, working "freely according to their individual peculiarities." In every age of the Church there have been representatives of the theory of dictation. Only in the Protestant theology of the seventeenth century, however, did it tend to become dominant. At that time it found more or less clear expression in many of the chief doctrinal treatises of the Lutheran and Reformed bodies alike, and in Britain as fully as on the Continent (e. g. Quenstedt, Calov, Hollaz, Heidegger, Buxtorf, Hooker, White, Lightfoot). In our own day this theory has been revived in the Lutheran Church, in reaction against the prevalent lower theories, chiefly through the example of a great theologian of the U. S., C. F. W. Walther; it is represented in Germany by such recent writers as Kölling and Rohnert.

2. *The Theory of Concursus.*—According to this mode of conception the whole of Scripture is the product of divine

activities, which enter it, however, not by superseding the activities of the human authors, but confluently with them; so that the Scriptures are the joint product of divine and human activities, both of which penetrate them at every point, working harmoniously together to the production of a writing which is not divine here and human there, but at once divine and human in every part, every word, and every particular. The philosophical basis of this theory is the Christian conception of God as immanent in his modes of working as well as transcendent. It is this theory, as has already been pointed out, that underlies the Church doctrine of inspiration and constitutes, indeed, the Church doctrine of the mode of inspiration. It was the conception of the greatest of the Fathers (e. g. Augustine) and of the Reformers, and it remains the conception of the great body of modern theologians. It is, for example, the theory of Gaussen, Lee, Bannerman, Manly, Dieckhoff, of A. C. Strong, A. Cave, C. Hodge, A. A. Hodge, H. B. Smith, and Shedd.

The Relation of the Divine and the Human in Inspiration.—That the Scriptures are a human book, written by men and bearing the traces of their human origin on their very face, is obvious to every reader. That they are a divine book as well is the contention of every theory of inspiration. How are these two factors, the divine and the human, to be conceived as related to one another in the act of inspiration? And how are the two consequent elements in the product, the divine and human, to be conceived to be related to one another in the Scriptures? This is one of the fundamental problems in working out a conception of inspiration, and it has received very varied treatment.

1. Some writers have emphasized one factor or element in so exaggerated a way as to exclude the other altogether. At one time the divine element was commonly so emphasized. This produced the seventeenth century theory of dictation. This is not common to-day. The opposite fault of emphasizing the human factor or element so exaggeratingly as to exclude the divine, which is an inheritance from rationalism, is, however, very widespread. The effect remains the same, though the underlying philosophy be altered to one of a pantheizing type, which speaks, indeed, of the Scriptures as wholly divine, but adds that so also is all thought and all expression of thought. Nor is the effect altered when men allow a divine element of preparation for the book, but deny a divine factor in the immediate production of the book itself as such, and consequently deny any divine element in the book itself as such (e. g. Gladden, *Who Wrote the Bible?*, Horton, *Inspiration and the Bible*).

2. Others appear to conceive of the two factors in inspiration as striving against and seeking to exclude one another, and of the two elements in the product as lying over against one another, dividing the Bible between them. Crude and mechanical as it appears, such a conception seems extraordinarily common, and makes itself heard in the most unlikely places. It is this point of view which leads to the declaration concerning a given element in the Bible, that because it is human it is therefore not divine; and which underlies the quite common remark that in the prosecution of biblical science it is becoming ever more certain that the "human element" in the Bible is larger than we supposed—with the implication that the divine element is therefore smaller. (Sanday, *The Oracles of God*; Thayer, *The Change of Attitude toward the Bible.*) So Dr. Ladd speaks of the difficulty of determining "the exact place where the divine meets the human, and is limited by it." (*What is the Bible?* 437.) This conception naturally is held with different degrees of crudity, and sometimes results even in an attempt to separate the inseparable, and to point out in detail what elements or parts of the Bible are divine and what human (Gess, *Die Inspiration*, etc.; Horton, *Revelation and the Bible*).

3. Justice is not done to the two factors in inspiration or to the two elements in the Scriptures by any other theory than that of *concursus*. On this theory the whole Bible is recognized as human, the free product of human effort, in every part and in every word—with the exception of the comparatively small portion which came by direct revelation. And at the same time the whole Bible is recognized as divine, to the smallest detail. The human and divine factors in inspiration are conceived of as flowing confluently and harmoniously to the production of a common product. And the two elements are conceived of in the Scriptures as inseparable constituents of one simple and uncompounded product. On this theory, of every word of the Bible in turn, it is to be affirmed that it is divine and that it is human; and all the qualities of divinity and of humanity are to be sought and may be found in every portion and element of the Scriptures. This is the Church doctrine on the subject, and it has underlain the thought of all the great Church teachers of all ages, and finds more or less full expression in their extant writings.

The Evidence of Inspiration.—It will not be possible to present even an outline of the evidence for the inspiration of the Christian Scriptures here. All that can be attempted is to indicate the sources from which it is drawn. It is necessary even for this purpose, however, to discriminate between the several definitions of inspiration. If we are to define it as the correlate of revelation, the evidence for it is the evidence for supernatural religion. If we are to define it as a wide term, including all the divine activities which have entered into the production of the Bible, the evidence for it is the evidence for the general divine origin of the Hebrew and Christian Scriptures. In these two bodies of evidence the whole ground of Christian apologetics is covered. If, on the other hand, we define inspiration, with exact writers, as the activity of God in producing a divinely safeguarded record of his will in written documents, all this mass of evidence for supernatural revelation and for the divine origin of the Scriptures is presupposed. Inspiration, in its more exact sense, can not come into discussion until theism, the reality of revelation, the authenticity and historical credibility of the Scriptures, the divine origin and character of the religion which they present, and the general trustworthiness of their presentation of it, have been already established. It is the crowning attribute of these sacred books, and is inconceivable and would not be affirmed if they were not previously believed to be the trustworthy records of a divinely given religion. When inspiration is said to be independent of the authenticity or historical credibility of the Scriptures, or of their trustworthiness in their presentation of the facts or even the doctrines of Christianity, or even independent of the truth of theism itself, it is because a different definition of inspiration is in mind from that which is used by exact writers, and in which it is affirmed by the Church doctrine.

It is obvious that the primary source of evidence for inspiration, in this its exact sense, is the declarations of Scripture itself. (1) This is not reasoning in a circle: the question of inspiration does not come into discussion until the general trustworthiness of the Scriptures as sources for Christian doctrine has already been established; and the establishment of this belongs to the general "evidences of Christianity," and not to the specific evidence for inspiration in its more exact sense. (2) Nor is it to be objected to on the ground that the nature of the inspiration of the Scriptures is to be inferred by induction from the phenomena of Scripture, and not learned from the teaching of Scripture. This could be true only on the supposition that the general trustworthiness of the Scriptures as sources of Christian doctrine had not already been established by the general "evidences of Christianity." Immediately on the establishment of this, any phenomena of Scripture which may seem to be inconsistent with its teaching as to its own origin and character, pass into the category of "difficulties" not yet explained; and can set aside or modify the doctrine derived from the teaching of Scripture only in case they raise an objection to it formidable enough to neutralize the whole body of evidence for the general trustworthiness of the Scriptures as sources of Christian doctrine. The actual phenomena of Scripture—phenomena, as is asserted, of "error" and "discrepancy"—which are pleaded in this reference, are, however, of a kind which are far from being able to raise so formidable an objection to the truth of scriptural teaching. These "discrepancies," as Prebendary Row says truly, "have been exaggerated to an extent that is absurd. A large number of them admit of an easy reconciliation under the guidance of common sense. Others arise from the fragmentary nature of the narrative, and our ignorance of the entire facts. Not a few of the remainder owe their origin to the fact that the events have been grouped in reference to the religious purpose of the author, rather than to the order of direct historical sequence. Of a few the reconciliation is difficult." None of them are such as would justify a rejection or modification of the teachings of the New Testament, coming to us authenticated as that teaching as a whole is. (3) Nor yet is it to be objected to this appeal to the Scriptures that equal testimony is not borne by all parts of the Scriptures to their inspiration, and specifically that it is only in the later and more "scholastic" portions of Scripture that a fully developed doctrine of Scripture can be discerned. This is just what would be expected

from the progressiveness of the delivery of doctrine, and from the manner in which Scripture is written (occasional writings); and it is much in favor of the doctrine as derived from Scripture that it is only developed gradually in the progress of revelation, and finds its clearest and fullest expression in the New Testament, from the mouths of Christ and his apostles—and, among them, from the mouths of those most didactic and logical in their expression of doctrine.

It has already been pointed out that the Church has always, acting on these principles, derived her doctrine of inspiration from the Scriptures, and primarily from the New Testament. As Dr. Sanday truly says (*Inspiration*, p. 393): "The one proof which in all ages has been the simplest and most effective as to the validity of that idea was the extent to which it was recognized in the sayings of Christ himself." It has also already been pointed out that it is really not a matter in dispute among untrammeled scholars that the doctrine of inspiration which underlies the whole New Testament's dealing with the Old, and which is expressed in all the New Testament declarations upon the subject, is one quite as high and strict as that which the Church has adopted. As Hermann Schultz (*loc. cit.*) expresses it: "For the men of the New Testament the Holy Scriptures of their people are already God's word, in which God himself speaks"; and the doctrine of a "verbal inspiration" both underlay all Christ's dealings with Scripture and is formally recognized by the "scholastic men of the apostolic circle" "in express words, as well as in the way in which they cite" the Old Testament books. It will not be possible to draw out here the details of evidence on which is based this general judgment of modern scientific exegesis as to the New Testament conception of Scripture. It must suffice to say that it rests on a wide induction from all the phenomena of the use made of the Old Testament by the New: inclusive not only of such direct assertions of divine infallibility and authority for Scripture as those of Christ in John x. 35, of Paul in 2 Tim. iii. 16, and of Peter in 2 Peter i. 21, but also of the obvious assumption of the divine inspiration, trustworthiness, and authority of the Scriptures in the whole dealing of the New Testament with them. This comes to expression, for example, in the titles given to Scripture, such as "Scripture," "the Scriptures," "the oracles of God"; in the formulas of quotation, such as "it is written," "it is spoken"; in the mode of its adduction, by which "Scripture says" and "God says" are made equivalents (Rom. ix. 17, x. 19; Gal. iii. 8), and even the narrative portions of Scripture are quoted as utterances of God (Heb. iv. 4); in the ascription of Scripture to the Holy Ghost as its source, and the recognition of the human writers as only his media of expression (Mat. xxii. 43; Acts ii. 34): in the reverence and trust shown toward the very words of Scripture (Mat. xxii. 32, 43; John x. 34; Gal. iii. 16); and in the attitude of entire subjection to Scripture which characterizes every line of the New Testament books. That the New Testament books were in the estimate of their writers equally "Scripture" with the Old Testament is evinced by the claim to equal authority which is made for them (2 Cor. x. 7; Gal. i. 7; 1 Thess. iv. 2; 2 Thess. iii. 6–14); by the similar ascription of their inspiration to the Holy Ghost (1 Thess. i. 5, ii. 13, iv. 2; 1 Cor. ii. 16; vii. 40); and by the inclusion of New Testament books along with the Old Testament under the title "Scripture" (1 Tim. v. 18; 2 Peter iii. 16).

There can be no question that what has been outlined above as the Church doctrine of inspiration is grounded in the conception of Scripture held by Christ and his apostles. It will necessarily be accepted as true by those to whom the authority of Christ and his apostles is supreme. It will be rejected by those who refuse the authority of Christ and his apostles in matters of doctrinal truth. And it may be avoided by those who, while accepting this authority in general, yet suppose that on a principle of "accommodation," or on a principle of "incomplete knowledge," as applied to Christ and his apostles, they may modify the application of that authority in detail. The first of these attitudes toward the authority of Christ and his apostles is the historical attitude of the Christian Church; and it is the only attitude from which the "plenary inspiration" of Scripture can even come into discussion. If Christ and his apostles are not of infallible authority, even in the matter of their doctrinal teaching, the question can not be raised whether they have been rendered by the Holy Ghost infallible, not only in the matter, but also in the very form of all their communications, of whatever kind.

Literature.—The history of the doctrine: Delitzsch, *De Inspiratione Scripturæ Sacræ quid statuerint Patres Apostolici et Apologetæ Secundi Sæculi* (Leipzig, 1872); Westcott, *Primitive Doctrine of Inspiration* (in his *Introduction to the Study of the Gospels*, App. B.); Berger, *La Bible au Seizième Siècle* (Paris, 1879); Rabaud, *Histoire de la Doctrine de l'Inspiration des Saintes-Écritures* (Paris, 1883); Ladd, *Doctrine of Sacred Scripture* (New York, 1883); Cramer, *De Roomsch-Katholieke en de Oud-Protestantsche Schriftbeschouwing* (Amsterdam, 1883), *De Schriftbeschouwing van Calvijn* (Amsterdam, 1884); *De Geschiedenis van Het Leerstuk der Inspiratie in de Laatste twee Eeuwen* (Utrecht, 1887); Rohnert, *Die Inspiration der heiligen Schrift und ihre Bestreiter* (Leipzig, 1889), together with separate pamphlets by the same author on the doctrine of Luther; Pieper, *Luther's Doctrine of Inspiration* (in *Presbyterian and Reformed Review*, iv., 249); Moore, *Calvin's Doctrine of Holy Scripture* (in same *Review*, iv. 49).

The seventeenth century doctrine: Among the Lutherans, in such dogmatic treatises as those of Gerhard, Quenstedt, Calov, Hollaz; among the Reformed, in such as Chamier, Amyraldus, Turretine; in Great Britain, before Le Clerc, in Bishop Jewel, Whitaker, Usher's *Body of Divinity*, Ball's *Catechism*—after Le Clerc, in Owen's *The Reason of Faith*, Calamy's *The Inspiration of the Holy Writings*, among the more conservative, and Lowth's *A Vindication of the Divine Authority and Inspiration*, etc., and Williams's *Boyle Lectures*, among the more concessive.

Modern Treatises.—Expositions and defenses of the Church doctrine: Lee, *The Inspiration of Holy Scripture*; Bannerman, *Inspiration of the Scriptures*; Gaussen, *Theopneustie* (and English translation); Elliott, *A Treatise on the Inspiration of the Holy Scriptures*; Cunningham, *Theological Lectures*; Manly, *The Bible Doctrine of Inspiration*; Watts, *Faith and Inspiration*; Patton, *Inspiration of the Scriptures*; Macgregor, *The Revelation and the Record*. Advocates of a modified doctrine: Row, *Inspiration, its Mode and Extent*; Warrington, *Inspiration*; Simon, *The Bible, Theocratic Literature*; Ladd, *Doctrine of Sacred Scripture* and *What is the Bible?*; Sanday, *The Oracles of God* and *Inspiration*; Horton, *Inspiration and the Bible, Revelation and the Bible*, and *Verbum Dei*. Benjamin B. Warfield.

Installation [from Mediæv. Lat. *installa'tio*, deriv. of *installa're*, put in a place or seat; *in*, in, into + *stal'lum*, from O. H. Germ. *stal*, place (: Eng. *stall*) > Mod. Germ. *stelle*, place]: the ceremonial act by which an ordained minister is formally put in possession of his office and empowered to exercise its functions and receive its emoluments. In the English Church the ceremonial form differs according to the office conferred, and also the name, *enthronization* being the technical term in reference to a bishop, and *institution* and *induction*, the first being the committal of the "spiritualities," the second, the admission to the "temporalities," being the terms for the lower clergy, while *installation* properly refers to the office of a canon or prebendary in a cathedral church. The word is also applied to any formal induction into a rank, an order, or an official position, as, for example, the *installation* of a Knight of the Garter. Among the Congregational churches of the U. S. the term applies to all ministers, and is distinguished from *ordination* as being the conferring of the pastoral office over a particular church. Originally the Congregational minister was only regarded as ordained when, and as long as, installed over a local charge.

Revised by W. S. Perry.

Insterburg, in'ster-boorch: town of East Prussia, Germany; at the confluence of the Angerap and the Inster (see map of German Empire, ref. 1–K). It is an important railway junction, has two evangelical churches, a Roman Catholic church, a Reformed church, a gymnasium, and a reformatory, and carries on a considerable industry in weaving, tanning, brewing, and distilling, and a brisk trade in corn and linseed. It owes a great deal of its prosperity to a number of Scottish families which settled here in the seventeenth century. Pop. (1895) 23,546—of whom 21,247 were Protestants, 437 Roman Catholics, and 348 Jews.

Instinct [from Lat. *instinc'tus*, instigation, impulse, deriv. of *instin'guere*, *instinctum*, goad on, incite, impel]: complex inherited reactions of an animal organism directed to an end, and stimulated from the environment. Instincts are distinguished from impulses (see Impulse), which originate within the organism. Two great characters seem to attach to instinct: first, they are considered a matter of the original endowment of an organism, and, further, they are thought to exhibit the most remarkable evidence in na-

ture of the adaptation of organisms to their living medium. The following remarks in the way of further description may be made: 1. Ordinarily *instinct is not under voluntary control.* Here the case differs from the phenomenon of impulse. 2. *Instincts are, as a rule, definite and uniform*; they lack the idiosyncratic and individual variations of impulse. 3. *Instincts are correlated with definite stimulation, to which they afford reflex reaction.*

In saying that instincts are reflex we bring to mind all the characteristics of such reactions: their mechanical nature as fixed types of nervous process, their irresistibleness as phenomena of consciousness, their particular forms as belonging to distinct animal species. They represent the consolidated nervous structure which is transmitted by inheritance, and the low form of consciousness which has not character enough to be impulsive. In saying that they are reflex it is further meant that instincts do not carry consciousness of the effects which they work. The hen, when she first "sits" on her nest, has no picture of her future brood, and no purpose to hatch her dozen eggs. In saying she has an instinct to "sit" we mean that when her organic condition (warmth, etc.) is so adjusted to the environment (nest, eggs, etc.) that hatching will ensue, she sits by a necessity of her reflex nervous organism. So we can not say that migratory birds have a picture of the country to which they fly for the first time, or an anticipation of the congenial warmth of a southern clime; all we can say is that, atmospheric and other conditions acting as stimuli, the bird's migratory instinct shows itself as an appropriate motor reaction.

Complexity of Instinct.—But the simple concept of reflex reaction needs some modification in view of the marvelous complexity of observed instincts. If the purposive adaptations of the organism were limited to a single reflex arc, i. e. to a sense-stimulation and a muscular movement in reaction, the life of the animal world would be cut off at a low level of development. The adaptation to its environment on the part of the nervous system must gain this complexity in two ways: first, by a co-ordination of muscular elements in a single group for a common end—what we may call a *coexisting complexity*; or, second, a union of successive motor reactions in a dependent series for a common end—what we may call a *serial complexity.* Both of these are realized in animal instinct. The bird's nest-building involves both the simultaneous performance of many muscular reactions and the long succession of movements in flight, etc., from day to day, which in voluntary life we call the employment of means to end.

Apart from the original fact of adaptation, this serial complexity, extending often over great periods of the creature's life, is the most extraordinary aspect of instinct. The entire life of some creatures is a round of instinctive adaptations to conditions of temperature and atmosphere. Witness, further, the social life of bees and ants and their organization for effective common labor, etc.

Variability of Instinct.—This general theory of instinct is further strengthened by the fact of variability, possible modification, or entire loss of an instinct by reason of changes in the stimulating conditions. Recent observations have established this point beyond question. The child loses the power of sucking after he has been weaned; and if he relearn it, it must be by a gradual process. Birds in confinement lose the nest-building instinct. Bees will so modify their hive structure as to overcome new and quite artificial obstacles, while still retaining the architectural principle essential to economy of material. We accordingly reach a broad class of phenomena which seem to lie on the border line between impulse and instinct, as now defined, and which tend to bring unity into this phase of conscious life. The facts may be gathered under the following points: 1. *Decay of Instinct from Disuse*: a principle which explains itself. Physiologically it means the encroachment of nervous combinations which are used, upon the material or connections of such disused instincts, the result being a readjustment of elements in a way which destroys the former instinctive reaction. 2. *Modification of Instinct from Imperfect Adjustment.* This means the reversion of reflex co-ordinations to a less complex type. The bird that has lost the nest-building instinct may still retain the egg-laying and mating instincts, although in a wild state it is difficult to draw any line of division between them. The adaptation of the reaction to that degree and kind of stimulus actually present is wonderful, but still a fact. It is probable that this modification of instinct is due in part to the influence of memories of earlier experiences, the present elements of stimulation working by help of re-enforcement from their own memories. In this way the elements essential for a present reaction are emphasized. Imitative suggestions tend, in the same way, to modify instincts. Voluntary selection, also, breaks up instincts, until in many cases only the impulses remain, so to speak, instinctive. 3. *Natural Exhaustion of Instincts.* Many instinctive reactions naturally spend themselves and die away. Thus the infant's sucking instinct, the gregarious instinct in some, the bashful instinct in others. In many cases the instinct of modesty seems to disappear altogether as life advances. So many physical enjoyments disappear and the enthusiasms of youth fade and perish together. Such instincts represent phases merely in the life history of the organism.

Origin of Instinct.—As Romanes makes clear, the purely reflex theory of the origin of instinct, as held by Mr. Spencer, overlooks the part played by purposive consciousness and intelligence in the formation of instinct; and in this he is supported by the evolutionist Schneider, who holds that there is always a conscious state through which the instinctive reflex works. There is undoubtedly a class of phenomena here which neither the hypothesis of "nervous reflexes" nor that of "lapsed intelligence" is sufficient alone to explain; phenomena of the adaptation of the nervous system to new reactions through consciousness which is yet not will. From study of the child mind the present writer has endeavored to justify the use of the word SUGGESTION (*q. v.*) exclusively for this class of facts; the word in this usage meaning the modification of a reflex reaction through the conscious state which links together its sensory and motor branches. (See *Science*, vol. xvii., 1891, p. 113, and *Mind*, London, Jan., 1894.) Such a conception unifies the two ways in which we may suppose instinct to have arisen—namely, first, by a modification of nervous reflexes through suggestion; and, second, the lapsing of intelligent voluntary reactions into secondary-automatic, and finally into suggestive reactions. On the organic side, these two laws of the rise of instinct represent "upward" and "downward" growth, respectively, of the nervous system.

Lewes and Schneider (*Thierische Wille*, p. 188) advocate the view that instinct arises exclusively from "lapsed intelligence." Romanes, following Darwin, recognizes both this and the principle of reflexes; the latter, under the phrase "law of natural selection," being called by him the "primary," and that of lapsed intelligence the "secondary," principle of the origin of instinct. His is probably the most adequate treatment of the question yet written. (*Mental Evolution in Animals*, chaps. xi.–xviii.) It is difficult, however, to agree with him in drawing a sharp line between reflex and instinctive action on the basis of differences in the "mental elements" involved; i. e. he holds that reflex action involves sensation only, while instinct involves perception. (*Ibid.*, p. 160.) On the contrary, it seems clear that each may involve either. It is difficult to assign, for example, any perception to the migrating instinct, or to confine such a reflex as the closing of the eyes before a foreign body to sensation. The origin and development of particular human instincts are treated by Preyer, and classifications of instincts are attempted by Preyer, Schneider, and James.

REFERENCES.—Baldwin, *Handbook of Psychology* (vol. ii., chap. xiii., § 2); George, *Lehrbuch d. Psychologie* (p. 167 ff.); Bastian, *The Brain as an Organ of Mind* (chap. xiv.); Fortlage, *Psychol. Vorträge* (vi.); Lewes, *Problems of Life and Mind* (3d series, Prob. iii., chap. i.); Preyer, *Mind of the Child* (trans., i., chap. xi.); James, *Principles of Psychology* (ii., chap. xxiv.); Volkmann, *Lehrbuch der Psychologie* (§ 146); Romanes, *Mental Evolution in Animals* (chaps. xii.–xviii.); Morgan, *Animal Life and Intelligence* (chap. xi.); Schneider, *Menschliche Wille* (Theil ii.) and *Thierische Wille* (iii.); Spencer, *Psychology* (ii., part iv., chap. v.); Perez, *First Three Years of Childhood* (chap. iv.); Bascom, *Comparative Psychology* (pp. 147 ff.); Joly, *L'Instinct*; Darwin, *Origin of Species.*

J. MARK BALDWIN.

Institute of France, The: an organization formed in 1795 by the National Convention, to take the place of the four academies which had been abolished in 1793. It was in almost all respects the heir of the older associations, for whose history see ACADEMY. The Institute occupies a unique position among the learned societies and academies of Europe. "Many countries," says Ernest Renan (himself a member), "have academies which may rival ours by the fame of their members and by the importance of their works. France only has an *Institut* where all the efforts of the human mind

are bound together in one sheaf; where the poet, the philosopher, the historian, the philologist, the critic, the mathematician, the physician, the astronomer, the naturalist, the chemist, the lawyer, the sculptor, the painter, and the musician may call themselves comrades."

The three men who had the greatest share in the framing of its constitution were Lakanal, Daunou, and Carnot. It was divided into three classes, which were respectively charged with the advancement of (1) physical sciences and mathematics, (2) moral and political sciences, (3) literature and fine arts. The Directory nominated forty-eight persons, a third of the members, and these elected the remainder. Some changes were introduced by the First Consul, who looked with suspicion upon a body which might be expected to unite intellect and independence. The modifications of 1803 were in some respects improvements. They involved, however, approval of the chief of the state for each election, and suppressed the class of moral and political sciences which thenceforth should be studied only in their relation to history. The number of the classes was increased to four in the new division. While mathematics and physics flourished by the aid of Lagrange, Berthollet, etc., the literary sections displayed comparatively little spirit. In 1807 they undertook the continuation of the *Histoire littéraire de la France*, begun by the Benedictines. The Restoration was as eager to link the institutions of France with its monarchical past as the Revolution had been anxious to destroy their continuity. The Institute indeed escaped destruction, but a royal *ordonnance* in 1816, after naming the foundation of the old academies as one of the glories of the ancestors of Louis XVIII., declared that it was right and proper (*convenable*) to restore to each class of the Institute its original name, in order to bind together their ancient glory with that which they had since acquired. The opportunity was taken to deprive twenty-two persons of their right of membership. David, the painter, Monge, Lakanal, and Sieyès were among the illustrious victims of royal spitefulness, and their places were supplied by nominees of the crown. The unity which had been one of the aims of the Institute was broken. During the Restoration it languished, but the Revolution of July did something to improve upon the feebleness and intriguing spirit with which it had become infected. Guizot in 1832 restored the class which Napoleon had suppressed. Ten of its old members were found, and they constituted the nucleus of the Académie des Sciences morales et politiques. The fear of socialism led Cavaignac to ask the aid of this Academy in combating the communistic ideas of the wearers of blouses. They complied, and produced a volume of small treatises which, as Renan remarks, probably had not a single reader among those whom they wanted to convert.

In its present organization the Institute is made up of five distinct academies, each having its own officers, meetings, publications, etc.: (1) The Académie Française, the number of whose members is restricted to forty. The elections have not always depended upon merit alone; the old Academy rejected Molière, and the influence of Monsignor Dupanloup, Bishop of Orleans, sufficed to procure the rejection of Littré on his first candidature. A body like the Academy is generally conservative, yet in 1827 it had the courage to address the king in opposition to the laws for the restriction of the press. The Academy has the functions of a high jury. The French, with their passion for liberty, have also a predilection for authority, and the approbation of the Academy is one of the prizes to which young authors look forward. Among the best known of its many prizes is the Montyon prize for virtue; 20,000 francs are yearly divided among poor persons who have distinguished themselves by some specially virtuous act. Montyon also left a yearly prize to reward the publication of the book most conducive to public morality. De Tocqueville's work on American democracy is perhaps the most notable book which has received this distinction.

(2) The Académie des Inscriptions et Belles-Lettres, with 40 ordinary, 10 honorary, 8 foreign associate, and 50 corresponding members. It has the distribution of various prizes, the most important being that of about 10,000 francs founded by Gobert in 1833 for the most learned work relating to the history of France.

(3) The Académie des Sciences, having 68 ordinary, 10 honorary, 8 foreign, and 100 corresponding members. The most brilliant names in French science have adorned the roll of this academy. Arago, Ampère, Gay-Lussac in the new, as Lagrange, Laplace, Haüy in the old, have made it illustrious. The descriptions of French trades, the maps, etc., issued by the old academy were useful in their day, and still have value. In the new academy associated work has been left aside, and it is the individual labors of its members which are chronicled in the *Comptes rendus*. This, by its frequent publication, is now the most important scientific periodical. The eight foreign members of the academy may be regarded as those whom a competent though not always unprejudiced jury regard as the most eminent men of science out of France.

(4) The Académie des Beaux-Arts has 41 ordinary, 10 honorary, 10 foreign associate, and 40 corresponding members. It distributes a number of prizes and has published a dictionary of the fine arts.

(5) The Académie des Sciences morales et politiques has 40 ordinary, 6 honorary, 6 foreign associate, and 48 corresponding members.

Such is the manner in which the Institute is divided. All the year there are five academies, but on Oct. 25 the Institute holds a general meeting of all the sections of which it is composed. There is a fine and rare library attached to the Institute. Each member receives a salary of 1,500 francs, and the *secrétaires perpétuels* have 6,000 francs a year. The Institute is a creation of which France may well be proud. Beyond the personal renown of its members and the value of their labors, the organization of the Institute shows that its founders had a clear sense of the *solidarité* of knowledge—a unity sometimes lost sight of in our own age, when nearly every savant is a specialist. The tradition of the old academies has stereotyped the internal form of the Institute, and probably prevented a growth and classification of its sections more in accordance with the present state of science. Revised by F. M. Colby.

Insulators: See Electricity.

Insurance [deriv. of *insure* < M. Eng. *insuren, ensuren*, of same meaning as *assuren* < Lat. *ad*, to + *secu'rus*, sure]: in its most general definition, a contract whereby one agrees, for a sum of money, to indemnify another in case the latter shall suffer loss by certain specified risks. It is termed *marine* or *fire* according as it is applied to maritime or fire risks. The term Accident Insurance (*q. v.*) is used specifically of that form of insurance which undertakes to indemnify for loss resulting from accidental injury to the person. See also the articles Fraternal Insurance Societies, Life-insurance, Marine Insurance, etc.

History.—Insurance was known to the ancients, but had its principal development in the exigencies of modern commerce. It was first applied to mercantile adventures. The fear of pecuniary ruin by the loss of ship or cargo checked the spirit of enterprise. Few were so wealthy as to be able to bear alone so great a loss, but by dividing the risk among many it was seen that the inconvenience to each of the proportion of loss which he assumed might become trivial. Thus originated the practice of insurance, which has for its purpose to break the force of the blow of calamity by increasing the power of resistance. Though known and practiced among the commercial communities of Southern Europe at a much earlier period, it was a comparative novelty in England in the time of Elizabeth. During the nineteenth century, however, it has received an immense development, until now every prudent person who has property at risk takes care to seek shelter under a policy of insurance.

The Contract.—The principles which underlie the contract are substantially the same to whatever subject-matter they may be applied, modified only as the peculiarities of the different risks assumed may require. Its fundamental principle is indemnity for loss, as distinguished from an agreement to pay a fixed sum absolutely, as in the case of life and accident insurance; and so far as it is made the means of accomplishing more than this it passes over into the domain of speculation and leads to the mischiefs of gambling. It is a personal contract—insuring not the thing, but the person interested in its preservation, against loss to him by reason of injury to it, and is therefore not transferrable without the consent of the insurer. The person who undertakes to pay in case of loss is termed the insurer; the danger against which he undertakes, the risk; the person protected, the insured; the sum which he pays for the protection, the premium; and the contract itself when reduced to form, the policy. So general, if not universal, was the use of a policy in the early history of the contract that until quite recently it has been doubted whether writ-

ing was not essential to the validity of the contract; but it is now conceded that both a verbal agreement to issue a policy and a verbal agreement to insure are valid, even though the contract covers a period of time longer than one year, as the contract may be determined by the happening of the event insured against within a year, and so is not within the statute of frauds. Even corporations, which, under the ancient stringency of the common law, could only bind themselves by a contract under seal, it is now held, may contract verbally by their officers or other agents. All persons competent to make other contracts may be parties to this. Formerly, and to some extent at the present day, as in the case of the "Lloyd's"—a society of private capitalists who meet at Lloyd's subscription-rooms in London, and subscribe to such proportions of the risks there offered as they may feel inclined to—the business was carried on by private underwriters; but the superior advantages of public companies now give them the chief control. Policies are sometimes made for a sum agreed upon to be paid in case of loss, hence called valued; or for whatever the amount of the loss may prove to be, hence called open; but the majority of policies are for the actual loss incurred, not to exceed the sum named in the policy, for a fixed time, or for the voyage, hence called time or voyage as the case may be. The contract is complete and binding when the parties have agreed upon all its terms, and, if entered into by correspondence, when the letter accepting the terms offered is deposited in the office for transmission in due course of mail. If the terms are agreed upon and the policy is made, it will be valid and binding without delivery if it be the understanding of the parties that it shall become operative from and after a certain act.

Insurable Interests.—The law will not permit an illegal business or an unlawful enterprise to be encouraged by insurance. Nor will it permit the insurance of an interest the protection of which would manifestly tend to evils which would more than counterbalance the advantages of insurance. Seamen's wages, for instance, can not be insured, as this would tend to render them indifferent to the safety of the ship upon which their wages depend. Whatever, however, does not contravene good morals or sound public policy may receive protection. Subject to these limitations, any property or interest in its preservation may be the subject-matter of the contract. Policies without this interest to support them are wager-policies, and are prohibited as a species of gambling and a temptation to fraud and crime. The insurance, however, in the same policy of a lawful and a prohibited interest will not vitiate the policy as to the lawful interest if it be separate and distinct. Insurable interests are as manifold as the relations of individuals to property. Whoever owns property, whether by an absolute or qualified, legal or equitable title, or any interest in property, or has upon him the duty or in him the right to protect and preserve it, may insure it to the extent of his interest or liability, provided he can find an insurer who is willing to assume the risk. The owner of a vessel or house, the mortgagee or lessee, executors, administrators, and trustees, common carriers and bailees generally, consignors, supercargoes, whose compensation depends upon the success of the voyage, or under instructions to land goods and wait for a market, captors and salvors having a well-founded expectation of an allowance out of the property captured or saved, and sheriffs and other officers of the law having the care and custody of property, may severally insure their respective interests. The insurability of the interest depends not at all upon its value, provided it has some value; nor is it any objection that several interests in the same property are coincidentally insured. The mortgagor may insure to the full value of the property, and the mortgagee or successive mortgagees may at the same time insure to the amount of their several interests, and each may recover, in case of loss, to the extent of the several amounts insured, though the aggregate of these may much exceed the entire value of the property. All these claims may be met, however, by the replacement of the property. To compel a body of insurers to pay a body of policy-holders an aggregate sum in excess of the value destroyed, would be in contravention of good neighborhood and public policy. The contracts therefore all retain the option of replacement by the companies. (See below.) A partner may insure the entire stock of the copartnership, being interested in the whole, out of which to realize his share, and for the same reason, no doubt, a stockholder in an incorporated company may insure the entire property of the company to the amount and for the protection of his interest. The vendee in possession of real estate under a contract partly performed, but not enforceable at law or equity, since the vendor may not refuse to perform, an insolvent debtor, in the possible surplus which may come to him after payment of his debts, and the mechanic who has a lien upon the building for labor or materials furnished, have also insurable interests. The interest must subsist at the time of effecting the policy and at the same time of the loss, though it need not continue the same in amount. If an insured vessel be sold, and repurchased during the time covered by the policy, the policy will cease to protect during the period of alienation, but will reattach and protect after the repurchase. Stocks of goods, insured as such without naming specific articles, may be sold and replaced by others under the same policy. The shifting interests of a mortgagee who makes advances and receives payments from time to time may likewise be protected if covered by the same mortgage.

The Policy, and Representations and Warranties therein.—The policy is generally issued upon an application containing certain statements descriptive of the property insured and the circumstances affecting the risk. These statements are termed representations, and if by reference or otherwise they are made part of the policy they are termed warranties. A warranty is an agreement that a fact is as stated, or some future act or omission shall be as promised, upon penalty of forfeiture of all rights under the policy if the statement prove untrue or the promise be not kept; while a representation, being no part of the contract, but only an inducement thereto, need be true only so far as it is material to the risk. Untruthfulness or mistake in a representation, unless material to the risk, will not avoid the policy, while either in a warranty, unless imputable to the fault of the insurer, will be fatal, whether material to the risk or not. A warranty that a ship is American, or that she will sail at a given time, will be violated if she be British or sail at a different time. A representation that a building is occupied in its several parts for certain specified purposes will not be vitiated though it appear that one of the apartments be differently occupied, or not occupied at all, if the difference be not material to the risk or of a character to materially increase the hazard. Warranties are not favored, because they work forfeitures and sometimes operate very harshly; and for this reason, if from the form of expression or other circumstance there is chance for doubt, a statement will be regarded as a representation rather than a warranty. It is sometimes said that representations should be more full in marine than in fire policies, since in the former there is less opportunity for personal inspection; but this depends upon circumstances, and is no rule of law. The law calls for absolute good faith from both parties to the contract, and the insured must disclose all material circumstances incident to the risk. It has been held that all representations made in answer to questions put by the insurer are thereby made material. The fact of having asked the questions indicates that they were considered important by the underwriter, and the insured in answering them intended to have the underwriter rely upon the truth of such answers, but latterly it has come to be held that if a question is not answered, and the company does not insist on an answer, it thereby waives the omission. It has been held that the underwriter is responsible for its agent's error in writing down the answers of the insured. That representation is material which induces the insurer to take a risk upon terms less favorable to himself than he would have made had he known the truth. The same test applies to a concealment, which is the withholding a fact which ought to be made known, if such fact be not known or ought not to be expected to be known, to the insurer, and is known, or ought to be known, to the insured. Mere silence about a matter which is unknown is no concealment. Warranties specially stated in the contract are express. There are also implied warranties, as of ownership, of seaworthiness at the beginning of a voyage-policy, and against deviation—which is a voluntary departure from the usual course of the voyage without necessity or justification, as, for instance, to avoid capture or to save life—and such a substantial alteration as to change the identity of the risk assumed. Seaworthiness is fitness for the particular service, and is one thing at one time and place and another at another, according to circumstances. The voyage begins when the vessel casts loose from her fastenings and moves on her way, and ends, in the absence of express stipulation, when she has been moored in safety at her port of destination.

Deviation from Terms of the Policy.—Like a voluntary deviation, a substantial alteration in the property insured against fire without the consent of the insurers, such as to make the risk in kind a different one from that assumed, will avoid the policy. Ordinary and reasonable changes and repairs, however, made in good faith for the due preservation of the property or prosecution of the business, will not vitiate the policy, although alterations increasing the risk are forbidden. If such repairs were deemed alterations, the insured could neither preserve his property from decay nor avail himself of improved methods of business—a result which neither party can be presumed to contemplate. Policies generally allow some time for repairing without notice. Alterations in the surrounding circumstances, as in the erection of new buildings and changes not under the control of the insured, unless by special stipulation, are not imputable to him. In fact, however, the rates of premium are based upon an assumed liability for such risks; nor would any prudent person accept a policy which did not protect him from dangers beyond his control, the most perilous perhaps to which he is exposed. It is common to except from the risk such articles, uses, and trades as are regarded as specially hazardous, and the risk of which the insurer does not wish to assume. This is done by including them in a memorandum of articles excluded, in which case nothing can be claimed as indemnity in case of loss of, or damage to, such excluded articles; or it may be done by a clause in the policy prohibiting the use of the premises for such and such processes, trades, or businesses, or for keeping or storing such and such goods, on penalty, unless specially authorized by the policy, of avoidance of the policy. In this case special authority is deemed to be given if the subject-matter of insurance, by fair interpretation and according to usage, includes the excepted article or use. The insurance of a stock in trade, for instance, "such as is usually kept in a country store," will permit the keeping of all such goods as are usually kept in such stores, although some of them may, by the terms of the policy, be prohibited as hazardous. The insurance of a furniture business will likewise permit the use of such oils and varnishes as are customarily used in the manufacture and prepartion of furniture for sale, although the keeping and use of such oils and varnishes may be expressly prohibited; and if, during the period of insurance, some new process not used or known before comes into vogue, it may be adopted by the insured without prejudice to his rights, unless it be of such a character as manifestly to make the risk greater than either party could have contemplated. It can not be supposed that in such cases it is the intention of the parties that the insured shall be tied down to the methods and processes of the date of the policy, and deprived of the right to avail himself of such improvements as may be necessary to the successful prosecution of the business. "Use and keeping" mean habitual use and keeping. A mere casual use of a prohibited article—as, for instance, benzine or naphtha to be mixed with paint while repairs are going on, or the building a fire for the purpose of heating tar to be used in the course of such repairs—does not contravene a policy prohibiting the keeping of fire or the introduction of hazardous articles upon the premises. Nor is the permission by the insured of an unlawful act upon the premises a use of the premises for that purpose. Playing a single game of cards does not make the premises a gambling-saloon. Unless otherwise agreed, houses may be left vacant, tenants may be changed, factories may be worked or shut down, and property may be watched and cared for, heated, and lighted at the discretion of the insured; and stipulations for the use of care and precaution against fire are generally not warranties, but representations to be carried out by substantially doing that which is provided. In such case equivalents will do. Keeping ashes in any receptacle made of equally incombustible material is a fulfillment of an agreement to keep them in an iron receptacle. Notice is frequently required of any changes in the circumstances or surroundings of the insured property affecting the risk, in order that the insurer may have the option to continue or cancel the policy. Under this requirement notice need be given only of such changes as are material; and if within a reasonable time after notice the option to cancel is not signified, all objection to the change will be presumed to be waived, and the policy will remain a valid security. And, generally, it may be said that whenever a condition has been violated, giving to the insurers the right to treat the policy as void, any subsequent recognition by them after knowledge of the breach of the policy as a subsisting and valid contract, as by the acceptance of premiums or the doing of any other act from which it may be fairly inferred that the insurers do not mean to take advantage of the breach, will be a sufficient answer to any attempt by them to set up the breach against a claim for loss.

Alienation of Insured Property.—Alienation or sale of course suspends the operation of the policy, as when the property passes out of the hands of the insured, either by sale or operation of law; if alienation continue till the time of loss, nothing can be recovered by the insured. Having lost nothing, he can claim no indemnity. But there is no alienation so long as the insured retains an interest in the subject-matter, although that interest may have undergone a change or even suffered a great diminution. A mortgage is not an alienation, nor is a written agreement, with or without seal, to convey, nor is a descent of property to heirs, and such qualified changes in the title or interest will not work a forfeiture unless specifically so agreed upon. Even an absolute sale by one partner of his interest to his copartner is not to be regarded as an alienation, but rather a shifting of interests among joint owners, so long as no stranger is admitted. As any substantial change in the relation which the insured holds to the property insured is a matter of consequence affecting the judgment of the insurer as to the quality of the risk and the propriety of continuing it, the character of the person insured being oftentimes an important element in making up the estimation, so it is of consequence to him to know the true state of the title and interest of the insured in the property insured, whether absolute or qualified or incumbered, or how otherwise, to the end that in adjusting the amount to be insured so much in value shall be left unprotected as to make the insured himself also interested in guarding against loss.

Assignment of the Policy.—The assignment of the policy without the consent of the insurers is often forbidden, and is objectionable upon the same grounds as alienation is objectionable. The insurers may be quite willing to insure one person, while they might be quite unwilling to insure another, or that to that other should be transferred the interest in the policy. Strictly speaking, a policy is not assignable or negotiable, so as to give the assignee the right, in his own name, to claim the benefit of the contract. In order to do this there must be an assent of the insurers to enter into direct relations with the assignee, as by consenting to the assignment and to pay the assignee in case of loss. In such cases the assignee will be substituted for the assignor, and may recover as he, and only as he, could recover; so that if the assignor after the assignment violate any of the conditions of the contract, this violation will work a forfeiture of the right of both the assignor and assignee to recover under the policy. To avoid this result, the policy and property may both be transferred to the same person with the assent of the insurer, the assignee securing by a new note or other memorandum the obligations of the assignor toward the insurer. The transaction thus becomes substantially a new contract, rather than an assignment of an old one, and is not subject to be defeated by the delinquencies of the assignor, the original insured.

The Premium.—The premium is the consideration which the insurer receives for the risk he assumes, and is greater or less according as experience and observation have shown that the chances of loss upon the particular risk are greater or less. The premium is usually paid when the policy is delivered, but this is not necessarily so. And even though by the terms of the policy it can only become operative on payment of the premium, a delivery of the policy without insisting upon this condition will make it operative. It is a condition for the benefit of the insurer, and like other similar conditions he may waive it if he will. In the absence of express stipulation as to the modes of payment, a note or check sent by mail, if so requested, or any other ordinary mode of payment acceded to by the insurer or his agent having authority in the premises, will be sufficient. Should it so happen that the property insured is never exposed to the perils insured against—in other words, if the risk never attaches—the insurer may demand a return of the premium if he has not been guilty of any fraud. The whole premium, however, is earned if the risk attaches even for a moment.

The Risk.—In marine policies, unless restricted, the risk extends to all losses proximately caused by the perils of the sea—that is, all losses which happen fortuitously from the extraordinary action of the winds and waves, stranding, col-

lision, lightning, and other like natural and unavoidable accidents connected with navigation. Besides these perils, it is usual in marine policies to insure against loss by fire, barratry—i.e., the fraudulent misconduct of the master or crew—theft, piracy, capture, arrests, and detentions. As no one can stipulate for immunity from the consequences of his own fraudulent or criminal misconduct, where the master of a vessel is also owner, barratry is not covered by the policy any more than a house is protected to the owner against loss by fire set purposely by himself; but in both marine and fire insurance loss by mere negligence of the owner or of his servants will be covered by the policy. In fact, as it is impossible for any one who has even a moderately extended business to give his personal attention to all the details, one of the prime objects of insurance is to guard against the negligence of servants. And negligence of the insured himself, not so gross as to warrant the inference of fraud, will also be within the risk. All losses directly attributable to the risk insured against come within the sweep of the policy unless there be an exception stated in the policy itself. Damage by fire may happen without actual ignition, as by cracking of glass, or the blistering of pictures, or the scorching of paint, or heating and thus destroying the value of certain articles of commerce. Damage by fire produced by lightning is within the risk, but damage or demolition by lightning without burning is not. To protect in such a case the insurance must be against loss by lightning. So damage by fire resulting from explosion, as of gunpowder, for instance, is within the risk. Explosion is but the burning of the gunpowder by sudden combustion, and if damage results by concussion from such an explosion it is damage by fire; but loss occasioned by the explosion of a steam-boiler, the bursting itself not being occasioned by unusual fire, and no fire supervening, is not a loss by fire. Damages and expenses in reasonable efforts to save the insured property from destruction, as by water, removal, covering up, or any other suitable means, are included within the risk of a fire policy. So are damages by falling walls if the walls fall by reason of the fire. If, however, they fall by their own inherent weakness, crushing the insured property in the ruins, whence fire supervenes, this is not a loss by fire, as the property is destroyed by the fall, and not by fire. So loss by the bursting of a boiler, whereby a vessel goes down at once, is not loss "subsequent to and in consequence of such bursting," the bursting and the loss being practically simultaneous. When a vessel sinks till the water reaches her furnaces and drives out the fire upon her woodwork, so that the vessel is burned to the water's edge, the loss is attributable to the fire if, but for the supervention of the fire, she would not have sunk; otherwise not. When there are two concurrent causes to which the loss may be attributed, the predominating and efficient cause where the damage is indiscriminate will be deemed to be the true cause.

If it be doubtful what property is covered by the policy the doubt will be resolved in favor of the insured. A house or building includes all the appurtenances necessary to the ordinary use of the principal building, and a mill includes the machinery by which it is operated. Property in trust is not limited to property technically held in trust, but includes all such property as the insured may have the custody and care of for special purposes; and a policy may be so worded as to follow and protect property as it passes through divers hands, as by expressly insuring goods "sold, but not removed."

The Loss.—The sound principle of practice in insurance is that the insured must be in such position that in case of total loss he must himself necessarily suffer loss. If he be insured to the full value of possible loss he may be tempted to carelessness, or even fraud and crime. He may not only neglect all precaution to prevent the happening of the peril insured against, but he may be tempted to scuttle his own ship or set fire to his own house. To inquiries made touching these and various other circumstances affecting the judgment of the insurer upon the value of the risk the answers must be with precision and certainty if they amount to warranties, or only with substantial truth if they are representations merely. If no specific title be required, then any form or extent of title or ownership will be sufficient. A declaration of ownership simply is but a declaration that the applicant is in some form or sense an owner. In mutual insurance the true state of the title is more especially material, since the lien which such companies usually have upon the real estate they insure constitutes to some extent the capital of the company. It is therefore of importance that the title should be such that a lien will attach. Hence a misrepresentation as to the title may be material in a mutual company, while it might be quite immaterial in a stock company. It is also material, and for the same reasons, that the insurer should know not only what insurance may already exist upon the property upon which insurance is applied for, but also whether any and what further insurance may thereafter be obtained. Upon these points, therefore, inquiries and stipulations are usually made. Other insurance is additional, prior, or subsequent insurance effected by the same person, or for his benefit and with his consent, upon the same subject-matter, risk, and interest. Owners of different interests may insure them respectively without violating the condition against other insurance. The additional insurance must also be valid, or it is no insurance. A policy by its own terms void if there be prior insurance without notice, will not be a breach of the terms of a prior policy to be void if other insurance be obtained without notice. When notice of subsequent insurance is required, it must be given within reasonable time, and if the insurers, having the option to cancel the policy upon such notice, neglect so to do for an unreasonable time, or meanwhile recognize the validity of the policy as a subsisting contract, they will be held to have waived the right to insist upon a forfeiture.

Over-valuation of the property insured is another mode in which the insurer may be misled into making a contract which he would not otherwise have made. While intending only to make the prudent contract of insuring one-half the value of the property, he may be led by over-valuation into the risky contract of insuring the property up to, or even beyond, its full value. If this over-valuation be fraudulent, or so gross as to justify the inference of fraud, the policy will be void, whether there be or be not any stipulation therein upon this point of over-valuation.

After loss the insurers must be notified, and generally agree to pay in so many days after proof of the loss. If no form of notice be agreed upon, any notice, verbal or written, will answer. Notice "forthwith" is notice without unreasonable delay, and should be given to the person designated in the policy, or, this wanting, to some officer of the insurance company, or to some agent acting in its behalf. The proofs of loss must also be such as are required by the terms of the policy, and substantially in the form required and within the time specified. If the certificate of the minister of the parish or of the nearest magistrate to any particular fact, or that the loss is as stated, be required, such certificate must be produced before payment can be demanded; and if the minister or the magistrate in some sense nearest will not so certify, the insured must fail in his claim. It is his misfortune that he can not comply with the terms of the contract into which he has voluntarily entered, and which seems to be perfectly proper and fair. Such agreements should be avoided, or provision made for some substituted mode of proof; as, for instance, the certificate of some other satisfactory person. In fact, as these arbitrary conditions are made by insurers in their own special interest, they may waive them if they please either in form or substance; and if they receive notice or proof, however informal or imperfect or out of accord with the requirements of the policy, without objection, and do not give the insured to understand that they are insufficient and unsatisfactory, and in what respect, so that he may have an opportunity to supply the deficiencies, or if the insurers, by silence or otherwise, induce in the mind of the insured the belief that they are sufficient, they will not be permitted to interpose such insufficiency against a claim for loss. If upon the receipt of verbal notice of a loss the insurers declare they will not pay, this will relieve the insured from the duty of further notice or proof. The law does not require a useless formality. If stipulation be made that suit shall not be brought against the insurer unless within a limited time, the insured will be bound by it. It is reasonable to require that disputed claims should be brought to an early trial, while the facts are comparatively fresh and the witnesses are at hand. But an agreement that a suit shall be brought in a certain place or court, or that the whole matter in dispute shall be submitted to arbitration, has no validity. The law determines how and where suits shall be tried, and parties can not by their agreements settle or unsettle the jurisdiction of the courts. And when to an action to recover a loss the insurers set up in defense any breach of condition, misrepresentation, or other matter, it is always

a good reply that such breach or other delinquency is chargeable to the act or omission of the insurers themselves or their agent.

Recovery by the Insured in Case of Loss.—When there is an actual total loss, the insured recovers to the full amount of his insurance if the property be worth so much, and there be no express limitation to a proportion of the loss. In marine insurance there is a constructive total loss whereby, when the property, though not entirely destroyed, is damaged to such an apparent extent as practically to render the voyage worthless as a pecuniary adventure, as where the damage exceeds one-half of the value of the vessel or of the goods, or the vessel be captured or detained by embargo, the insured may abandon the damaged or detained property to the underwriter and claim for a total loss, leaving the latter from that time forth to get what he can by sale or use out of the abandoned property. This rule promotes commerce by reinstating the insured immediately in his capital, wherewith to engage in new adventures, rather than to subject him to delay and possible ruin by further efforts to restore his shattered fortunes. It is at the option of the insurer whether he will abandon, and this option must be made within reasonable time, and notice thereof given to the insurer in order that he may at once avail himself of his right to treat the property as his own and make the most out of it. The abandonment carries with it all rights and claims on account of ship or cargo, so that if the ship be recovered and the voyage completed and made productive, the insurer will have all the benefit both of the property recovered and of the profits in the way of freights earned, or otherwise. In the U. S., however, only so much of freight goes to the insurer as is earned after the abandonment. When the loss is partial the rule in marine insurance is that the cost of repairing the vessel, less one-third for the greater value of the new substituted for the old, may be recovered. But in fire-insurance there is no right of abandonment, and no rule of proportionate deduction on account of the greater value of the new, actual indemnity being the limit of the right to recover. In either case when goods are damaged, the insured recovers the difference between the value of the damaged goods as they are and the market price of sound goods of like kind. The adjustment of marine losses, when all the interests saved are to contribute their proportion of indemnity for those destroyed or thrown overboard for the general good and safety of all, is oftentimes a matter of great nicety, and comes under the head of general average, a peculiar and intricate branch of maritime law, employing a special class of experts, known as average-adjusters. There is less difficulty in adjusting losses under fire policies, where general average contribution is unknown, but much confusion sometimes occurs in cases where policies are "non-concurrent"—i. e. cover some goods in common, together with other goods to which all do not apply. Under both kinds of insurance, however, there may be divers policies upon the same subject-matter, in which case, if the loss be less than the aggregate insurance, either insurer may be held for the entire loss, unless there be an average clause, as it is called, limiting his liabilities to his proportion of the loss. In case he pays it, he will have his claim over for his indemnity against each of his co-insurers. Only the actual loss can, however, be recovered by the insured from all the insurers. The amount of loss recoverable within the limits of the amount insured does not always depend on the value of the interest to the insured. If the insured has any insurable interest, and that interest attaches to the whole property, he may recover for the whole value. Thus a commission merchant, actually interested only to the amount of his advances and commissions, may recover to the full value of the goods lost, holding any balance for his consignor. A mortgagor may insure to the full value of the property, and recover the whole loss, although the insured mortgagee may also recover to the full amount of his interest, and thus the insured be compelled to pay much more than the whole value of the property destroyed, but the companies may, at their option, replace as stated. In such cases, however, there is usually a clause in the policy subrogating the insurer to all the rights of the mortgagee, which frequently enables the insurer to recover the whole or a part of his loss from the mortgagor. The respective contracts are independent, and cover distinct interests, each of which may extend to the whole value of the property. The fair market value of the property, without regard to special circumstances, is the criterion of the amount of the loss. Sometimes the policy stipulates that the insured, in case of loss, shall recover only a certain proportion—two-thirds, for instance—of the actual damage. In such case the insured will be entitled to the whole amount of his insurance if that does not exceed two-thirds of the whole loss. A partner after the death of his copartner can only recover for loss to the partnership property as it was at the time of the dissolution by death. Goods bought after the dissolution will not be covered unless by special agreement. When the right to repair or rebuild is reserved to the insurer, as it usually is, as a mode of payment to which they may resort if they deem the claim for loss exorbitant, it is optional with him whether he will or will not avail himself of his right; and if he do not, the rule of damages is the actual loss, and not the cost of restoration, which may be, as in the case of an old and dilapidated building, greatly above the actual loss. If a new building be erected by the insured, it is not the cost of the new, but the value of the old one destroyed, that is recoverable. And the option of rebuilding must be made known without unreasonable delay. An agreement to replace goods stands upon the same footing. The insured is to be indemnified, and no more. If the insurer be prevented from rebuilding or replacing without the fault of the insured, as by the intervention of the public authorities, that is his misfortune, but no defense against the claim of the insured. When the insured is not designated by name in the policy, but is referred to indefinitely as "the estate of A" or "whom it may concern," the loss will be payable to all such persons as can bring themselves within the scope of the designation; and if the policy be to A for the benefit of whom it may concern, A will take the payment and hold it for the parties in interest.

Rights of Subrogation.—Sometimes disputes arise as to the disposition of the money after it is paid or as to the right of the several parties in interest. But as a rule neither can claim anything from the other unless by the terms of the policy it appears that it was the intention of the parties that one should be benefited by the payment to another. If the loss be paid to a mortgagee on an insurance taken by him at his own expense, the insurer, unless so stipulated in the policy, can not require him to assign the mortgage, nor can the mortgagor require the money to be applied toward the reduction of the mortgage or to repairing the damage. Each party stands on his own contract as against the other, unless it appears to be intended that some third party shall have an interest, as where a mortgagee insures at the expense of the mortgagor; but when the insurer pays a loss caused by the wrongful act of some third person, against whom the insured might have brought an action, the insurer is said to be subrogated to the right of the insured against the wrongdoer, and may, in some States, in the name of the latter, recover against him whatever sum the insured might have recovered. The liability of the wrongdoer is first and chief; and if the insured insists, as he may, upon proceeding against the insurer, he is in fairness bound to allow the insurer to use his name in proceeding against the wrongdoer; but if the insurer pay the loss, and afterward the insured proceeds against the wrongdoer, the latter can claim no advantage by the payment. If A sets fire to B's house, and B gets his insurance, A can not avail himself of this fact as a defense to a suit by B against A for damages.

In mutual insurance the holders of policies besides being insured are also insurers. They are members of the company, and by virtue of their membership are obliged to contribute to the losses of their associates, and have the right to claim from them by way of assessment or contribution in proportion to the amounts for which they are severally insured, indemnity for their respective losses. Rightly managed, it is a safe and cheap form of insurance, since, whatever be the rate of premium, the associates participate in the profits; and if the premium be fixed sufficiently high the aggregate amount of premiums, paid or promised by deposit notes, will constitute a capital adequate under any but most extraordinary circumstances to meet contingent losses. Mutual fire-insurance is better adapted to country practice, where the losses are liable to be single and small, than it is to the fluctuations of conflagration losses which are a feature of insurance in cities, and are better met by large capitals and accumulations than by heavy and unexpected assessments on members.

Revised by F. Sturges Allen.

Integral Calculus: See Calculus.

Intellect: See Mind and Psychology.

Intemperance: See INEBRIETY and INTOXICATION.

Intension: See LOGIC.

Intent [< Lat. *intentus*, from *intendere*, stretch out]: in law, is the voluntary purposing of an act which has legal consequences. A person's intent in a particular transaction is a question of fact. If he has undertaken to express that intent in a DOCUMENT (*q. v.*), its ascertainment is for the court, which will apply to the writing established rules of INTERPRETATION (*q. v.*). If the intent is to be gathered from oral language, and the acts and circumstances attending the transaction, it will generally be determined by the jury. Oftentimes the actual intention of a person, even in cases of contract, is immaterial, and will not be inquired into either by a jury or court. If one has freely accepted in unequivocal words an unambiguous offer made by another, he will not be allowed to get rid of the contract by proof that he misunderstood the offer, and therefore did not purpose to make the contract evidenced by such offer and acceptance. Or if a principal, with knowledge of all the facts, accepts the fruits of an unauthorized contract made on his behalf by an agent, he will not be permitted to show that he did not intend to ratify his agent's acts. In such cases the law regards not the secret thought but the overt act in determining a person's legal intent.

In torts, the wrongdoer's intention may or may not be material to the question of his liability, according to the nature of the transaction. Primitive law generally ignores altogether inquiry concerning the intent of the harmdoer. It visits vengeance on the visible cause of the harm, without regard to the innocence or fault of the actor. As a legal system develops it distinguishes accidental from willful harm, but even in its most advanced stage it leaves persons to act in many situations at their peril. Even to-day the actual intention with which one commits trespass to the property of another is wholly immaterial. He may believe without fault that the property is his own, yet if he uses it as his own he is a tort-feasor. On the other hand, if a person has a legal right to do an act, his intention in doing it will be disregarded in law. Hence one may build an unsightly structure on his own land for the sole purpose of annoying or harming his neighbor, without subjecting himself to liability in tort. For further information on this branch of the subject, the reader is referred to the various articles treating of specific wrongs.

Criminal intention is a necessary ingredient in every crime. It does not follow that every criminal is actuated by wicked motives, or that in doing the criminal act he purposed to break the criminal law. A woman in the U. S. may conscientiously believe she has a right to vote for a member of Congress. She may have been advised by able and honest lawyers that such is her right, and yet if she votes she will commit a crime. (*U. S.* vs. *Anthony*, 11 Blatch. 200.) The criminal intent in such a case consists in knowingly voting. Again, a person will be guilty of arson who fires a prison in order to effect his escape, though he does not intend to destroy the building, but on the contrary plans to extinguish and does extinguish the flames as soon as they have burned an opening through which he can escape. If, however, a special intent is necessary to the constitution of a crime, as in case of an assault with an intent to kill, the prosecution must establish not only the assault, but the particular intent as well. For the relation of INSANITY and of INTOXICATION to intent, see those topics. FRANCIS M. BURDICK.

Intercalation [Lat. *intercalare*, to insert]: the insertion of supplementary days or months into the calendar in order to effect an adjustment between the civil and the natural year. See CALENDAR.

Intercolumniation: the clear space between two consecutive columns. In Greek Doric colonnades it commonly measured from one to one and a half times the inferior diameter of the shaft, but in the Ionic order it was never less than two and sometimes reached three diameters in width. In arcaded structures of Roman type the decorative columns or pilasters are widely spaced, with intercolumniations of five or six, or even more, diameters. Vitruvius enumerates five sorts of intercolumniation: the *pycnostyle* of one and a half diameters between the shafts, *systyle* of two diameters, *eustyle* of two and a quarter, *diastyle* of three diameters, and *aræostyle* of more than three diameters. In nearly all the great monuments of classic architecture, however, the intercolumniations appear to have been determined by considerations of abstract taste rather than by arbitrary rules or traditions. See ORDERS OF ARCHITECTURE. A. D. F. HAMLIN.

Intercourse (Right of) between States: the right to political and commercial intercourse, including the right of the citizens or subjects of one state to pass into or through the territory of another. No text-writer on the law of nations, so far as we know, maintains that nations are bound to have communication with one another by ambassadors; least of all would the claim to send resident ambassadors be admitted as having the nature of strict right. As for the right of commercial intercourse, it is hard to maintain that a nation may rightfully force another into such a relation. It must begin in a voluntary way, on terms agreeable to both parties. If, now, one of the states wants nothing that the other can furnish, with what right can the other, to satisfy its wants, compel it to take certain products? But if there is a theoretical difficulty in such demand, intercourse is pretty sure to begin whenever an honest, peaceable way of bringing it about be tried, because all men love to exchange and can be soon made to see the advantages of so doing. Where either political or commercial intercourse between two states is already an accomplished fact, to break it off would be a proof of a hostile disposition on the part of the state so doing, which would require explanation and might be visited with a penalty. It would be the violation of an acquired right. As for the right of traveling into or across a country, if this be necessary in order that a nation may have access to the rest of the world, it seems to be a right, subject to such precautions as may prevent dangers from foreigners. Revised by T. S. WOOLSEY.

Interdict [readapted to Lat. from M. Eng. *enterdit*, from O. Fr. *entredit* < Lat. *interdictum*, prohibition, neut. of *interdictus*, past partic. of *interdicere*, forbid; *inter*, between + *dicere*, say]: in European history, a prohibitory order pronounced by the pope, by a synod, or by a bishop, withdrawing from particular persons or places, or both, certain religious privileges. It still exists in theory as one of the ecclesiastical censures of the Roman Catholic Church, but is seldom exercised, except toward individuals, who may be, for example, interdicted from entering a church. It is also sometimes pronounced against places where horrible crimes have been committed. In the Middle Ages the interdict was the most terrible of spiritual punishments. Every man's hand was against the interdicted person, and even great princes have been humbled by the power of this censure. At one time no bell might ring or organ be played in an interdicted district; the church doors were locked; services were performed without solemnities and in secret; all crosses and ornaments were hidden; Lenten food only could be eaten; no one could give or receive a kiss; the Eucharist was not given except to the dying; no man could shave his beard or brush his hair until the interdict was raised. But few interdicts, however, were so severe as this, though at the best an interdict was regarded as a severe measure. The Church herself from time to time mitigated the terrors of this dreadful visitation. The right of imposing an interdict rests on the same principle as the ancient exclusion of public sinners from the church, the refusal to accept their offerings, suspension from ecclesiastical office—all of which Church punishments are found at a very early date. The mediæval interdicts were always greatly modified in practice, especially in the thirteenth century. The brutality of absolute princes, the oppression of the Church and the people, public scandalous violation of Christian morality, were among the chief causes of the general interdicts, which must not be judged from the standpoint of our modern society, but from that of the mediæval orthodox Catholic world. They were meant for its benefit, as a protest against tyranny, absolutism, and gross immorality. That they had evil consequences was soon seen by the Church herself, but the same may be said of many other measures destined by society for its own good. Among the most celebrated interdicts were that laid upon all France by Gregory V. in 998; that laid on England by Alexander III. in 1171 as a punishment for the murder of Becket; that laid by the same pontiff upon Scotland in 1180; by Innocent III. on France, 1200; on England in 1209 under King John; on Venice by Paul V. in 1606, the last example of a public interdict. See article *Interdict* in Wetzer and Welte's *Kirchenlexicon*. A description of the mediæval interdict is to be found in Hurter's *Life of Innocent III.* (vol. iii., pp. 373–386). For the actual Church legislation, see Aichner, *Compendium Juris Ecclesiastici* (Brixen, 6th ed. 1887), and Laemmer's *Kirchenrecht* (2d ed., p. 382). The legislation of the Decretals is found in Santi, *Prælectiones Juris Canonici* (Ratisbon, 1886). The

actual norm for this censure and for all others is the constitution of Pius IX., *Apostolicæ Sedis*, by which important modifications were made. Revised by JOHN J. KEANE.

Interesse Termini: See LANDLORD and TENANT.

Interest [via O. Fr. from Lat. *interest*, it concerns, it is of advantage; *inter*, among, between + *est*, is]: the compensation paid for the use of money borrowed. The most convenient form of capital to be loaned, for both lender and borrower, is money. Hence loans are most commonly made in money, and interest is always reckoned at a certain per cent. of a defined sum of money, which is called the *principal*. The rightfulness of interest rests upon three facts: (1) The fact that capital is the result of past labor, preserved by self-denial in saving. (2) The fact that in the production of values present labor is crippled, almost fruitless, without the products of past labor—i. e. capital—to work upon and to work with. (3) The fact that any efficient use of capital is attended with some risk to the owner. Interest computed upon a sum consisting of the principal and previously accrued interest is called compound interest. See the article POLITICAL ECONOMY.

Interest was not formerly recoverable at common law. On the other hand, every person who stipulated for or who received any interest on a debt was punishable by both the ecclesiastical and secular courts. The earliest English statute that gives any color of legality to contracts for interest (then called usury) is 37 Hen. VIII., c. 9, passed in 1545. It recited the inefficiency of all previous legislation on the subject; the shifts and devices resorted to by money-lenders to obtain interest under the cover of fictitious sales and other apparently innocent transactions; expressly repealed all former acts; rigorously forbade all shifts and devices for obtaining interest; and declared that any one taking more than 10 per cent. interest should forfeit treble the principal and should suffer imprisonment and fine and ransom at the king's pleasure. It contained no express permission to exact any rate of interest. This statute was repealed by 5 and 6 Ed. VI., c. 20, which forbade the taking of any interest under the penalty of forfeiting the principal and interest, and of imprisonment and fine at the king's pleasure. In 1570 by 13 Eliz., c. 8, Edward's statute was abrogated on the ground that it had not done so much good as was hoped, and that it did not contain any provisions for the punishment of fictitious sales and other shifts and devices, and Henry's statute was restored. Section 5 of the new act declared that "all usury (interest), being forbidden by the law of God, is sin and detestable," and provided that the taking of or contracting for 10 per cent. or less should subject the creditor to the forfeiture of all interest, while the taking of or contracting for more than 10 per cent. should be punishable according to Henry's act, and also according to ecclesiastical law. This act was not repealed until 1854, but it seems to have been a dead letter, so far as interest at 10 per cent. or less was concerned, and is often referred to in connection with the statute of Henry as legalizing such rate. In fact, the right to recover interest was established in England by judicial and not by parliamentary legislation. This accounts for the lack of harmony in the reported cases upon this topic. No attempt will be made in this article to reconcile the decisions, nor to present in detail the opposing views. It must suffice to state briefly the most important and well-established rules. The authorities are agreed that interest is now recoverable only upon a contract to pay it, or as damages for breach of contract to pay the principal, or for an unlawful detention of a debt, or for a violation of duty.

Contracts.—The parties may provide in express terms that the debt shall bear interest at an agreed rate from a specified day until the principal is paid. If such rate is not in violation of a statute, the creditor will be able to recover the entire sum agreed upon, save in a few jurisdictions where the courts treat contract provisions for the payment of interest after maturity of the principal, as stipulated damages, and upon proof that they greatly exceed the real value of money, declare them to be penalties and not recoverable. (*Browne* vs. *Steck*, 2 Colo. 70.) If such a contract has been merged in a judgment, the rate of interest thereafter will be that fixed by statute. The contract may bind the debtor to pay interest from a certain day at a fixed rate, with no provision as to interest after maturity. In such a case the courts of some of the U. S. hold that interest is to be computed at the contract rate until the principal is paid. The decided weight of authority both in England and the U. S., however, is that in such cases the interest recoverable after default in payment of the principal is by way of damages, and can not exceed the statutory rate. Again, the contract may stipulate for the payment of interest without specifying either the date from which or the rate at which it is to be computed. In that event interest will be reckoned at the statutory rate from the inception of the contract. If default has been made in the payment of stipulated interest, the debtor may bind himself by contract to pay interest thereon; but a contract that in case future interest is not paid when due, it shall be treated as principal and bear interest, is generally held to be unenforceable. The latter doctrine can not be supported upon principle, and is to be accounted for only by the immemorial prejudice against money-lenders.

Even when a debtor has not expressly promised to pay interest, the circumstances of the transaction may disclose an implied promise; as where he knows that interest is payable by the usage of trade, or by the usage of the creditor. A valid agreement to pay interest, whether expressed or implied, is a part of the obligation of the contract, and therefore within the protection of the clause of the U. S. Constitution which forbids a State from passing any law impairing the obligation of contracts. (Art. i., § 10.) Such is not the rule, however, where a State has by legislation reserved to her juries the power to say whether interest may be recovered at all. *Hormanson* vs. *Wilson*, 1 Hughes 188, U. S. Dist. Ct. E. D. of Va.

Damages.—In many cases interest is recoverable by way of damages for the breach of a contract to pay money, or for the violation of a duty. This liability should be carefully distinguished from that which exists where there is an implied contract to pay interest. The failure to observe this distinction accounts in part for the great conflict of decisions already adverted to. A person who agrees to pay a debt at a stipulated time does not impliedly promise to pay interest from such date if he breaks the agreement. Whether he should pay interest, and if he should, at what rate, are properly questions of fact in each case. They are so treated in England, no matter what may be the form of the contract. In the U. S. some courts hold that where the parties have named a rate of interest in their contract, they have thereby evinced their intention that the same rate shall continue after default. Others hold that although there is no implied agreement for the contract rate after default, yet by fixing a rate they have consented that this shall be the standard of damages for breach of the contract. By a third class it is ruled that the statutory rate is the proper measure of damages. And it may be laid down as the general rule in the U. S. that where the parties have not stipulated a rate of interest, if any interest is given as damages it will be the amount fixed by statute at the time of default. Another rule generally adopted by the U. S. courts is that the debtor makes default and thus becomes liable to pay interest as damages whenever, knowing the amount of the principle sum and the time when it is due, he neglects or refuses to pay it. From this it follows that interest is not recoverable on unliquidated accounts, or on claims that are uncertain in amount or time of payment. Wherever the law fixes the date of payment, the debtor is conclusively presumed to know when the claim matures. For example, on a cash sale of goods in a deliverable state, it is the duty of the buyer to pay immediately, and interest may be recovered from the day of sale. Taxes do not ordinarily bear interest, nor do judgments in the absence of a statute granting it. Interest is not recoverable against the State by way of damages for breach of contract. (*U. S.* vs. *North Carolina*, 136 U. S. 211; but see *People* vs. *Canal Commissioners*, 5 Denio (N. Y.) 401.) Whether the interest coupons of bonds bear interest after their maturity and default, has been differently decided in the U. S. In some jurisdictions interest, as damages, may be recovered, even though the coupons are held by the owner of the bonds, to be reckoned from their maturity. (*Walnut* vs. *Wade*, 103 U. S. 683.) Other courts have held that interest will not be allowed, unless the coupons have been negotiated apart from the bonds, as until then they are mere incidents of the bond debt. *Williamsburg Savings-bank* vs. *Solon*, 136 N. Y. 465.

Where one person is under a legal duty to pay money to another, although there is no contract relation between them, interest may be recovered by way of damages for wrongfully withholding it. The date from which interest should be reckoned in such cases is the time when the wrongful withholding begins. For example, where money

has been paid to one by mistake, he will not be charged with interest until the mistake is discovered and demand for restitution is made. The breach of a legal duty to invest funds will subject one to the payment of interest as damages—as when executors, administrators, guardians, or trustees retain funds in violation of their duty to invest them. If they use the funds in their own business, or are grossly negligent in their accounts, they may be compelled to pay compound interest.

In tort actions interest is not allowed by the English rule, on damages that are unliquidated; but these are deemed liquidated when they can be made certain by easy proof. While the decisions in the U. S. are conflicting, it is believed that the weight of authority sustains the following propositions: No interest can be recovered in actions for personal injuries save where expressly given by statute. In actions of trover, replevin, and trespass, where the property loss is certain or may easily be made certain, interest on such loss is to be added as a matter of law. In other actions sounding in tort, interest on the damages claimed is in the discretion of the jury. *Wilson* vs. *Troy*, 135 N. Y. 105, 18 L. R. A. 449.

Computation.—The method of casting interest which prevails generally in the U. S. is as follows: Compute the interest on the principal sum from the time when interest became payable to the first time when a payment, alone or in conjunction with preceding payments, shall equal or exceed the interest due on the principal. Deduct this sum and cast interest on the balance as before. Other methods will be found in Perley's *Law of Interest*, 167 (Boston, 1893).

FRANCIS M. BURDICK.

Interference [deriv. of *interfere* < M. Eng. *enterferen*, from O. Fr. *entreferir*, exchange blows < Lat. *inter*, between + *ferīre*, strike]: in physics, a phenomenon resulting from the combination of any system of waves with differences of phase. Interference is of great interest in physics; on the one hand, because by means of it, chiefly, such theories as the undulatory theory of light have been developed and the existence of the wave-motions by means of which radiant energy is transmitted through space has been established; on the other hand, because color effects of the highest degree of beauty have their origin in interference; so that the subject is of æsthetic as well as scientific importance. Interference is met with in every department of physics in which we have to do with wave-motion. We have interference of water-waves, of the waves of air and other media with which acoustics deals, also of the wave systems of the ether (light-waves, electro-magnetic waves, etc.).

To consider one of the simplest cases, the set of "standing waves" into which an elastic cord is broken up when transverse waves are sent over it, and returned by reflection, are due to interference. The conditions of the experiment are that the successive waves follow one another at intervals, such that the direct and reflected waves meet with permanently fixed difference of phase for each point of the cord. The breaking up of such a string into nodes and loops is a familiar phenomenon. Another familiar example is in the standing waves upon water or mercury con-

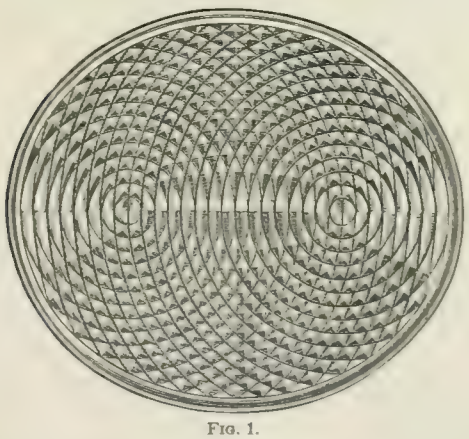


FIG. 1.

tained in a vessel of symmetrical form. Fig. 1 shows the case of an elliptical dish with waves starting from one focus under the excitation of a series of drops impinging upon the surface at that point, and reflected to the other focus. A very remarkable example of the interference of water waves exists in the so-called "rollers" which make the approach to certain isolated oceanic islands dangerous. Under the influence of the trade-winds, long and well-developed ocean swells are formed which, intercepted by the island, are broken into two systems, one of which, diffracted around one extremity of the island, meets the other system (oppositely diffracted) in the lee of the island and combines with it, producing interference effects on an enormous scale. This theory of the cause of "rollers" is credited to Cleveland Abbe (see *Nature*, vol. xliii., p. 565), who observed the phenomenon from a mountain top on the island of Ascension in 1889. In *acoustics* diffraction effects occur, although not noticeable under ordinary circumstances. Lord Raleigh, with the sensitive flame of Le Conte as an aid, has found it possible to explore the sound-shadow behind a disk 15 inches in diameter, picking out the central region of sound and the alternate rings of silence and sound surrounding it. See his lecture at the Royal Institution, 1888, *Nature*, vol. xxxviii., p. 208.

W. Le Conte Stevens (*American Journal of Science* (3), vol. xxxvii., p. 257, for 1889) also making use of the sensitive flame as an indicator, has found it possible to map the field of interference behind a screen with two openings through which sound-waves were made to pass. An experiment analogous to that of the Fresnel mirrors was also successful, at least six interference bands of sound vibration being located by means of the flame.

The interference of direct and reflected waves, in the case of a tuning-fork of high pitch vibrating in front of a reflecting wall, can be made evident to the ear by simply moving the fork rather rapidly toward or away from the wall. The result is a clearly defined series of sound - beats, the rate of which depends upon the pitch of the fork and the velocity with which it is moved. The apparatus (Fig. 2) for demonstrating the interference of sound by means of tubes (*a b*) affording independent paths of adjustable length for the passage of portions of the same set of sound-waves, together with a manometric flame (*f*) for testing the amplitude of the recombined wave, is familiar to all students of sound. When the difference of path traversed by the waves in *a* and *b* is half a wave-length, quiescence of the flame *f* shows complete interference of the recombined wave within the passage *c d*.

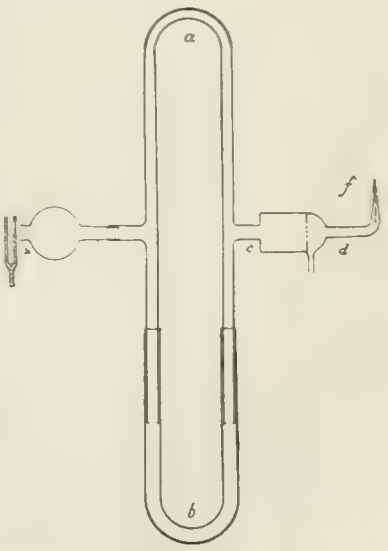


FIG. 2.

However, it is in the domain of optics that the most beautiful and important phenomena of interference occur.

Were light vibrations all of one wave-length, there would result from interference a variety of effects of light and shade of very great beauty and significance. Since light is composed of an infinite series of wave-lengths, all present under every ordinary condition of natural and artificial illumination, interference operating independently in each wave-length produces differences not only of brightness but likewise of color.

One class of interference phenomena is described in the article DIFFRACTION (*q. v.*). Diffraction deals only with the bending of light-waves which have passed through appertures or past opaque edges, or which have been reflected from grooves, as in the ruled gratings used in spectroscopy, and with the interference of the various wave elements in consequence of the difference of path which they have followed. It is possible, however, to produce difference of path by a number of other devices, two or three of which are of interest because of the part which they have had in the rejection of the omission theory of light and the establishment of the undulatory theory. The condition of inter-

ference is difference of phase between two light-waves vibrating in the same plane, and traveling in nearly the same direction. Complete interference (producing darkness) implies a phase difference of half a wave-length. This may be brought about by causing one of the two waves to travel over a path longer than that of the other by $\frac{\lambda}{2}, \frac{3\lambda}{2}, \frac{5\lambda}{2}$, etc. Difference of phase amounting to $\lambda, \frac{4\lambda}{2}, \frac{6\lambda}{2}$, etc., gives, on the contrary, resultant amplitudes which are the sum of the component amplitudes of the interfering waves.

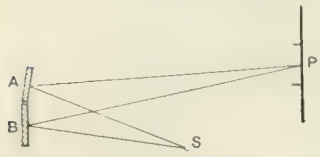


Fig 3.

Two of the historical methods of producing the requisite difference of path are as follows:

(1) Fresnel's mirrors (Fig. 3, A B) are two opaque mirrors, accurately adjustable to an angle of very nearly 180°. S is a source of light and P a point on the screen illuminated by rays from both mirrors. When $SA + AP = SP + BP \pm \frac{(n+1)\lambda}{2}$ where n is any small, even integer, interference with extinction of the rays will occur. At points on the screen near P other conditions will prevail, and at certain points, say $P'P''$, etc., we should have $SA + AP = SB + BB' \pm \frac{n}{2}$. Such regions would be regions of maximum. Still further away the condition found at P (only for larger or smaller values of n) would occur, so that the entire screen would be alternately light and dark. If S be a slit, the points of darkness and of maximum brightness form parallel lines, which, with the intervening regions of intermediate illumination, constitute the interference fringes of Fresnel. If, further, S be a composite source, such as daylight or gaslight, the positions of extinction on the screen will vary with the color, and the entire field will be illuminated. The color at each point of its surface will be a white with one component entirely missing—viz., that for which the point in question interferes to extinction. At the same point one component will be very bright—viz., that which combines with both rays in the same phase, and all other colors will be present in intensities depending for each wave-length upon the square of the amplitude of the resultant vibration after interference. The result of interference in this case, then, will be fringes or bands, alternately black and colored for monochromatic light, or consisting of a series of colors following the order of the spectrum tints, and emerging one into the next by insensible gradations when the source is white light.

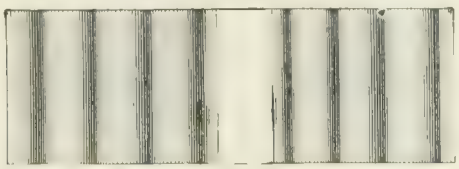


Fig. 4.

Fig. 4 shows the arrangement of these Fresnel interference fringes when the source is a vertical slit.

(2) The same effect was obtained by Fresnel by means of a biprism, B B′ (Fig. 5), the oblique faces of which made a suitable angle very slightly less than 180°.

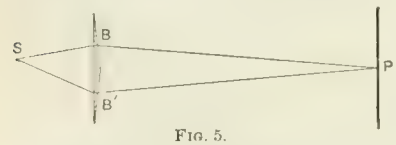


Fig. 5.

(3) Another method of bringing two rays from a single source into combination with difference of phase (difference in the length of the path traversed) is due to Lloyd. From the source S, Fig. 6, one ray reaches P directly, another is reflected from a plane mirror, M, placed very nearly in the path of the direct ray. When the angle of incidence of the second ray approaches 180° the two rays will interfere, producing fringes.

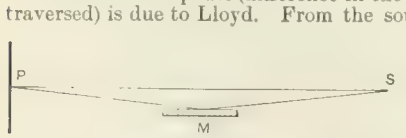


Fig. 6.

(4) Difference of phase may also be produced by introducing into the path of one of two rays which illuminate a point, P, Fig. 7, from sources, S S′, equally distant from the former some substance such as glass, through which light travels more slowly than in air. The retardation in this case is equivalent to lengthening the path, and interference occurs, as in the cases already considered. Another and equally important class of interference phenomena is that of the colors of thin plates. The interference in this case is always between the rays reflected from the two faces, and the difference of path is determined by the thickness of the film and the velocity of light within it.

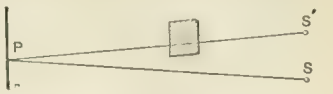


Fig. 7.

The simplest case is that of a film of uniform thickness. It may be optically denser than the surrounding medium, or *vice versa*. In either case one of the interfering rays will be reflected with change of phase, the other without change of phase. Now, interference reduces the amplitude of the resultant vibration to zero, producing darkness when the interfering rays are in precisely opposite phase. This happens when one is behind the other by one-half a wave-length. It follows that but for the change of phase due to reflection of the ray which suffers internal reflection (reflection in passing from the denser to the rarer medium), the thickness of the film necessary to produce complete interference (darkness) between the rays reflected from its first and second faces would be one-fourth of a wave-length of the light in question. Change of phase by internal reflection, however, amounts in itself to a quarter of a wave-length, so that complete interference really occurs in the case of films, the thickness of which measured in the direction of the ray is half a wave-length. For thicker films this condition recurs for additions of half a wave-length, or in general when the thickness is

$$S = \frac{n}{2}\lambda$$

where n is an integer.

Compositions with maximum increase of amplitude, on the other hand, take place for films of thickness,

$$S = \frac{2n+1}{4}\lambda.$$

Since both rays in this process suffer in brightness by reflection and by absorption, but unequally, the interfering rays are in general not of equal amplitude. Interference, therefore, produces neither complete extinction nor doubling of intensity. A familiar and typical case of interference in thin films is that of the soap-bubble. Suppose $l\,l'$ (Fig. 8) to be a portion of such a film, the thickness of which is three-fourths the wave-length of red light (or $S = \frac{3}{4} \times 0{\cdot}75\mu = 0{\cdot}0005625$, where S is measured obliquely from m to n). Upon this film suppose oblique rays to fall, among others a and b. These upon reaching the upper surface of the film are each partially reflected and partially refracted. The ray b, for example, is divided into $h\,b'$ which is reflected from the upper surface of the film and a refracted component $h\,p$. At the lower surface of the film p is also divided into $p\,k$ which is internally reflected with change of place, and $p\,u$ which is refracted passing on along a path parallel to the original path $b\,h$. At k further subdivision takes place, a portion of the ray following the path $k\,b''$, which is also the path of the first reflected component $k\,a'$ of the ray $a\,k$. These two interfere, their difference of phase being determined by the length of the path $h\,p + p\,k$, through the film. If the film is of uniform thickness the same wave-length will be suppressed everywhere, and the film will appear of a uniform tint. Films varying in thickness correspondingly show color changes, such as we see in the soap-bubble. To interference

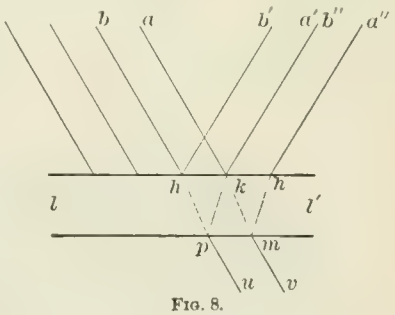


Fig. 8.

of light in thin films some of the most beautiful colors in nature are due. *Iridescent* bodies owe their colors to it, as do the opal and the pearl.

The well-known phenomenon of Newton's rings is produced by the air-film between a convex lens and a plane plate in contact with it at the axis. The thickness of the air space increases continuously with the distance (radically) from the center, and the ring-shaped interference bands follow one another in the order of the colors of the spectrum. All the cases considered in this article are those in which rays are made to interfere. That of polarized light gives rise to other very interesting phenomena, of which some description is given in the article POLARIZATION.

E. L. NICHOLS.

Interference, or **Intervention**: in international law, the measures which one state takes to prevent injury to itself arising from the political measures of another state, or growing for some other reason out of the other sovereign's conduct. Yet since all states are independent, the presumption is against the right of intervention. Practically one may say that to be justifiable, interference by one state in the affairs of another must have proved successful. The principal legitimate causes of interference are—first, that for the purpose of preserving the balance of power—that is, of preventing a state from gaining, by political means or by force, an accession of power which would be dangerous to its neighbors. Many alliances and wars have taken place in Europe on this ground within the last four centuries. The plea here is self-preservation. (See BALANCE OF POWER.) A second class of instances of interference, all or nearly all of a modern age, have grown out of the efforts of nations to right themselves against tyrannical governments by revolution. The plea here also is self-preservation—that no government can stand against the revolutionary fever of neighboring countries. But the plea is made for the benefit of the powers that be, and not for that of the people. As a practical rule, it does not apply to great nations like France, which changes its political forms at will, without standing in fear of other states. It is also a dangerous rule to those who follow it, for it only intensifies revolutions within and without by exciting the feeling that there is a radical, endless antagonism between the interest and will of legitimate governments, so called, and the nations which they try to keep down.

It was in pursuance of this principle that Austria interfered in Italy in 1821 to crush the movement of the liberal party, and France in Spain to assist a royalist insurrection. (See HOLY ALLIANCE.) Two years later certain European powers took steps toward introducing a similar spirit of intervention in South America, with the object of restoring the revolting Spanish colonies there to their mother-country. It was to meet this proposed step that the Monroe doctrine was formulated. See MONROE DOCTRINE.

A *third* and more righteous kind of interference is that used when a government commits great inhumanity in punishing revolutionists, or great cruelty against rebels in war. Thus in 1827 Great Britain and France interfered to protect Greece from the Turks, and in 1877 Russia found a reason for its attack upon Turkey in the atrocities committed by Turkish soldiers in Bulgaria. On the whole, there is a somewhat vague border-line, beyond which, in extreme cases, nations having common interests and a common civilization will pass, in order to put an end to evil or to avert danger from themselves. Revised by T. S. WOOLSEY.

In'terim [Lat., meanwhile, for a while, temporarily]: the name of certain edicts of Charles V., issued with the object of maintaining the *status quo* until a general council could decide all questions between Catholics and Protestants. There were three such—the Interim of Ratisbon (1541), of Augsburg (May 15, 1548), and of Leipzig (Dec. 22, 1548), each being the result of conferences between Catholic and Protestant theologians upon the points at issue. These interims were in reality despotic ordinances of Charles V., attempting to regulate the confessions of faith adopted by the Protestants, and forbidding them to innovate upon the doctrines or rites they had once professed or agreed to. No permanent result could be expected from such attempts at compromise; accordingly, the Leipzig Interim was generally disobeyed and resisted by arms, was abrogated by Charles in 1552, and was finally superseded by the Augsburg Confession, originally presented in 1530, confirmed to the Protestant states in 1555 by the diet of Augsburg.

Revised by S. M. JACKSON.

Interior, Department of the: the name of an executive department in several modern states. In the U. S. it was created Mar. 3, 1849, and the first head of the department was Thomas O. Ewing, of Ohio. It has charge of public business relating to pensions, patents, the public lands, Indian affairs, education, railroads, the geological survey, national parks, and the census. The chief officer is the Secretary of the Interior, who is appointed by the President, and has a seat in the cabinet. He is assisted in the administration of the department by the first and second assistant secretaries, the chief clerk, the commissioners of patents, pensions, the general land office, Indian affairs, education, and railroads, the director of the geological survey, and the superintendent of the census. In other countries the so-called department of the interior varies greatly in its organization and in its scope, and many of the duties that devolve upon it in the U. S. are performed by other departments. Thus in Belgium the supervision of railways is the work of another ministry than that of the interior and instruction; in France and Italy the Premier is Minister of the Interior as well as president of the council, while in many governments the term interior is not applied to any of the executive departments.

Interjections [Lat. *interjectio*; *inter*, between + *ja'cere*, throw]: exclamatory words representing the potency or value of unformed sentences. They may express an emotion, a command, a judgment, an indication, an inquiry, or may be merely reflex imitations of sounds. Thus *oh*! expresses surprise, *sh*! command to silence, *hm*! disapproval, *hm*? inquiry; *bang*! is imitative. In the strictest sense the term interjection is used of only such words as do not readily admit of classification among the other parts of speech.

BENJ. IDE WHEELER.

In'terlaken: a village in the canton of Berne, Switzerland; on the Aar (see map of Switzerland, ref. 5–E). It has about 2,000 inhabitants, and consists mostly of hotels and boarding-houses. As it is beautifully situated, and its surroundings present some of the finest prospects of Switzerland (the Staubbach and the Jungfrau), it is visited during the summer by thousands of tourists.

Intermittent Fever, or **Ague** [*intermittent* from pres. partic. of Lat. *intermit'tere*, to interrupt, to be suspended at intervals; *inter*, between + *mittere*, send; *ague* from O. Fr. *ague* < Lat. *acu'ta* (sc. *febris*, fever, femin. of *acu'tus*, sharp)]: a disease in which there is a regular succession of periods of fever and periods of entire freedom from fever. The fever period is made up of three stages—the cold stage, the hot stage, and the sweating stage. The cause of intermittent fever is usually held to be a hitherto undiscovered poison conveyed by the air from swampy, undrained, or recently overturned ground. As will be seen by reference to MIASMA, there is another view, held by those who accept the germ theory of disease, namely, that malarial diseases are caused by taking into the system certain microscopically minute (micro-) organisms or their more minute seeds (spores). The first of these theories regards the cause as consisting in a vitiation of the air, the nature of which has not been defined by chemical analysis; the latter (which harmonizes with what is believed in regard to a number of other diseases) regards the cause as a form of vegetable life which enters the blood, and lives and propagates in it as a parasite, called a hæmatozoön.

Intermittent fever occurs in paroxysms separated by intermissions or non-febrile periods. The paroxysms may recur daily, constituting the "quotidian" form, or on alternate days, the "tertian" form, since it recurs on the third day (counting that of the previous attack). There is also a "quartan" form. Exceptionally there may be a "double quotidian," with one strong and one mild attack each day; a "double tertian," with a daily onset, that of every second day being relatively weak; a "double quartan," having two attacks in every three days. Febrile paroxysms usually recur at a definite hour each day or alternate day. A recurrence of successive paroxysms at an earlier hour for each attack is termed "anticipating," and indicates an increasing malarial influence. When the paroxysms come at a later period, with successive attacks, it is termed "postponing" or "retarding," and indicates a subsidence of the malarial influence. Paroxysms may occur a few hours after exposure to malaria or after a period of incubation as long as two weeks. A paroxysm has three distinct periods or stages—(1) cold stage; (2) hot stage; (3) sweating stage. The average duration of the cold stage is one-half to three-quarters of an hour; it may be a few minutes or two to three

hours. It begins with shivering, chilliness in the loins, extending to back and limbs, and muscular tremor; the lips quiver, the teeth chatter, and the whole body is shaken. The respiration is sighing, the pulse feeble, the face pale or livid, the nails livid, the fingers waxen and cold. The general surface is pale, cold, often shriveled. The thermometer in the mouth or armpit, however, reveals an increased temperature of the blood even in the cold stage, the blood having been expelled from the skin and extremities by the involuntary contraction of the elastic tissues of the skin. During the first stage there is therefore a determination of blood to internal organs, which may be dangerously congested, constituting the "pernicious" or "congestive" forms. Headache, vomiting, tenderness over the liver and spleen, are symptomatic of such congestion. The transition from the cold to the hot stage is gradual; the chilliness ceases, and flushings of heat are felt. The skin then becomes hot and red, the pulse full and bounding, the face flushed; headache increases, and the temperature of the surface may be 105° or 106° F. The duration of the hot stage is from three to eight hours. The third or sweating stage comes on gradually; moisture appears on the face and soon after on the trunk and extremities. The heat, headache, thirst, and restlessness subside; the temperature falls rapidly; the person is drowsy, and falls into a long and refreshing sleep, with profuse or slight sweating. The duration of this stage is usually from three to four hours. During the intermissions or apyrexial periods there may be every appearance of good health, or, in graver cases, impaired digestion, debility, pallor, or a sallow cachectic complexion.

Malaria impoverishes the blood. Intermittent fever, when incompletely cured, tends to recur, either in marked paroxysms or in less pronounced "latent," "masked," "concealed" forms, with vague symptoms of chilliness and weariness known as "dumb ague," or in periodic neuralgia. The spleen is often permanently enlarged, and then constitutes what is termed "ague-cake." The periodical recurrence of the paroxysms is due to successive efforts at elimination of the poison, the interval being the time required for the zymotic material of malaria to redevelop and impress the system.

The paroxysms require no treatment other than warm drinks and blanketing during the cold stage, cooling drinks and sponging during the febrile or hot stage. The treatment for the prevention of the paroxysms is to be in the periods of intermission. The remedies most used are Peruvian or cinchona bark, or the alkaloids derived from it. Quinine is mostly used in the form of the sulphate and bisulphate, less often the muriate. Salicine, the alkaloid of willow bark, berberine, piperine, apiol, eucalyptus, and other vegetable substitutes are weaker and less efficacious than quinine. Quinine is given either in one full dose of ten or more grains, or in divided doses of five grains three times a day, to break the paroxysms, and is continued in smaller doses for many days to prevent their recurrence. Fowler's solution of arsenite of potash is often used when quinine produces unpleasant effects or can not be had. Nitric acid, sulphite of soda, ferrocyanide of iron, chloride of ammonium are also used. The patient may be much benefited by administering cholagogue cathartics, and subsequently employing iron and tonics generally. The prevention of intermittent fever is to be sought by soil-drainage, by avoiding damp night air, and sleeping in closed rooms well above the ground. Sunflowers freely planted adjacent to dwellings have been considered protective by absorbing malaria, and the *Eucalyptus globulus*, or Australian fever-tree, has been extensively planted in certain localities, and is said to lessen, or even eradicate, malaria.

Revised by CHARLES W. DULLES.

Internal Revenue: See FINANCE.

International Expositions: See EXPOSITIONS, INTERNATIONAL and UNIVERSAL.

International Law: a collection of rules by which nations, and their members respectively, are supposed to be governed in their relations with each other. In its exact sense, law is a rule of property and of conduct prescribed by sovereign power. Strictly speaking, therefore, as nations have no common superior, they can not be said to be subject to human law. But there is, nevertheless, a body of rules, more or less generally recognized, by which nations profess to regulate their own conduct toward each other, and the conduct of their citizens respectively. Being rules of property and of conduct, though not prescribed by a superior, they are somewhat loosely designated as laws; and taken together they form what is called international law, and as such are enforced by each nation separately upon persons and things within its jurisdiction. This body of rules is derived from custom or treaty. From the earliest times there must have been some sort of rule, tacit or expressed, for the intercourse, however small, which must have existed between nations, and must have begun with the beginning of nations. No community has ever yet existed, and none could exist, so independent and isolated as to have no communication whatever with its neighbors; and intercourse between communities, as between individuals, necessarily required some kind of regulation. We find, accordingly, in the oldest historical records, mention of messengers or embassies sent by nation or king to another nation or king, and of compacts between them. Treaties followed the unwritten regulations as a matter of course, for the necessity of changing or of adding to existing rules led to express stipulations. These were expressed as stipulations between individuals were expressed: orally before a written language was known, and orally or in writing afterward. Of these treaties or compacts between nations there are many and multiform records. Various collections of them have been made, the most important and complete of which are those of Dumont, Rousset, de Martens, Murhard, Samwer, Calvo, Rymer, Hertslet, and de Clercq. Notwithstanding the treaties of every kind and form that have been entered into, the greater part of international law is to this day customary only. These customs have been declared and enforced by judicial decisions, and set forth in the writings of publicists in all the languages of Europe.

The body of law which we have thus described is sometimes also called public law, or the law of nations. Its formation has been gradual, and its history is curious and instructive. They err greatly who say that it is the sole product of modern times. It is the product of all times ever since there were nations upon the earth, though its greatest development is unquestionably modern. The Amphictyonic Council enforced a kind of international law among the Greeks, by which, among other things, an exchange of prisoners of war and a truce after a battle for the burial of the dead were enjoined. The Romans, improving upon the Greeks, instituted a college of heralds for the declaration of war, and established one important and beneficent rule: that none but a soldier sworn into the service could fight the common enemy. Christianity wrought, with its other changes, a great change in public law. The spirit of Christian brotherhood found its way into cabinets and camps. The citizen of another state or the subject of another king was yet a brother in Christ, and the barriers which separated nations were, in part at least, thrown down. The influence of the Christian Church upon the public law of the world can not be overestimated. As soon as the brotherhood of man came to be accepted as a religious tenet, it was inevitable that the old doctrine of the natural antipathy of nations should, sooner or later, disappear. In the earliest ages the stranger had been accounted an enemy, and even the victims of shipwreck might lawfully have been plundered. Such barbarities fell before the gospel; and others (less gross), which kept their hold in spite of the Bible and the Church, gradually lessened in intensity and in number. The laws of states, the ordinances of kings, and the writings of publicists have moderated the severity of earlier times, while every new treaty between nations has been an addition to public law. Starting from the theory of the natural rights of men and the equality of nations, publicists have striven to establish the code of ethics as the law of nations. Montesquieu declared it as a maxim that nations should do each other as much good in peace and as little harm in war as possible without injury to their own interests. The rules of the Hanseatic League, the laws of Wisby and of Oleron, the Consolato del Mare, and the Ordinances of Louis XIV. were all so many contributions to international law. A host of writers have discussed its principles and enforced its precepts. Aristotle, Cicero, Bacon, Grotius, Barbeyrac, Puffendorf, Wolfius, Burlamaqui, Rutherforth, Bynkershoek, and Vattel, and such later authorities as Kent, Wheaton, Phillimore, Twiss, Lawrence, Wharton, Woolsey, Dana, Manning, Pomeroy, Halleck, Field, Heffter, Bluntschli, Hautefeuille, Cauchy, Calvo, Mancini, Holtzendorf, Goldschmidt, Asher, Lorimer, Westlake, Bernard, Hall, Pasquale Fiore, Pradier-Fodéré, and Pierantoni are among those who have written on the subject. Of all these writers, Grotius stands as the acknowledged head.

As now existing, international law is a science of which the major part is generally understood and accepted. The residue consists of propositions more or less disputed or unsettled. Regarded as a whole, it consists of two main divisions, one treating of peace and the other of war, or rather of the relations of nations and of their members to each other, except as they are modified by a state of war, and the modifications of these relations produced by war.

The portion of international law relating to peace is naturally subdivided into two divisions, one public and the other private. Public international law contains the rules respecting the relations of nations to each other and to the members of other nations; private international law contains the rules respecting the relations of the members of a nation to the members of other nations. In respect to the first department, they relate to the essential rights of nations, such as their sovereignty, equality, perpetuity, territory, property; to their extra-territorial action in regard to navigation, discovery, exploration, and colonization; to fisheries and piracy; to the intercourse of nations with each other by means of accredited agents; to international compacts, asylum and extradition, national character and jurisdiction, and domicile; and to the reciprocal duties of nations to foreigners, and of foreigners to the nation where they live, in respect of residence, occupation, religion, obedience to the laws, taxation, civil and military service. To the subject of private international law belong provisions respecting private rights and the administration of justice. Here may be grouped together regulations concerning personal capacity, social condition, the validity and interpretation of contracts, the effect of marriages and divorces, the devolution of property at death, the administration of justice, procedure and evidence, as these subjects apply to the persons and property of foreigners.

This brief enumeration shows how vast is the scope and how varied are the details of international law. The tendency of the science is strongly toward amelioration. Various causes are working to produce this result, such as increasing intercourse between different parts of the world and the waste and suffering of war. Men are perceiving more and more the need of reforming and of defining clearly the rights and duties of nations, that war may be discouraged, international controversies avoided, and international intercourse increased. The changing circumstances of men always require a corresponding change in the rules which guide and restrain them. The oppression of standing armies, the tyranny of conscriptions, the burden of taxation to meet the interest of debts contracted for war are all so many motives to modify, if it be possible, and to define with exactness, the rules by which nations are to be guided in their intercourse with each other. Of all the measures taken in our time for the civilization of international intercourse and the settlement of international differences, none is comparable to that of international arbitration. The idea is not new—indeed, it is as old as Henry IV. of France—but the practice is modern. The U. S. has the honor, on which she may justly pride herself, of having oftenest taught by precept and oftenest adopted in practice the closing of international controversies by the intervention of impartial arbiters. There are many instances of international arbitration to settle specific questions in dispute. See ARBITRATION and ALABAMA CLAIMS.

A general agreement to resort to arbitration has been introduced into several treaties; in one between Spain and the Hawaiian islands; in another between Spain and Sweden; in another between Spain and Uruguay; and in seven different treaties negotiated by Sir John Bowring.

The arbitration of Geneva was followed by a vote of the British House of Commons on July 8, 1873, by which, on motion of Mr. Henry Richard, it was resolved: "That an humble address be presented to Her Majesty, praying that she will be graciously pleased to instruct her principal Secretary of State for Foreign Affairs to enter into communication with foreign powers with a view to further improvement in international law and the establishment of a general and permanent system of international arbitration." The measures which have been taken for the codification of international law are of much significance. At the meeting of the British Association for the Promotion of Social Science, held at Manchester in Oct., 1866, a motion was made by David Dudley Field for the appointment of a committee to prepare the outlines of an international code. The proposal was agreed to, and a committee appointed, comprising jurists of different countries. Some circumstances, however, led Mr. Field to prepare and to publish in 1872 a draft of the whole work, which he entitled *Draft Outlines of an International Code*. In 1868 Prof. Bluntschli, of Heidelberg, published a work (*Modernes Völkerrecht der Civilisirten Staaten, als Rechtsbuch Dargestellt*) which has been translated into French under the title of *Droit International Codifié*. On Sept. 8, 1873, eleven publicists assembled at Ghent and founded an institute of international law. The number of members is limited to fifty. The next meeting of the institute was held at Geneva in Aug., 1874, and the following three subjects were there more or less examined, and reports thereon were made: namely, international arbitration; the three rules of the Treaty of Washington; and private international law. On Oct. 10, 1873, upon the invitation of a committee formed in the U. S., a conference was held at Brussels, where was founded an association for the reform and codification of the law of nations. This conference was attended by representatives from the U. S., Great Britain, France, Germany, Italy, Spain, Switzerland, Holland, and Belgium, comprising some of the most eminent authorities on international law. The two following resolutions were unanimously adopted: "1. The conference declares that an international code, defining with as much precision as possible the rights and duties of nations and of their members, is eminently desirable in the interest of peace, public order, and general prosperity. It is therefore of opinion that no effort should be neglected to obtain the preparation and adoption of such a code. The conference reserves the question as to how far the codification of international law should be simply scientific, and how far it should be incorporated into treaties or conventions formally accepted by sovereign states. 2. The conference declares that it regards arbitration as the means essentially just, reasonable, and even obligatory upon nations, for the settlement of international differences which can not be settled by negotiation. It abstains from affirming that in all cases without exception these means are applicable, but it believes that the exceptions are rare. It is convinced that no difference should be considered as insoluble until after a clear explanation of the matter in difference, a sufficient delay, and the exhaustion of all pacific means of accommodation." This association had another meeting in 1874, at which papers were presented on various branches of international law. That the steps thus taken may lead to such a reform and codification of international law as will define, with all the precision possible, the rights and duties of nations, and thus lessen the occasions of dispute and the opportunities of conflict, the wise and good of all countries must devoutly hope.

SUMMARY OF PRINCIPLES.*

I. *Rights and Obligations of Nations, except so far as they are Modified by War.*—1. Here we speak, first, of the essential nature of a state, and of the parties to international law. (*a*) An individual man can not be a party of this kind, but can only claim, if a stranger, humane treatment. The law of nature will be respected by the courts, but the law of nations is not as broad nor does it cover the same ground as the law of nature. When certain blacks, imported against Spanish law into Cuba, rose on the crew, killed the captain, and took the vessel into the waters of the U. S., the Supreme Court held that if not slaves they were not committing piracy in getting the vessel into their own power; and so they were not delivered up. By the same application of the laws of humanity, persons fleeing from cruelty at home, or shipwrecked mariners from a country not under the law of nations, would be treated with the same kindness as those with whose countries the U. S. had treaty relations.

None are parties to international law except independent organized communities—that is, nations properly so speaking, communities having the full power of making treaty contracts with other nations. This definition will exclude from active partnership in international law all protected or dependent states, all provinces and colonies, all separate members of confederacies, the members of which by their

* By a change in the method of arrangement in this revision, which it is hoped will serve the convenience of the reader, the form of this article on INTERNATIONAL LAW, which was originally written by the late Prof. T. D. Woolsey, has been retained as a summary of principles, while part of its matter of detail, with additions, is inserted under separate headings. Thus each of the articles BLOCKADE, CONSUL, CONVOY, DECLARATION OF PARIS, BRUSSELS CONFERENCE, SEARCH, WAR METHODS, and so on, does in fact give a complete practical account of the subject without obliging the reader to search for it in the main article.

organic law form a close union, and the separate kingdoms which become one by a perpetual compact. Thus the separate States of the U. S. have no more power than private persons have of making arrangements with foreign nations, unless perhaps that of selling State lands to them for purposes not inconsistent with the Federal Union. On the other hand, no form of government or of religion excludes an independent state from participation in international law; there are examples of all forms of government among the nations which acknowledge this law, and of various forms of a common Christian religion; even Turkey, a Mohammedan state, belongs to this international brotherhood, and there are signs that other states more remote from our civilization will move in the same direction. Although the present international law originated within the circle of Christian nations, there is no reason why it should not embrace heathen states if they could consent to come under its provisions.

(*b*) Independent states are said to be *sovereign* and *equal*. The latter term denotes *equality* in rights and obligations, which is the same as saying that they are all equally states, for a state has certain fixed relations toward the members of it, and toward other states, out of which rights and obligations grow. Size, therefore, and rank or dignity according to the etiquette of courts, have nothing to do with this state equality. *Sovereignty*, again, denotes properly the condition of having no superior in the political sphere, and is inseparable from independence. It is an unfortunate word, especially in the U. S., where it has been the habit to talk of qualified and divided sovereignty. But as far as international law is concerned, only the Union or state called the U. S. is sovereign; the separate States in this sense have not a particle of sovereignty. But the States have local powers of great moment, and might commit a crime against the law of nations. Who is responsible? Clearly the U. S. Some one must be, and no one else, under the Constitution, can be called to account.

(*c*) Every state which is capable by its organization of fulfilling the ends for which states exist, and especially that of entering into treaty relations to others, is *legitimate*. International law knows only states *de facto*; it does not pretend to decide that although they exist they have no right to exist, nor does it pretend to deny such right to an organized community that has begun to exist by revolutionary means. In fact, a large part of the states of Europe and America have in violent ways passed through separations or unions or changes of form within the last century. It may happen, however, that an organized community, which has heretofore been a portion or a dependence of another, is acting as an independent body, and resisting efforts to force it back into its former condition. What is the legal attitude of old states toward such a newcomer? They have no relations to it whatever, and have acknowledged the state from which it has separated as one of their body. They can, if they please, aid the parent state to subdue it; against this help from one state to another there is no law. Or they can remain neutral while a contest is going on. But they can not aid the insurrectionists without thereby engaging in war with the parent state; and if the new community has so far become independent that the parent state gives up endeavors to bring it back into subjection—if, in short, the new state is without question a state *de facto*—they can not, with any reason or propriety, refuse to concede to the community thus born a place among the parties to international law. A state being a *persona moralis*, capable of taking obligations upon itself, can not destroy the obligations by any change of constitution. Thus the U. S. acknowledged that it was bound to pay the debts of the old Confederation, and when Denmark and Norway separated in 1814 they took each an equitable share of the debt of the old kingdom.

(*d*) A state's independence is exercised especially in the free management of internal affairs. The right of interference in the internal policy of a state, or even in its external peaceful policy, is so inconsistent with the end for which separate states exist in the world that such independence is universally acknowledged. Yet there are several exceptions to the rule of non-interference either indorsed or admitted by international law. The first of these that we mention is interference for the preservation of the balance of power. That is, when, by diplomatic means, a state is becoming dangerous to the peace of its neighbors, it is held that they may take combined measures to check such growth. Thus when by management in 1700 the throne of Spain passed over to a grandson of Louis XVI., a large part of the European powers combined to prevent it, and with this the war of Succession was begun. Intervention for this purpose will not be resorted to unless the aggrandizement takes place by political measures, unless those who are parties to it live near enough to fear each other's increase of power, and unless such increase takes place on the land. Commercial growth, colonial growth in remote parts, furnish little ground for apprehension. The plea for intervention in this case is self-preservation. (See BALANCE OF POWER.) The same plea, after the French Revolution and the fall of Napoleon, was made for interference in the *internal* affairs of other states. It was urged that the right of a people to alter its government against the will of the reigning dynasty is dangerous, and that revolution is opposed to the peace of all states in the neighborhood. On this plea some of the leading powers of Europe put down revolutions in Italy and Spain, although they did not venture to obstruct the way of revolution in France after the restoration of the Bourbons. This principle has never been admitted by Great Britain; it is contrary to the principle of national sovereignty, and it only delays and intensifies revolution. A principle just the opposite of such intervention, and intended to prevent its application to the Spanish South American republics, lay at the bottom of the "Monroe Doctrine"—that is, of the declaration, made by President Monroe in 1823, that the U. S. would "consider any attempt on the part of the allied European powers to extend their system to any portion of our hemisphere as dangerous to our peace and safety." This declaration, highly just and timely, against political interference was made in concurrence with British policy, at a time when Mr. Canning opposed the measures of the leading continental states, and it had a decided effect. Nor has the policy on the part of the U. S. ever been altered. (See MONROE DOCTRINE.) To this righteous ground for interference we add another, dictated by feelings of humanity, when any great cruelty or barbarity is committed. Such was the pretext for interfering on behalf of the Greeks in their struggle for liberty in 1827. The three great powers, Great Britain, France, and Russia, by their effectual aid destroyed the Turkish power in Southern Greece and built up a Greek monarchy. It is held, also, that atrocious barbarities in war, especially in civil war, will justify not only remonstrances, but measures for the protection of the weaker power, to the extent even of an earlier recognition of its independence on that account. But all these instances of interference, so far as they are to be justified at all, are to be regarded as extreme and exceptional cases. The exception must be looked at with severe impartiality, as a measure of necessity, and not be made the rule. See INTERFERENCE.

2. Another right of a state is that of *Property and Territory*. A state can not exist without being sovereign within certain limits. A state may hold property like a private person, such as public buildings, ships and forts, unoccupied lands, etc.; it is the protector of all private property within its limits, and has the right of taxing its citizens or subjects; and it is also territorial sovereign within the same limits, by which it is intended that it exercises jurisdiction there over property, territory, etc., to the exclusion of all foreign powers. A state's territory consists of all the surface of the earth, land or water, within such boundaries; of the sea-line to the distance of a marine league from the shore; and of harbors, gulfs, and straits within certain not very remote headlands. Here observe (*a*) that the claim of control over the sea for a marine league is a rule dictated by self-preservation and the necessities of commerce. If, for instance, war between two other powers could be waged within sight of land, serious evils to the nation inhabiting the land would grow out of it; and if there were no control over the operations of commerce within a moderate distance from the shore, there would be room for many evasions of the laws touching the revenue. (See HOVERING ACTS.) The control over such an extent of sea is an *incident* to the occupation of the coast, and could not exist independently. (*b*) There is no absolute rule as to the remoteness of the headlands within which the waters are subject to territorial laws. It is perhaps enough to say that they ought to be near enough to enable vessels to ascertain when they are within territorial jurisdiction, and that a very considerable interval would obstruct the freedom of the seas and be unnecessary for national self-defense. Thus the Bay of Fundy and Bay of Chaleurs are held to be part of the high seas, while Delaware and Chesapeake Bays would probably be consid-

ered territorial waters. (*c*) Outside of such limits the sea is free to all nations, so that the right of using it for commerce or for fishing purposes is common. But while fishing—e. g. on the banks of Newfoundland, as being a part of the ocean—is free, the power of spreading and drying nets and of curing fish on adjoining coasts can be lawfully exercised by foreigners only under sanction of treaties. (*d*) It was claimed by Hübner and other writers in the interest of neutrals in the eighteenth century that *ships* on the high seas were territory. This, however, was an unfounded position, taken for the purpose of preventing, as far as theory could, the exercise of war-rights, such as that of searching neutral vessels. A commercial vessel on the high sea, so long as it retains the national character and commits no piratical act, is under the exclusive jurisdiction of its own courts, but its deck is not properly territory. If it were, the war-right of search could not be exercised upon it. The vessel is simply private property under the protection of its own country. Hence when it lies in a foreign port it may be attached for debt, and its crew may be amenable to the laws of the port and of the foreign country. (*e*) Rivers separating two states, unless treaty pronounces otherwise, are common to both, and the boundary-line passes along the principal channel. (*f*) Rivers rising in one state and having their entrances into the sea in another have been treated by international law as subject to the exclusive jurisdiction of the state within whose boundaries they are contained. Thus the dwellers on the upper waters have no right to descend to the sea through other territory except by concession; and yet there seems to be the highest equity, amounting almost to a right, in their free use of the entire river. The conflict between strict territorial right and this equitable claim has been settled by a succession of treaties, chiefly made within the last sixty years, which have now opened all or nearly all the navigable rivers of the Christian world to those who live in states situated on their upper waters, and some of them to outside nations.

3. *The Relations of Foreigners within a Country to its Laws and Government.*—Here we come to a department of international law where the rules of comity, or of humanity and comity—that is, not of strict right and obligation, but of equity and duty—determine the shape of the science. Of course, these rules express themselves with some differences in a multitude of treaties, but the general tendency of modern times is toward increased privilege, so that all the disadvantages of one foreign nation as compared with another are disappearing with every new treaty. Thus the *droit d'aubaine*, or right of the crown to succeed to estates of foreigners dying without heirs, has disappeared in France, leaving natives and foreigners on the same footing in the matter of succession. It has been contended that no nation has a *right* to shut its ports to the rest of the world or to prevent their passage through its territory, if this should be necessary for their interests. It has even been said that there is no right of cutting off other nations from the use of necessaries that can not be obtained elsewhere. But intercourse can hardly be called a right between nations, any more than between individuals of the same nation. I am not bound to trade with any one, but may raise everything which I use. I have the right of contract, but nobody is bound to make a contract with me. The most civilized nations obstruct the way of free trade by highly protective tariffs. The true view seems to be that a nation may shut itself out from the society of the world, and that there is no right to force it from such a position; and in truth intercourse takes care of itself; it is so natural, even a savage is so ready to accept that which he can not produce in exchange for that of which he has an abundance, that only an opportunity of awakening a sense of want, and fair treatment afterward, are needed. The principal points to be noticed under this head are—(*a*) that aliens entering a country are subject to its laws, unless exempted by treaty or international usage. (*b*) Their condition is not necessarily that of citizens—in fact, ordinarily they can not vote nor hold real property—but they have a secure enjoyment of their property subject to ordinary taxation, the use of the courts, and the same rights of contract and communication with others. Sometimes they are called on to aid the country by personal service in time of war, but this, we believe, is not common unless they are domiciled, nor does it seem to be right. They can make wills in favor of heirs abroad, transmit property to their own land, and have consuls as well as ambassadors of their native country as their protectors. (*c*) There are several descriptions of persons who enjoy what is called exterritoriality—that is, they are exempt, in whole or in part, from the action of local laws—such as sovereigns traveling through a foreign friendly country, ships of war in its ports, foreign armies if allowed to pass through its borders, and ambassadors accredited to its government. The crews of ships of war, when on shore, are under the control of the police; and it seems that police power may be exercised when soldiers in transit stray away from the army or from their corps. The exterritoriality of ambassadors will be considered elsewhere. (See DIPLOMATIC AGENTS and EXTERRITORIALITY.) (*d*) There are some nations where, by special treaties, the residents from Christian lands are exempt from the local laws, and placed under the protection of consuls or other representatives of their own nation. This practice first arose in the Middle Ages, when there seemed to be a wide gulf between the Turks and the Christians, and when personal, instead of territorial, law did not seem as strange as it does now. Such nations are Turkey, Muscat, Japan, and China. Thus by the treaty of 1858 criminal acts of Chinese subjects toward citizens of the U. S., for example, are punishable by the Chinese authorities according to the law of China, and "citizens of the U. S., either on shore or in any merchant vessel, who may insult, trouble, or wound the persons or injure the property of Chinese, or commit any other improper act in China, shall be punished only by the consul or other public functionary thereto authorized according to the laws of the U. S." The same provision is found in the treaty between the U. S. and Japan made in 1858 by which also the courts of Japan and the consular courts are respectively opened for the recovery of just claims. (See CONSUL.) (*e*) Foreigners may have privileges in Christian states, if mere residents or travelers. But there is also a condition known to the law called *domicile*, the criterion of which consists in residence with no intention of returning to one's native country or of departing elsewhere except for temporary purposes. (See DOMICILE.) This status is of importance where the question is, Who is an enemy and who a neutral? It is also of importance in INTERNATIONAL PRIVATE LAW (*q. v.*). (*f*) There is still a closer relation which an alien may form with the country of his residence, called *naturalization*. By this process he becomes a citizen, having all or nearly all the rights of native-born citizens. In England for centuries it was held that no English native-born subject could expatriate himself, nor could a foreigner be naturalized without a special act of Parliament; but by an act of 1844 a principal secretary of state, on petition from a foreigner desirous of being naturalized, can grant him all the capacities and rights of a natural-born British subject except that of being a member of the privy council or a member of either house of Parliament. The secretary may except other rights also; and in 1870 the theory of indelible allegiance was given up, and five years' residence coupled with intention to remain will secure the rights of British citizenship. (See NATURALIZATION.) In the U. S. five years' residence is necessary before naturalization, and three years' residence after a legal declaration of intention to become a citizen and to renounce former nationality. (*g*) As the laws of countries differ in regard to the hold they have upon native-born persons, it may happen that one is legally a citizen or subject of two states, and collisions of jurisdiction can thence arise. Treaties made between 1868 and 1871 with the North German Confederation, with Bavaria, Austria, Belgium, and others, and with Great Britain, have removed a great part of the possibility of such collisions. (*h*) Aliens taking refuge in any country on account of crime form a class by themselves. If the crime is political, the freest nations now give to such persons their protection. If it is a gross crime against person or property, treaties of extradition provide for their being delivered up. (See ASYLUM and EXTRADITION.) (*i*) The rights of copy, patent, and trade-mark which persons enjoy in their own country are to a considerable extent granted to them in other countries according to a rule of reciprocity. See TREATIES.

4. A. *The Rights of Legation and Representation, or Ambassadors and Consuls.*—To assist in the maintenance of friendly relations between states, and in the transaction of diplomatic business, agents are reciprocally appointed either for a special purpose, or more often to reside at the foreign seat of government. Such men should be trained in the rules of international law and the usages of diplomacy, should be familiar with foreign languages, and should possess such personal qualifications of character, tact, breeding, and address as to facilitate the transaction of affairs. Many nations accordingly employ a special corps of public serv-

ants for this purpose, with a regular system of promotion, special pay for special acquirements, such as familiarity with the more difficult languages, and rewards for successful service. The U. S. have no such system. By usage and by treaty the rights and duties of these agents have become well defined. For a full description of these and all other details relating to the right of representation, see the article DIPLOMATIC AGENTS.

B. *Consuls.*—To watch over the commercial and personal interests of its subjects in foreign lands, another class of agents called consuls is maintained by all civilized states according to their necessities. Their rights and duties rest more upon positive treaty and less upon usage than is the case with diplomatic agents, and they enjoy less dignity, fewer immunities, and no representative character. A consular treaty is apt to be one of the earliest signs and bases of intercourse with a new state, and upon the oversight and information furnished by consuls much profitable trade depends. They are fully treated of under CONSUL.

5. *Treaties.*—There could be no intercourse between nations without some understanding in the form of a contract or treaty, and a confidence that it would be observed. The main work of foreign ministers is to make arrangements of this kind, either temporary or permanent. The history of international law is in great measure to be gathered from such arrangements between nations. The subject of treaties is one attended, in its general principle, with little difficulty, and the interpretation of them follows substantially the rules which settle the meaning of other written contracts. The difficulty is not generally in the interpretation of treaties, but in securing their enforcement. The day of hostages and pledges with this end in view has gone by; guaranteeing a treaty by a third power is not a thing to be lightly done; war, the eventual penalty for the breach of a treaty, is too serious a matter to be undertaken without a compelling cause; the result may be that, under favoring circumstances, a state will deliberately violate an onerous treaty stipulation. History, unfortunately, is well provided with examples of this. Russia, for instance, after a solemn agreement not to maintain a naval force on the Black Sea, took advantage of the absorption of Europe in the war of 1870 to declare that she would no longer observe this stipulation, and in 1886 withdrew the character of a free port from Batum, in violation of Article 59, treaty of Berlin.

Prussia agreed after 1866 to submit the annexation of North Schleswig to a plebiscite, yet has never done so. Great Britain violated the provisions of the treaty of peace with the U. S. in 1783 during the years directly following it. Similar instances might be multiplied. For most treaty infractions like these there is no penalty, except the inevitable distrust engendered, which injures the standing of the nation breaking faith in future negotiations. Yet they are direct and serious blows at that good faith which is the basis of all human intercourse and progress. This is a weakness inherent to the international law, destitute as it is of a recognized means of enforcement. In spite of this, however, states do fulfill their contracts as a rule, or by their laborious excuses in case of violation prove their desire to be thought faithkeeping. The nature, language, forms, and varieties of treaties, their subject-matter, how and when they operate, and the effect of war upon them, will be treated in full under topic TREATIES.

II. *International Relations as Affected by War.*—Almost all the important questions and discussions of international law are connected with a state of war between two or more nations. War, of course, must interrupt intercourse between the belligerents, and it may also prevent neutrals from pursuing the same kind of commerce with either of the belligerents as before. It is thus an act or a state of relation of two nations by which other nations also may be seriously affected. Hence we have to consider war first as if the belligerents were alone affected by it, and then what other nations must consent to endure, and what they have a right to do. Thus the rights of war in the limited sense, the rights and duties of neutrals, and how far the belligerents may wage war to the prejudice of neutrals, are the principal subjects of consideration in this part of international law.

War itself is armed contention between two organized communities, and a *just* war is such a contention for the purpose of obtaining justice which has been denied. The power of waging it, and the decision when to wage it, must be left by the nature of the case to each of the independent communities of the world. If a state can wrong another and refuses to redress the wrong, the injured party, having no superior, must decide for itself what it will do. It may decide to take no steps to recover its rights, but to waive them as being trifling in the particular case or as not worth the cost of prosecuting them; or it may ask others, its equals, to interpose by way of mediation, or, if the other state will consent, of arbitration; or it may make use of armed force. The choice belongs to the injured party, just as, in disputes between man and man, if appeal to the courts and single combat were allowed, the offending party might employ either of the alternative methods he thought best. No one therefore can interfere in a just war, otherwise every war might become universal. But, as said in the case of interference, so we must say here—that in wars judged by third parties to be unjust there may be armed interference in extreme cases on the part of the injured.

The particular causes of war are as many as the rights of an organized community or of the individuals under its protection which have been invaded; and to these must be added that an apprehension of intended injury may be so great as to justify the party concerned in striking the first blow; but war can never be right, although it may be undertaken to vindicate just claims, unless measures have been taken to obtain reparation in a peaceable way. This, of course, applies to the active party, as the passive or defensive party accepts a fact and wards off attempted harm. When two parties are in an alliance involving mutual protection or defense, each must judge whether the *casus fœderis* has occurred—that is, whether the assistance is called for by the other in order to prevent a wrong which the alliance contemplated. All these rules, however, are violated, especially by strong nations; and the most frivolous pretexts for war, for joining others in war, for refusing to abide by treaty obligation, and in this way or by some other wrong for bringing on war, have been employed many times over in the history of nations.

When nations have complaints against one another, there are several summary processes by which justice has been sought without recourse to actual war. These are *hostile embargos, reprisals, pacific blockades.* (*a*) We say *hostile* embargos, because there are what may be called peaceful or civil embargos. Hostile embargo consists in the seizure of ships and their cargoes belonging to subjects of an offending state which may happen to be in the ports of the injured country. These are held pending the issue of the affair, and may serve as an indemnity. (See EMBARGO.) (*b*) This is a form of reprisals—a word which, taken in its large sense, denotes any seizure and detention of property for the same purpose for which ships of a foreign power would be detained in the case already mentioned. Reprisals imply an attempt to obtain justice forcibly, yet without having recourse to war, while *retortion* or *retaliation* is not an attempt to obtain justice, but rather to punish a wrong done to a subject, like legal discrimination against him, by applying similar treatment to a subject of the offending state, the law of tit for tat in politics. Reprisals have often been made the subject of treaty, and in many instances it has been agreed that a nation will not resort to them until several months—four months are named in a number of treaties—shall have elapsed after the threat to make use of them. The evil of embargo and reprisal consists in this—that an innocent individual suffers loss for the wrong or pretended wrong of his government. This evil can be prevented or compensated for only by distributing the harm which he suffers over the whole political body, and making him a compensation. (*c*) *Pacific blockades* are an invention of one or two of the leading nations of the present age, the object of which has been to prevent neutral vessels from entering or issuing from certain ports of an offending state just as in war, with the same rules of proclamation and arrest for violation of the rules as in war, while yet war is declared not to exist. The examples of the application of such a pretended rule nearly all occurred between 1827 and 1838; one, of the ports of Greece, was laid in 1886. Of the writers on international law who mention them at all, most do this to condemn them as an experiment unjust to neutrals. This appears to be the correct opinion, because if any measure implies a state of war, blockade does so most decidedly; and no such new measure can be introduced into the law of nations without the consent of all. Neutrals, therefore, would have the right of making complaints against such a principle, which affects their commerce. In fact, when a Brazilian vessel was condemned in a lower French court for breaking such a blockade—France and Great Britain being almost alone in this new experiment—on the ground of at-

tempting to take contraband of war into a blockaded port, the higher court decided that as there was no war there was no contraband of war, and restored what was thus condemned. If a state of war did not exist, there was as much obligation to allow the vessel to go into her port as there was to restore the goods condemned on this ground afterward.

Besides these forcible measures for the purpose of bringing another state to act justly, taken by the injured state itself, there are others which attempt to settle the matter in dispute through the advice and good offices of a third person These measures are mediation and arbitration. *Mediation* is the intervention of a friend volunteering to pacify the minds of his friends, and offering them his advice toward a settlement of their difficulties. When two nations want a pretext for avoiding a war to which they are tending, this is a way of getting them out of their unpleasant position and yet saving their honor; but mediation binds no one; it is mere advice, without any pledge on either part of listening to it. Such a course was recommended in the protocol of the Congress at Paris, Apr. 14, 1856, in these words, which might include arbitration as well: "The plenipotentiaries do not hesitate to express in the name of their governments the wish that states, between which a serious disagreement might arise, should, before appealing to arms, have recourse, as far as circumstances should permit, to the good offices of some friendly power." *Arbitration*, to which in the introduction to this article reference has been made, is of two kinds—that by means of a permanent international court, and that by the special action of the states which are at variance. The first is a cumbrous, unwieldy thing in the present state of the world, and would hardly work very well if a few of the states governed by Christian international law should hold aloof. The other is simple, easy in its operations, and has often been tried with success. The parties agree on the court of arbitrators, on the points to be submitted, on the place, time, etc., on the law which is to govern the decision, and pledge themselves to abide by the result, it being understood that the decision does not go beyond or aside from the points submitted, and that the arbitrators are honest and impartial. The success of the arbitration at Geneva between Great Britain and the U. S. in 1871–72 brought this kind of arbitration, by compromise, as it is called, into greater notice, and inspired many with the hope that wars will be more frequently avoided hereafter in that method. The Parliament of Italy, on motion of one of the deputies, Prof. Mancini, a distinguished publicist, passed the following resolution in its session of Nov. 24, 1873: "The chamber expresses the wish that the king's government, in its foreign relations, may endeavor to render arbitration an accepted and frequent means of settling, according to justice, international controversies in matters susceptible of arbitration; that it may propose on fit occasions to introduce into the stipulations of treaties the condition of submitting to arbitrators such questions as may arise in the interpretation and execution of the same; and may consent to persevere in the praiseworthy initiative which it adopted a number of years since of promoting between Italy and the other civilized nations conventions for the purpose of making uniform and obligatory, in the interests of the respective peoples, the essential rules of international private law." The unanimous acceptance of this resolution, accompanied by the advocacy of it by the Minister of Foreign Affairs, the vote of the British House of Commons, to the same effect substantially, in the summer of 1873, and in 1893 as well, and the earnest wish expressed still later of vast numbers that arbitration may at length be an efficient and formally adopted way of terminating disputes between nations, warrant the hope that a better time is coming, when wars shall be less frequent. See ARBITRATION.

War is an *open, public*, not a secret, covert, way of attempting to obtain justice. Not only must a demand have been made beforehand, which the complaining party conceives to be just, and a denial of justice, as he conceives it to be, have come from the other party; but there must be an *open* withdrawal from intercourse, an open commencement of hostile relations. The way of doing this is called a *declaration* of war. In the old times no war was thought to be rightfully begun without such a declaration on the part of the assailing state. The Greeks made their declaration by a herald or by an ambassador and a herald. The Romans in their early times had a formal and ceremonial way of making complaint and declaring war through a college of *fetiales*. The notice here seems to have been given for the purpose of allowing the enemy time for reflection. In the Middle Ages the declaration, accompanied, it might be, by challenge to combat, seemed intended to remove all suspicion of cowardly, underhanded conduct. A true knight, according to the ideal of knightly honor, could take no advantage of his enemy. Open declarations continued until long after the practice of having resident ambassadors at foreign courts came to be the rule; but in modern times such declarations, formally made to the enemy, have ceased to be accounted necessary, although they have not always ceased to be desirable. Diplomatic correspondence and the increased publicity of political relations make nations aware of each other's intentions; and when two states are at variance, and military preparations are going on in one of them, the other is apt to demand the reason through its ambassador; it is thus possible to have earlier information of hostile intentions than could be obtained by simple declarations, and often the final breach is indicated by the ambassador's demand of his passports. Still, a war begun on slight grounds and precipitated upon the other party, like that of Napoleon III. in 1870, shows an intention to get the start of an enemy and attack him when he is unprepared; but, although declarations of war to an enemy are not now thought to be required by honor between nations, it is a very frequent practice to issue to other courts, or in some more directly public way, a justification of the determination to declare war. It is also common to give notice to one's own subjects in different parts of the world, so that they may protect their commercial interests against the foe, and make ready for a change of affairs. In the U. S., as war is in the hands of Congress, a resolution of the national legislature is all that is needed.

The beginning of foreign wars is now often notified by a neutral government to its own subjects in documents, to which the name of *proclamations of neutrality* has been given. These papers make known the fact of the foreign war, recite or refer to the laws of the nation made for the purpose of preserving its own neutrality, and warn its subjects of the penalties which they may incur by unneutral acts, and sometimes give notice to belligerent powers of what will be allowed and what forbidden in neutral waters. By these proclamations a nation screens its subjects from the penalties for piracy, in case they should be found on board of a belligerent vessel engaged in the work of war. It also takes from itself the power of complaining that its ships and goods are visited with the ordinary effects of lawful war, as the declaration of the fact of war is good against itself. Such announcements are of little use comparatively when two states, already long known as within the pale of international law, begin to carry on war against one another, but they are of great use when organizations calling themselves states rise up suddenly by a revolutionary process, because in this case there is generally no definite commencement of war, no point of time when what seemed a sedition blossoms into rebellion, and generally no willingness on the part of the old state, against which the revolutionary proceedings are directed, to acknowledge that war exists. Proclamations of neutrality have not been long in use, nor do they carry with them any especial authority. They may, however, in the case last supposed, be galling to a state attempting to quell a revolt, because, according to the rule now usually adopted by nations, the flag of the revolutionary organization meets with the same reception in the ports of the nations as any other flag. On the whole, although such proclamations may be issued too soon, and so may encourage a revolt that would otherwise be crushed, they do much more good than evil. See NEUTRALITY.

The effects of a state of war next demand our notice. The first of these is *non-intercourse* between the individuals belonging to the two belligerents. That is, all relations of commerce, all rights to reside in a country conceded by treaty—unless in express terms perpetual—every means of communication by direct channels between the subjects of the opposing parties, come to an end. It follows that in strictness houses of business, in which one of the partners is a belligerent enemy's subject, must be suspended or dissolved, and that the portion of profits due to him, or in general debts due to a person pertaining to a hostile country, can not be paid over. Sometimes slight exceptions are made by the government of a belligerent to this total non-intercourse by granting licenses to trade, which, however, do not make such trade internationally lawful, nor protect it against capture without the other hostile party's consent. There are also permissions, often given and sometimes conceded in treaties, that an enemy's subjects may reside dur-

ing the war under protection of the other hostile government if conducting themselves peaceably; and generally time is given to them, on the outbreak of a war, to remove with their effects from the country; but this is a concession indicating the progress of humanity, and not a strict right. The strict rule would be that foreign residents, as soon as their hostile character began, were liable to be detained or deprived of their liberty, and their property exposed to confiscation. The Supreme Court of the U. S. decided, in accordance with the prevalent opinion of text-writers, that the property of enemy's subjects and debts due to them are confiscable, but added that an act of Congress was necessary to carry such a measure into effect; and the treaty of 1794 (ratified in 1795) with Great Britain provides that "neither the debts due from individuals of the one nation to individuals of the other, nor shares nor moneys which they may have in the public funds or in the public or private banks, shall ever, in any event of war or national difference, be sequestered or confiscated; it being unjust and impolitic that debts and engagements contracted and made by individuals, having confidence in each other and in their respective governments, should ever be destroyed or impaired by national authority on account of national differences and discontents." This is a permanent article of the treaty, and important as a declaration of what the U. S. regarded to be just. Many similar stipulations are contained in the treaties of other nations, and no example of confiscation of debts occurred for a century and a half before the French Revolution, with the exception of the Silesian loan in 1753. No example, it is believed, has ever been known of *public debt*, whether due to the other belligerent or to his subjects, having been confiscated as a war measure. As for the persons of the subjects of one enemy within the jurisdiction of the other, the treaty just now cited expresses itself to the effect that in case of a rupture merchants and others, subjects of the enemy, may remain and continue their trade so long as they behave peaceably; and in case their conduct should render them suspected and the respective governments should think proper to remove them, the term of twelve months from the publication of the order should be allowed for that purpose. This provision, however, unlike the other before cited, is limited in its operation to twelve years. A multitude of similar provisions can be found in the treaties of other powers. It may be said, then, that at present—(1) debts and other items of property belonging to an enemy's subjects before the breaking out of a war remain intact; but (2) the owner has no power, while the war continues, of getting at his own by any process of law or in any way permitted by law, unless special treaties grant him the liberty; and that (3) at the end of the war the power is restored to him of prosecuting all claims for property held by him before its commencement. Also (4) that the enemy's subjects are generally allowed to remain in the other enemy's country if there resident before the war; and (5) if thought necessary to require their removal, that ample time be given to them to withdraw, taking their effects with them.

The effect of a war on previous treaties between the two belligerent powers deserves notice. Provisions of treaties, it is clear, which relate to the rules of war to be observed between the parties, can not be suspended by the fact of war, since only then can they come into operation. It is also clear that certain arrangements in their very nature are perpetual, and so do not terminate at the commencement of a war. Thus the recognition of a state like the U. S., made by Great Britain in 1783, or of the South American republics by Spain, would not need to be renewed after the war was over, on the ground that such a transaction is in itself final, and that such a state has become an international entity; unless, indeed, conquest or some act of such a state of itself puts an end to its international character. The same may be said of boundary-lines and of rights named in a treaty deducible from the existence of a state as such; but when we depart from these clear cases we find some diversity of opinion. See TREATIES.

A very important distinction, not always observed, but founded both in justice and in humanity, is that between active and passive enemies, or those who prosecute the war either as the responsible government of a country or as combatants, and those who obey the laws of the land in relation to a state of hostilities without any active participation in them. The latter being by far the most numerous class, and making no resistance to the enemy, can be said to be in a state of non-intercourse only, though in theory enemies, since every subject of one belligerent must be the enemy of the other. Otherwise there is lacking an explanation of the right to capture private enemy's property at sea, and on land as well, by strict law. Non-combatants suffer the ills of war so far as the unity of interests and destinies in a political body makes this necessary; but they are not in modern warfare even expected to annoy an invader, and are secure against devastation, while they remain in that passive state. The interests of humanity thus require that on the land, the treatment of non-combatants should be such as to interfere, as little as the necessary measures for prosecuting war will allow, with the occupations of peaceful industry and with the quiet of domestic life. On the sea, however, the rules of war have been much more strict: the peaceful use of the sea by enemies' vessels has never yet been permitted. Ships and their cargoes have been lawful plunder until now, although to despoil an unoffending householder of his goods and to burn his house would be considered barbarous. This difference is due partly to the greater suffering of families produced by carrying the rigor of war to an extreme, and partly in this—that capture of vessels and goods weakens the capacity of an enemy to sustain a war. Not a few voices have been lifted up in favor of removing innocent traffic on the sea, whether belonging to friends or enemies, from liability to capture. So many steps have been taken in this direction, that capture of enemies' vessels engaged in innocent trade on the sea may henceforth be hardly worth the expense of employing cruisers for this purpose, and must ere long come to an end.

The *forces* lawfully employed on the land and on the sea in times past have been somewhat alike, with important differences. On land they are national or standing armies, and a militia, as well as volunteers; these latter bodies are often commanded by officers of the regular army. On the sea they are national vessels and privateers. The citizen soldier and the privateer armed vessel are as legitimate forces of war as national armies and navies. In fact, privateers date from a time in Europe when there were few or no navies, except such as were improvised out of merchant vessels. Yet an indiscriminate rising of the inhabitants of an invaded country for defense can be allowed only on condition that the laws of war are conformed to, and the chief military powers have been very loath to permit it without an assurance that such a body shall wear uniform, be properly officered, and bear arms openly.

In like manner the use of privateers has been much discouraged, the whole tendency of the age being toward war through regular organizations. See PRIVATEERING and WAR.

The general usages of war, especially on land, although somewhat vague, and dependent upon the temper of the belligerents, or still more upon the character of the commanding officer, deserve our consideration. The principles of a humane and yet efficient war-code are especially these: that war is a way of obtaining justice when other means have failed; that it is waged between governments; that quiet inhabitants of a country are to be treated with humanity and with as little severity as will allow of the effective prosecution of the conflict; that as soon as justice can be secured, armed contest ought to cease; and that retaliation, if necessary on account of the inhuman or deceitful conduct of an adversary, can not go to the extreme of justifying that which is morally wrong. The *causes* which have brought on a more humane mode of warfare are various, such as the increased sway of the Christian spirit; the professional feeling in standing armies, coming down from the officers, which looks on the military forces of the foe rather as servants of the state than as enemies; the general practice of carrying supplies for troops on the march, and the system of commissaries and quartermasters, which prevents recourse to plunder in a great degree; and the use of weapons which do their work at a distance without exciting a feeling of rage between man and man. (For an account of the rules of modern warfare, see WAR, its laws and usages.) The rules of warfare have been codified in the U. S. in *Instructions for the Government of the United States in the Field*—a manual prepared by Dr. Francis Lieber, and which, we believe, is the first war-code, properly speaking, that has ever been prepared. What we aim at here is nothing more than to give a brief summary of the leading provisions for preventing the excesses to which war is liable: (*a*) One of these relates to the weapons to be employed, as well as the other means for injuring the enemy. Here much is vague. On the sea a greater license is allowed than on the land. Torpedoes were used extensively in the war between France and Germany, in 1870–71, to protect the harbors of North Germany. On the

land, weapons are to be condemned which merely give a ghastly wound without otherwise adding to the efficiency of war. (See ST. PETERSBURG DECLARATION.) (*b*) The troops employed in war must be such only as can be under military discipline. Hence to employ savages, like American Indians or like the Turcos used by the French, is, to say the least, questionable; and it increases the general ferocity of war, as the opposite party will return to regular soldiers the brutalities inflicted on them by this part of the foe's army. (*c*) Perfidy and solicitations to commit crime are not allowable. Military necessity, as the war-rules of the U. S. express it, admits "of such deception as does not involve the breaking of good faith, either positively pledged regarding agreements entered into during the war, or supposed by modern laws of war to exist. Men who take up arms against one another in public war do not cease on this account to be moral beings, responsible to one another and to God" (§ i. 15); and, again (§ i. 16), "military necessity does not admit of cruelty—that is, the infliction of suffering for the sake of suffering or for revenge—nor of maiming or wounding except in fight, nor of torture to extort confessions. It does not admit of the use of poison in any way, nor of the wanton devastation of a district. It admits of deception, but disclaims acts of perfidy." (*d*) When prisoners of war are made, they must be humanely treated as respects food and quarters. It is customary to allow officers their liberty, on parole of honor not to serve again until exchanged. Deserters, found among the prisoners taken from the enemy, may be dealt with as having committed a high crime. Escaped prisoners have committed no crime in seeking to regain their liberty, but when retaken may be subjected to more rigorous confinement. The treatment, however, of irregular troops, especially of guerrilla-parties and of "bushwhackers," who lay aside the soldier's character or put it on at pleasure, is much more severe than that of regular troops. (*e*) Of the treatment of non-combatants and of their property we have already spoken in part. We add here, on this most important of all the points relating to the conduct of war, that nothing but military necessity can justify the seizure of private property, that domestic privacy is to be respected, and that the persons of unoffending individuals are to be considered sacred. The code before referred to speaks thus of private property: "Unless forfeited by crimes or by offenses of the owner, it can be seized only by the way of military necessity for the support or other benefit of the army or of the U. S. If the owner has not fled, the commanding officer will cause receipts to be given, which may serve the spoliated owner to obtain indemnity." (*f*) As for property not private, hospitals, even those for military purposes, and other humane or religious institutions, are to be respected. (See GENEVA, CONVENTION OF.) Public buildings and works of art are not to be wantonly destroyed, nor the latter scattered or given away by the captor. Booty taken on the field of battle is generally considered the property of the conquering army; but prisoners, according to our code, are not to be despoiled of valuables found on their persons or of extra clothing. It is, however, added that large sums found on the persons or in the possession of prisoners may be taken from them after leaving enough for their support. (*g*) In storming fortified towns the practice, even under humane commanders, has been to put little restraint on their troops; but nowhere is greater humanity needed, since the inhabitants are liable to a triple curse—to the horrors of bombardment, to the sufferings and discomforts arising from a multitude of troops cooped up within the same walls, and to the final storm. The forces of war can and ought to protect houses and persons from plunder at such a season. (*h*) The rules of war allow of certain communications between hostile countries or hostile armies, such as those by flags of truce, heralds, cartels for the exchange of prisoners. These persons, if admitted within the enemy's lines, have a sacred character, but it may be inexpedient to receive them, and of this the party visited must judge.

A few remarks need to be added here in respect to certain kinds of war, on account of something peculiar in one of the parties. One of these is war with *savages*, where the simple rule of humanity is all that can be required of the civilized combatant. The parties being unequal, and one of them ignorant, distrustful, and perfidious, there can be no law of nations to govern their intercourse. Another is war with *pirates*. Since piracy is committed usually on the high seas, and since its animus is against all nations, not against the subjects of a single one, therefore this crime is one against the law of nations and is justiciable anywhere, before a court of any nationality. (See PIRACY.) Still a third kind of war with marked peculiarities is that *between a mother-country and a revolted colony*, or a state and the people of a seceding territory. Here the first question is does war exist, for the commencement of such a war is often difficult to be determined. It may be a sedition or an insurrection; it may need only the civil power to quell it or a slight military movement. But organization under a new government, apparent determination to make the secession complete, laws and practical efforts for creating an army or a navy, positive acts of war following all this, can give such an aspect to the movement that other nations will have a right to regard the fact of war as manifest. For, be it observed, other nations have the same right of judging whether civil war or rebellion exists, as they have of judging when it has ceased to exist, and when the independence of the rebels ought to be practically acknowledged. And this judgment of theirs is the more justifiable if the mother-country sanctions it by belligerent acts, such as proclamations of blockade or levies of troops. When, now, such a kind of war exists, the relation between the parties to it is peculiar in this—that every rebel is technically a traitor, waging war against his own lawful government, giving aid and comfort to its enemies. Those, therefore, who are not killed in war may be hanged by sentence, military or civil; but in general, in modern times, when so many revolutions are attempted, such severity would only awaken the spirit of retaliation or of revenge; and so also to act on the principle that rebel cruisers are piratical would only embitter the feelings of the rebels, shock foreigners, and provoke remonstrance, if not interference. The true policy is to treat such rebels as *justi hostes* on land and on the sea, entitled to the same rules of war as other belligerents. A nation can employ also against its rebels the same means of war as if they had been foreigners from the beginning—can obstruct the avenues of trade with them, and, after due notice, seize on foreign vessels attempting such trade. All this being incident to an international war, foreigners are bound to respect such proceedings. Further than this, What is the relation of foreigners to the two contestants? One of these is an acknowledged state; the other has no *international* existence, and so toward the latter foreigners have no *international* obligations whatever. If they give it aid, this is a cause of war for the parent state; if they recognize its independence, this too may be a cause of war. The usual way will be to recognize its belligerency only, which gives it no political status, but entitles it so far as the neutral is concerned to the same rights and privileges, and lays upon it the same duties as pertain to any other belligerent apart from positive treaty.

War, whoever the parties to it are, contemplates capture and conquest. These are so far morally justifiable in a just war as they have it for their object to procure the means of compensation for wrong previously inflicted, to pay the expenses of obtaining justice, and to provide some security for the future; but as both belligerents generally claim to have the right on their side, and as there is no arbiter between nations, the facts and results of war are acquiesced in, unless outrages are committed, or wrong done which excites in a high degree the moral sense of the world. As for capture, which has been a title of the law of nations discussed and shaped by the courts more than any other in times past, its importance will be much less in times to come, since now neutral ships, except those of Spain, Mexico, and the U. S., may carry enemies' goods with impunity, and therefore to a greater extent than heretofore will be used for that purpose. The motives of governments in sending cruisers out upon the sea for purposes of capture are to distress and annoy the enemy—to produce such derangements in the commerce of his subjects as to make him willing to come to equitable terms of peace. No one, as we have seen, can make captures unless under authority from a government. When a capture is made, a question may arise as to its validity, and then no property can be passed by sale with a good title unless the proper court of the country to which the captor and his vessel belong gives a title after examination of the facts. The ship and goods taken, however, belong presumptively to the government or country in the interval between capture and such judicial decision. Hence if for any reason it is inconvenient for a captor to carry or send his prize into port, a very barbarous usage allows him to burn it. A great deal of destruction of ships and goods took place in conformity with this usage in the civil war in the U. S., as the Confederates had no ports into which they could take their prizes. It has been sanctioned by the British courts under

the condition, however, of responsibility of the captor or his government, and was practiced by the U. S. in the Revolutionary war, and by France in the wars of the first part of the nineteenth century. It is a dangerous practice if a neutral vessel is so treated. A better way of treating prizes, which it is very inconvenient to convey into port, is to allow them to proceed on their voyage under what is called a ransom contract. That is, as a prisoner of war or his friends formerly paid a sum of money for his liberation, or bargained so to do, so a captured vessel could be redeemed from captivity on similar conditions. The validity of such a contract is recognized by the law of nations, but may be against the laws of particular nations, whose cruisers, therefore, are under especial temptation to burn their prizes. The ransom-contract secures the captured ship against further capture from the vessels of the captor's country or of its allies, provided it goes on a specified course so far as violence of the weather does not prevent. To secure the payment of the contract a hostage is sometimes delivered over to the captor. The contract is forfeited if the capturing cruiser is itself taken with that document or the hostage on board. See RANSOM.

Recapture, or the recovery of a captured vessel by a cruiser of the same country or of its ally, has been treated of by most text-writers under the form of the Roman doctrine of postliminy. As, however, the principles of recapture differ almost as much from those of postliminy as they resemble them, we must refer the reader for the meaning of that term to the article on it in this *Cyclopædia*, and content ourselves with giving the briefest explanation possible of recapture. If a vessel, having been taken, is carried *infra præsidia*—that is, to a place where by international law a capture can not be made—and is condemned as lawful prize of war, its former owner's right of property ceases. If captured again after this, it is like any other property taken from a hostile owner. Recapture, then, holds good only when a prize is on the way to a place of security; if it is effected within these limits the property reverts to the original owner, subject to the payment of such salvage as the law of the land prescribes. This is the U. S. usage, but does not prevail in most European countries. (See RECAPTURE.) If the men are recaptured, there is no salvage or ransom-money, as far as we are aware, that can be demanded for them according to international usage. If prisoners of war in a port of a neutral escape to the shore, they can not lawfully be surrendered; and this is a point where Roman and modern law agree. There is also a case bearing analogy to recapture on a large scale where after a conquest a government is set up and the country is again recovered by its own troops or those of its ally. The point of difficulty here is, What are the rights of the restored government, and what respect is due to the ordinances of the conqueror during his temporary sway? It is easily seen that some very perplexing political questions may arise in such a state of things; we may refer the reader to Phillimore for the extended consideration of some of them. Supposing the conqueror to have not only occupied, but also politically organized, the land before being driven out, we may say, in general, (1) that whatever in this interim he does by virtue of his political power, legitimately exercised, is valid. Taxes paid to his collectors can not be recovered from them on the ground of the unlawfulness of the government. Legal acts, done by officials or subordinates of his during his supremacy, are justifiable on their part. If he sells state property or borrows money on the credit of the state, this too is valid if done for ordinary state purposes, and not with a manifestly flagitious object in view. Thus the acts of Napoleon as head *de facto* of France between his arrival at Paris in Mar., 1815, and his surrender to Capt. Maitland in July, had validity; taxes already imposed, but collected by his officials, were legally collected, and new taxes, if collected in this interval and paid over, could not be recovered by private persons. But (2) none of his changes in the constitution or law have any claim to permanence; and (3) the restored or legitimate government has not the authority of going back of its restoration and claiming whatever services or dues it could have claimed during the intermission. It is manifest that some such rules are necessary to avoid the perplexity of private persons in regard to obedience, and to mitigate the sway of a tyrannical conqueror.

The last point relating to war, as considered in relation only to the belligerents, is its suspension and termination. (1) There are suspensions of war with a special and particular object in view, or having effect only so far as certain individuals are concerned. Here belong licenses to trade, which need no explanation, except the remark that they are of strict interpretation, which is true also of passports and safe-conducts or permissions to enter a hostile territory for certain specific and temporary purposes. Here we may mention also conventions relating to the war, such as a commander is allowed to make, or makes under necessity, arrangements respecting the manner of carrying on war, cartels and ransom contracts (before mentioned), capitulations, conventions relating to exchange of prisoners or to requisitions. (2) *Truce.*—This is a suspension either of all the operations of war, or of those in a particular quarter or before a particular place. Such agreements are made by a sovereign, or by a military commander so far as he has authority for such a purpose. They begin and terminate at a certain day, and need no notice of their expiration. Or, if the truce is general, different days may be appointed for the beginning and end in different quarters of the world. Truce allows generally a return to peaceful (or rather to non-warlike) relations for a definite period, but does not involve withdrawal of armies from before a fortress or from a special theater of war. A question on which considerable difference of opinion prevails is, What can be done during a truce, and especially whether a besieged place may repair its walls and construct new works in such an interval? An answer which would perhaps fail of removing all difficulty might be, that anything might be done which would have been directly prevented by war, or which is not in itself a directly hostile movement. Thus a besieging army can not lawfully add to its works of siege, and a fortress can not be repaired—at least in places which would have been commanded by the guns of the enemy. (See TRUCE.) (3) *Return of Peace.*—At the end of a war its results must be embodied in some form of agreement. (See TREATIES, subtitle *Treaties of Peace.*) This must settle a great variety of questions relating to cession of territory, money indemnity, payment for property taken or for support of prisoners, disarmament, form of government, boundaries, laws of war, and so on. It will also naturally refer to treaties in force before the war, and revive them or declare them void.

Two topics remain to be considered, both of which are of prime importance—the *rights and obligations of neutral nations, and the liabilities and rights of neutral trade.* In modern times neutral interests have become of such moment that a war between any two states under our modern international law produces wide-sweeping effects, such as ancient history never knew. All industry and finance is filled with apprehension; the neutral asks what he can do to avert the effects of war from his borders by changing the course of trade, or how he can interfere by influence to prevent or abridge war. It may ere long become a serious question whether, considering the increased amount of disaster that war brings on the world in modern times, the nations should have unlimited power to declare war—whether neutrals ought not to have a voice in the matter—whether, in short, as civilized nations are brought by their closeness of interest into something like a confederacy, they ought not to have something like the political authority of a confederacy, so as to have a deciding influence, at least, in all external wars.

A neutral is a state which is a friend to both the belligerents and takes no part in the war. Sometimes, according to an earlier treaty, a power of Europe has been bound, on the breaking out of war, to furnish troops to one of the belligerents; but it is plain that the other may regard this as the act of an ally if he chooses. There is also a neutrality or *neutralization* now known to public law, by which a certain territory and its inhabitants have put on the character of permanent neutrality, so that no armies can cross the boundaries of such a state, and it can itself engage in no war. Such, since the year 1815, has been the condition of Switzerland, and of part of Savoy—the last-mentioned country, so far as it was placed in this condition, continues in it since its cession to France in 1860; such also that of Belgium became, after its disruption from Holland in 1830. And, again, the northern powers of Europe in two instances (in 1780 and in 1800) formed what was called an *armed neutrality* for the purpose of maintaining certain alleged maritime rights against both the belligerents; but a league like this might turn into a secondary war. A neutral state must be impartial in rendering the same favors to both belligerents, but this is far from being enough. It must stand aloof, and keep its territory and its subjects aloof from the

war as far as possible. Impartiality may, in fact, be a great privilege and assistance to one of the parties, but none at all to the other. For this reason especially the modern idea of neutrality is stricter than that of a century or of two centuries ago. While the neutral state thus stands aloof, it must be humane to both parties, receiving their vessels into its ports when driven in by stress of weather, or, as it would receive fugitive troops on the land, admitting them into its waters when escaping from the enemy; yet in such sort that on the land the troops are disarmed, while the vessels can do nothing more than make the necessary repairs and procure provisions. The neutral is not bound to allow cruisers to enter its ports with prizes unless obliged by treaty; and the safest, most neutral course, is not to allow this. Much less can vessels of war of a belligerent procure military stores. Coal is an article of use in both war and peace; by modern practice—and there is no other—vessels of war are furnished with enough to take them to the nearest port of their own country; but war-steamers are too modern for any well-understood rule to have grown up in this respect. It was formerly not thought to be unneutral to allow transit to foreign armies in a time of war; and Switzerland supplied by treaty more than one state of Europe with mercenaries, but the age of such concessions has passed.

It has become of far more importance in the present age than it ever was before to decide what neutrals may not do and may allow to be done within their territories that may have a bearing on the fortunes of a war. Looking first at the second point, what neutrals may allow or suffer, we remark that a distinction is to be made between those private transactions and those ordinary proceedings of trade which can not be prevented without considerable *surveillance*, and those acts of individuals which are open to inspection. If a neutral's subject lends money or goes abroad privately to serve as a soldier, or exports articles to a blockaded port, or such as are contraband of war to any belligerent port, he does these things without sanction of law; and the courts both in Great Britain and in the U. S. will refuse to help him to recover money lent to a belligerent, on the ground that the transaction is contrary to the law of nations. (See Phillimore, iii., § 151.) But hitherto neutrals, while forbidding or warning against most of these things, do not make them punishable. It is otherwise with more public acts, such as building war-vessels for a belligerent or enlisting men for his service. Even here commercial cupidity and the tricks of foreign agents can often prevent the purpose which they are attempting to accomplish from coming to light. A neutral, however, if it be his duty to prevent his territory from becoming the starting-place for carrying on war against friends, can make effectual laws and maintain an active police. It is not the office of foreign ambassadors and consuls, but of home governments, to look into such trespasses, and the more, because they otherwise expose themselves to complaints from the injured belligerent. On the other hand, the duty of neutral governments themselves is tolerably clear. They can not lend money or troops to either belligerent, or open their ports for hostile purposes, or permit their courts to be used for deciding questions of prize where either of the belligerents is concerned. To secure the neutral conduct of their subjects, neutrality laws are enacted by several nations, perhaps by all who are under the Christian law of nations. Thus the U. S. passed acts in 1794, 1818, and 1838, and Great Britain one (59 Geo. III., ch. 69) which continued in force until 1870, when a new act was passed, entitled, like the first, a "foreign enlistment act," but far more stringent and conceding far more power of arrest to officials. Under the first British act vessels destined to prey on the commerce of the U. S. in the interest of the Confederates slipped out from British ports and did their work effectually. Great complaints were made by the U. S., until in May, 1871, the Treaty of Washington was effected, containing three rules which the parties agreed to have applied in deciding their past difficulties, to observe for the future between themselves, and to urge on the acceptance of other nations. These rules are that "a neutral government is bound, first, to use due diligence to prevent the fitting out, arming, or equipping, within its jurisdiction, of any vessel which it has reasonable ground to believe is intended to cruise or to carry on war against a power with which it is at peace; and also to use like diligence to prevent the departure from its jurisdiction of any vessel intended to cruise or carry on war as above, such vessel having been especially adapted, in whole or in part, within such jurisdiction to warlike use; second, not to permit or suffer either belligerent to make use of its ports or waters as the base of naval operations against the other, or for the purpose of the renewal or augmentation of military supplies or arms, or the recruitment of men; third, to exercise due diligence in its own ports and waters, and as to all persons within its jurisdiction, to prevent any violations of the foregoing obligations and duties." In regard to the meaning of these rules, we observe that "due diligence" as well as "reasonable grounds of belief" are necessarily indefinite; only the facts of the case can determine whether one neutral has reason to complain of the other as to these points. A most important question of interpretation is whether "to prevent the departure from its jurisdiction" relates only to the original departure, when the vessel is ready for sea, or also to any future departure, if it should enter the ports of the same neutral. There is good reason to believe that the commissioners of the U. S. understood the words in the latter sense, and so also did the judges, or the majority of the judges, at the tribunal of Geneva. In other words, the crime rests on the vessel, and the flag which it floats does not protect it; which is thus true of the vessel of *any established* government, but *much more* of a vessel belonging to an organized revolutionary body, which has no rights or status under the law of nations. See ALABAMA CLAIMS.

Neutrals, on the other hand, have important rights against belligerents, the principal one of which is that their territory or the sea within their jurisdiction shall not be touched by operations of war. Accordingly, a capture made within neutral waters, even if in hot pursuit and flight the contending vessels pass out of the open sea, is vitiated; and the same is to be said of captures following a contest in neutral waters which is completed on the high seas. The neutral has a right to demand from the belligerent captor satisfaction for such invasion of his rights, to seize the prize if brought within its waters, and perhaps to chase and arrest the captor on his way from the scene of the offense. So any attempt to compromise the neutral's position by enlisting men to serve in war, or by inducing them to go abroad for the purpose of enlisting, is an infraction of the law of nations, connivance at which on the part of the British ambassador in 1856 led the U. S. to demand his removal. The subject of arresting neutral vessels on the high seas will be considered under the head of VISITATION AND SEARCH.

The Liabilities and Rights of Neutral Trade.—(*a*) Here, when we speak of neutral owners and neutral property, the word *neutral* is taken in a qualified sense. He is a neutral owner who is resident in a neutral country, and that is neutral property which is owned by a neutral and is the product of neutral soil. That, on the contrary, is hostile property which belongs to a person resident in a hostile country, and hostile property is his property or the production of hostile soil. It may happen that one partner is hostile and one neutral; if capture takes place, their respective interests in the concern will decide how much is exempt from, and how much is liable to, the laws of capture. If a person resident in a neutral country has a place of business and capital in a hostile one, he has so far forth a hostile character; but the British courts have ruled that a person domiciled in a hostile country, but having a commercial house in a neutral one, is not neutral, but hostile. To these particulars we add that a hostile flag or license to trade makes a ship hostile; that papers relating to the nationality of a vessel can not be changed during a voyage without strong evidence of fraud; and that produce of soil which a neutral owns in a hostile country follows the character of the soil.

(*b*) A subject of a neutral may identify himself with one of the belligerents in several ways: he may carry contraband of war, or try to break blockade, or take out a trading license, whether between the belligerent mother-country and a colony or between ports along the belligerent's coast. Most of these actions would be regarded as criminal, and as exposing a vessel to pains and penalties, but the questions arise, What may a neutral vessel do? what may it not do? That it can do unneutral acts is undoubted; that the belligerents ought not to stop neutral trade, unless in self-defense, will be generally admitted. The great difficulty always was, until the Declaration of Paris, to decide whose goods the neutral trader might take on board of his vessel. Numberless were the contentions, the diverse arrangements by treaty, on that subject. The second and third rules of that declaration laid the basis for uniformity of practice among the signers; and as they are such as the U. S. al-

ways strove to have come into operation, they may be said to be all but universal, although we have never given our adhesion to them. They are, that the "neutral flag covers the enemy's goods with the exception of contraband of war," and that "neutral goods, with the exception of contraband of war, are not liable to capture under an enemy's flag." Enemies' goods on enemies' vessels are still liable to capture, whatever be their quality; but as the cautious trader, to avoid risk, would employ a neutral vessel, the amount of property on the open sea exposed to the vessels of the other enemy will be very small; the number of captures hereafter may be expected to be very small; and as privateers will cease to be employed as an auxiliary to national vessels, it is not unlikely that ere long no goods or ships will be exposed to capture but such as directly aid in war. The law of the future, in short, will provide that there shall be no difference between neutrals and enemies in regard to the right of undisturbed passage over the sea.

(*c*) The history of past rules and opinions touching liability to capture is too large a subject, and withal too antiquated, for us to enter into in an article like this. We will only add on that point one or two sentences which may serve to aid in understanding former practice and historical allusions to it. Two rules, then, may be said to have been in conflict heretofore—one making *capture* to *depend* on the *nationality of property conveyed* over the sea; the other, on the *nationality of the conveying vessel*. By the first rule the neutral's goods were *safe* on any vessel, the belligerent's *unsafe* on any vessel. By the second, the neutral's ship protected the goods, the belligerent's exposed them to capture; or, to put this into another form, free ships made free goods, enemies' ships made goods hostile. As for the last part of this rule, it was of slight importance what usage should prevail in regard to enemies' ships carrying neutrals' goods, for in war the neutral would naturally do more of his own carrying than before. But it was of great importance to the belligerent that the neutral flag should not protect his enemy's goods, while it was of great importance to the neutral that a rich carrying-trade should be opened to him in time of war. In this conflict of practice the belligerent interests, especially those of a nation, like Great Britain, with a naval force strong enough to protect itself and annoy its foe, prevailed; and so, on the whole, the first of these two rules had the most vogue when treaty did not intervene—the rule, namely, that the property of a neutral is safe under any flag, and that of an enemy unsafe under any flag. This rule exposed the neutral to great annoyance, as his cargo might be mainly hostile; but we must regard it, after all, as most just that not the vehicle but the property should determine liability to capture. For the reason for capture is—apart from cases of blockade and contraband—that the thing in question belongs to an enemy; and a neutral certainly has a right to take his friend's goods on his vessels, and to use his friend's vessel for the same purpose. The war-right of his friend's enemy may subject him to inconvenience, but neither his property nor his right of payment for freight ought to be taken from him. The present rules—that is, the rules of 1856—are not more just, but they are more humane, than those which Great Britain and the Supreme Court of the U. S. held to be the true law of nations. See Woolsey's *Introduction to International Law* (§§ 169 *b*–171).

(*d*) When, under the old rules of capture, a neutral ship was found with an enemy's goods on board, freight was paid by the captor for the voyage, capture being considered equivalent to delivery; but when a hostile vessel was captured with neutral goods on board, if the captor conveyed them to their original destination, he was allowed to charge freight, otherwise no freight was due.

(*e*) When a neutral used an armed vessel of the enemy for conveying his goods, he exposed them to capture, according to British doctrine, as thereby showing an intention to resist the inconveniences of search and capture. But U. S. courts held a different language, for why would the neutral run the risk of the total destruction of his goods in consequence of an engagement, as he was safe already from capture? A rule for this case is now of no great importance, whichever way it be decided, since privateering has ceased in great measure, and ships of war are not much in the practice of carrying the goods of private persons.

(*f*) *Contraband of War.*—The word "contraband," originally signifying that which it was against a ban, edict, or proclamation to export or to import, now denotes those articles which a neutral can not send to a country in a state of war consistently with the neutral character or without violating the law of nations. These are articles which directly aid the operations of war, and to send these to an enemy identifies the neutral with him. I may assist in war as effectually by sending arms or gunpowder as by getting men to enlist in a belligerent's service. What these articles are is, for the most part, pretty generally admitted, although there is a dispute about several of the more important ones. (See CONTRABAND.) Whatever article is of contraband character, thus much may be said—that belligerents have no right to add to the list, nor neutrals to take away from it. To restrict the trade of neutrals, especially by an arbitrary act, is not a thing to be endured in the present age. We are thus prepared to condemn the doctrine of *occasional* contraband—which has not received the assent, nor been sanctioned by the practice, of all nations—according to which naval stores, and provisions especially, are declared contraband by a belligerent when the circumstances seem to require it. The fluctuating character of such a doctrine is shown by the rules of the British judges in the early part of the nineteenth century, as that such articles were viewed with greater indulgence if they were the produce of the country from which they were exported, or if unmanufactured or destined to a commercial port, than if shipped from a country where they were not grown, or in a manufactured state or destined to a naval station. Afterward the British judge, Sir William Scott (subsequently Lord Stowell), withdrew this indulgence as to the commercial part, on the ground that the articles might there be used to fit out privateers. The complaints of neutrals led to a new modification of the harsh practice in regard to provisions and naval stores. Their whole trade might consist in such articles, and the belligerent doctrine be ruinous to them. The rule of *pre-emption*, which had some support from ancient precedents not strictly applicable, was now applied by way of relaxation of the rule, and consisted in this —that a cruiser at sea was allowed to detain vessels laden with provisions or naval stores, and bound for the enemy's ports, and to take them into a port of his own country. The articles thus intercepted were paid for at the market-price, and with a fair profit added, but not at the price which the neutral expected to obtain in the country to which he was conveying them. The U. S. in one treaty, that of 1794, sanctioned this principle. When a vessel is taken with contraband articles on board, the modern very mild rule is to confiscate such articles, and let the vessel with the other goods go free, unless both or either of them belong to the owner of the contraband, in which case, or where false papers show privity in carrying them, the guilt passes over to the remainder of the property of the same owner, or also to the owner of the vessel.

Special cases of contraband trade are the conveyance of ships of war or of transports with their crews, of persons in the military service, and of dispatches. All but the last would have been considered by older writers and by courts as highly criminal. Dispatches do not seem to have been spoken of before the beginning of the nineteenth century. The doctrine, first brought out in the British courts, but now pretty generally accepted, is that a shipmaster who knowingly conveys hostile dispatches exposes his vessel and the cargo, if he is the agent of it, to confiscation; but what are hostile dispatches? They are in substance defined to be "official communications of official persons respecting the public affairs of government." Such dispatches as keep up the intercourse between a belligerent and a neutral country are not hostile dispatches, nor has the other belligerent the right to obstruct it. It seems likely that vessels carrying the public mails, especially if on a certain stated course, would not be exposed to suffer from the operation of this rule.

According to received doctrine, neutral governments are under no responsibility to restrict private persons from conveying any kind of contraband to either or both of the belligerents, the burden of prevention lying on the shoulders of the party likely to be injured; but for many reasons we think that not only what Dr. Phillimore contends for—the making it unlawful for belligerent private vessels to get materials of war—should come to be a rule of international law, but also that no neutral vessel should be allowed to export such articles to either of the belligerents. This might be effected by requiring sufficient bonds from all vessels before sailing that they have no contraband on board, and imposing a penalty besides in case of transgression. Let all merchant ships of every nation be free to carry innocent

articles to the *theater of war*; let no ships of any kind be allowed to carry articles contraband of war.

(*g*) There was a special prohibition against a certain kind of trade, called the rule of 1756, which Great Britain insisted and acted upon, but which never fully passed into international law, and has now become of no significance. It related to trade closed in peace, but open in war. Such trade might be *coasting* or *colonial*, the first of which nations generally do not open to foreigners, while it was for a long time a principle to confine the other to native-born subjects or open it only under limitations. (See COLONIAL SYSTEM.) Such trade at first was allowed, we believe, in all cases, only to foreign vessels that had obtained a license. There was reason enough to regard a licensed vessel as identified with the belligerent's interests, and so far the rule was not harsh; but when the trade was opened to all neutral vessels, the same rule was urged with somewhat less of justice; the neutral saved a state from some of the embarrassments into which it might be brought by its enemy. The U. S. Government contended against the rule in its application both to coasting and to colonial trade, but some publicists were willing to let the rule have force in regard to coasting trade with an especially national character. The Declaration of Paris of 1856, by which the neutral ship has a right to take enemies' goods, superseded this rule.

(*h*) *Blockade.*—Like trade in contraband articles, trade with a blockaded port on the part of neutral subjects may be prevented as part of the war-right of a belligerent. Both are lawful limitations of neutral trade. See BLOCKADE.

On the doctrine of blockade and of contraband has been engrafted that of *continuous voyages* to meet a system of evasion which had been devised by the neutral. (See CONTINUOUS VOYAGES.) This rule was employed as recently as the civil war in the U. S. Its theory is sound, but in practice it is so liable to abuse, particularly in determining the question of intent as clinging to an importation of goods, as to make its usefulness and justice very doubtful.

(*i*) *Search.*—To carry out the rules of nations respecting contraband goods, blockade, and enemies' goods on enemies' vessels, search is necessary, for, as Lord Stowell said in the case of the Swedish convoy, "a merchant ship is liable to search, whatever may be her character, destination, or cargo; for until you have searched her you can not certainly tell what her character, destination, and cargo are. The right to capture carries the right to search with it." (See VISITATION AND SEARCH.) This right is essential to the others, so that if certain writers, as Hübner (1759), could have made it out that a ship on the open sea is under the same law as territory, a great part of the effectiveness of war on the sea would have ceased. Being, however, an acknowledged right, it must be submitted to, and resistance would authorize force on the part of the cruiser; the search, however, must not be made annoying. If the vessel is on an innocent, lawful voyage, she is to pursue her way; if otherwise, she may be seized and taken into a port for the purpose of adjudication. Search being a very irritating process for the neutral, the northern states of Europe around the Baltic attempted to introduce the so-called right of *convoy*, by which a public vessel, escorting merchant vessels and having their papers on board, could be a security for their being engaged in a commerce permitted to neutrals, and thus might free them from the necessity of being visited. This was a rule which the armed neutrality of 1800 endeavored without success to establish. It has hitherto been unable to find a place in the law of nations, although a large number of treaties have provided for it. It is attended with the practical difficulty that a fleet of merchant vessels under escort may often get separated from the convoying ship of war, and thus a belligerent cruiser may meet one of the merchant ships at a distance from such convoying ship. See CONVOY.

The right of search is properly a *war-right*, to be exercised in the case of merchant ships only. It is still a war-right, whenever vessels *suspected of piracy* are required to lie to and submit to examination, because pirates are enemies of the human race. The vessel is bound to satisfy those who are engaged in the search, because it is for the good of the world; and if the detention can be shown to be unreasonable, or to have been made annoying without reason, the commander has a right to complain. In one case a small Spanish government ship was stopped in order to ascertain whether she were or were not a pirate, and the court of the U. S., in speaking of this, says that ships of war, acting under the authority to arrest pirates or other offenders, "may approach any vessels descried at sea for the purpose of ascertaining their real character." There is likewise a permissible search on the high seas in peace when frauds are suspected against the *revenue*. This may take effect when a vessel that has committed an offense within the waters of a country flees from justice, in which case the public ship may chase her into the high sea and arrest her there. A British ordinance prohibits the transshipment of foreign goods within four leagues of the coast without paying duties, and a law of Congress of 1799 contains similar regulations. "The exercise of jurisdiction to that distance for the safety and protection of the revenue laws was declared by the Supreme Court to be conformable to the laws and usages of nations." (Kent's *Com.*, i. 31, lect. 2.) See HOVERING ACTS.

In the early part of the nineteenth century Great Britain claimed the right of detaining and visiting neutral vessels in war, in order to ascertain whether any of her subjects were on board, and, if so, of taking them out, that they might render military or naval service to the British sovereign. This claim was founded on the doctrine that an Englishman owed perpetual and indissoluble allegiance to his country. The evils of such a summary process bore hardest on the U. S., as many emigrants or residents in Great Britain were among its sailors. This was one of the causes of the war of 1812. The claim was distinctly stated by Lord Ashburton at the Treaty of Washington in 1842, but since then the supply of seamen for the navy by the impressment of persons on British soil has gone into disuse. As for the right involved, it must be most emphatically denied. A seaman, or even a criminal, can no more be forcibly carried off from a neutral vessel than a similar person could be taken by force from a neutral territory. The fact of war, also, had properly nothing to do with the case. The neutral was not violating a war-right, but had hired a man to be a sailor on his vessel. The rights to require indefeasible allegiance and military duty are as truly such in peace as in war, so that the pleas for their exercise would apply to a state of peace as well; but it is not probable that the British principle in regard to allegiance would be equally rigid now, since a treaty of 1870 with the U. S. allows renouncing allegiance and resuming it, and since an act of the British Parliament, passed in 1844, gives authority to one of the principal secretaries of state to grant to an alien, on his petition, nearly all the rights and capacities of the native-born subject. Moreover, as far as taking a person out of a neutral vessel on the sea is concerned, in the case of the Trent the British Government committed itself to the principle that it is illegal to detain a neutral vessel and take from her even persons at war with their country.

A right of search, on suspicion that a vessel was engaged in the slave-trade, was mutually conceded by Great Britain and the U. S. in 1862. This treaty together with a number of others was made by Great Britain in pursuance of a definite plan for putting down this traffic. See SLAVE-TRADE.

Finally: (1) International law is founded on justice, and contains the noble idea that universal, world-wide justice can be realized. (2) Its principal division is that respecting a state of war, but its whole spirit is to avoid war, both by having fixed rules and by the possibility of arbitration through the help of some impartial power or court. (3) Its progress is greatly encouraging. It has grown in definiteness, in humanity, in justice, in the extent of its sphere of operation. (4) It is, however, destined to become less important with the increasing humanity of the world. As laws and courts would sink in their importance if all men became thoroughly just and unselfish, so a day may come when men will wonder at the mass of controversies between nations, at the numberless treatises on international law—above all, at the prominence given to the laws and usages of war, because in some better age they will look abroad on universal peace and righteousness.*

Revised by T. S. WOOLSEY.

* For a fairly complete bibliography of this subject the reader is referred to Woolsey's *International Law*, 6th ed., pp. 405–422. Appended here are the titles of a few treatises covering each the whole field, and of standard value: Kent's *Commentaries*, part i.; Wheaton's *Elements*, 8th ed. by R. H. Dana; Halleck's *International Law* (Sir S. Baker's ed. 1878); Manning's *Law of Nations* (Amos's ed. 1875); Twiss (2 vols., 2d ed. 1875); Phillimore (3 vols., 2d ed. 1874); Hall (2d ed. 1884)—all these in English. In French, Calvo, *Le Droit Int.* (2d ed. 1872); also in Spanish. Pradier Fodéré, not yet finished; and translations from the Italian of Carnazza-Amari (1880) and Pasquale Fiore (1868). In German, Heffter (5th ed. 1867), *Das Europäische Völkerrecht*, and Bluntschli, *Das Moderne Völkerrecht* (1868).

T. S. W.

International Private Law: the branch of jurisprudence which regulates the reciprocal relations of subjects (transiently or otherwise) of different states. The notion of such a community of law was foreign to the ancients. To supply its felt need the Roman jurists and their successors fashioned congeries of precepts concerning the conflict of laws, whence the maxims and nomenclature now in use have been largely drawn. Much is indeed still lacking and doubtful in the science, but there is so marked a tendency toward a unity of civil and commercial legislation that certain publicists look for the recognition by all civilized states of a common system, affording all men everywhere liberty and security in private transactions. To this three conditions seem necessary: 1, every one should be assured of the enjoyment of his civil rights abroad as well as at home; 2, every one should be able to foresee, with tolerable certainty, what laws will govern the rights attaching to his person, his property, and his acts; 3, the basis of international regulations should be conformable to right, reason, and the nature of things, so as to insure permanence to the rules themselves, and the rights acquired under them.

The first and most general maxim of international private law results directly from the independence of states, and is —Each state has an exclusive sovereignty and jurisdiction within its own territory. Consequently the laws of every state govern all persons and all property within its limits. The second general principle is the converse of the former —No state can by its laws bind persons or objects outside its own territory. An important consequence of these two general principles, or converse sides of the same principle, is that all deference paid to foreign laws depends upon domestic regulations—upon the consent, express or implied, of the state where the foreign laws are applied. International private law rests, then, for its sanction upon considerations of utility and reciprocal convenience or comity. "It is not a question of the comity of courts, but of states, in that the legislature decrees what effect shall be given to foreign laws, and leaves the courts nothing to do but to carry out the directions of the statutes." When the legislature has supplied a law for the case, the applicability of a foreign statute can not come in question. Its pertinence can only be assumed by a judge in the absence of express provision, and when conformable to established custom or the analogy of his own jurisprudence.

The applicability of a particular law to a given case mainly depends upon the connection of the person concerned with a certain legal territory. To determine this two *criteria* are contended for—nationality or domicile.

Nationality is the quality attaching by birth in, or formal adoption into, a particular community. It has of late lost so much of its significance (by the adoption of the Roman principle that children follow the condition of their parents, and that adults are free to choose their own country) as to be considered by some solely of political moment. Nationality, however, remains of importance concerning rights not political; e. g. claims under treaty stipulations securing special rights to citizens, and the whole category of the disabilities of aliens. The character impressed by birth is so indelible that, upon a due change of residence and intention, it easily effaces the supervening character of domicile. It has also the advantage of being directly ascertainable, while domiciles are divided by very indistinct lines.

Domicile may be defined as "a residence at a particular place, accompanied by positive or presumptive proof of intention to remain for an unlimited time." Thus it answers very much to the common meaning of the word *home*. Where it may be said of a person having two residences that he makes one his home, that is to be taken as his domicile. Intent, the element which determines the question of domicile, may be evidenced in various ways. If such intent be proved, the fact of residence for the briefest time will suffice. A person may elect to regard his place of business as his domicile, and he may even have different domiciles for different specific purposes, but he can only have one principal domicile. This is the accepted test of the general national character of his business relations, and impresses itself upon his affairs and property.

Minor children, if legitimate, take and follow the domicile of their father until competent to choose one for themselves. Illegitimate children generally follow the domicile of the mother. It is usually held on the continent of Europe that the death of the father fixes the domicile of a legitimate child, so as not to be changed by the mother or guardian without act of law. The domicile of a wife generally merges in that of her husband, unless he suffer for a crime or be under restraint for lunacy or like incapacity. Envoys, consuls, prisoners, lunatics, exiles, students, and, in general, officers, acquire no new domicile.

Status is the sum of special rights and duties belonging to a person, over and above the general rights and duties which he shares with all the members of the community. To determine the status of a person outside of the country of his domicile many theories have been proposed. The one most accepted is that status is determined by domicile, with the qualification that in case of doubt laws favoring capacity are favored, and the contrary disfavored. Another theory, that status or personal capacity is determined by the allegiance of the person, is in force in Italy and Holland, and has the sanction of the Code Napoleon. It seems to be growing in favor as being more exactly ascertainable. Laws abridging capacity for rights—e. g. concerning slavery —have admittedly no extraterritorial force. Natural incapacity, such as lunacy, accompanies the person everywhere. In other respects, the general tendency is to respect the law of the place of the transaction, as that imposes the least burden upon business.

Ownership and Property.—Whether any particular thing be an object of ownership is admittedly determined by the law of the place of controversy. The capacity of a person to acquire and dispose of property generally depends upon the law of his domicile. A distinction which reconciles many embarrassing contradictions in the books is into a capacity to act and a capacity for rights. The former, proceeding from the personal status, depends upon the law of the domicile; the latter, upon the law of the situation, e. g. the inability of aliens in New York to transmit property results from a local incapacity for rights. The elder jurists sharply distinguished immovables from movables and other means of estate. The former, including not only land, but also all dismemberments of the property in land and the rights to their enjoyment, are admitted to be under the domination of the law of their situation, except when massed for purposes of succession and the like. By the tremendous fiction that movables cleave to the person, all personal property, however ponderous and permanent it might be, was subjected to the law of the domicile of the owner. The increase of personal property in comparative value and importance, with other considerations, has, however, led to a rejection of this distinction, so that outside of England and the U. S. the now prevailing rule is that "movables," when not massed for the purposes of succession or marriage-transfer, and when not in transit or following the owner's person, are governed by the law of the situation, except so far as the parties interested may select some other law." Like considerations, particularly those of public interest, are tending to incorporate the same rule into Anglo-American jurisprudence.

Real rights, or claims upon things obtaining against all persons, are, for the most part, governed by the law of the place where the subservient property, movable or immovable, exists. Implied real rights are not favored internationally, and are not upheld unless recognized by the laws of both places. Thus the hypothecation of an obligor's entire estate, implied by certain contracts in certain countries, is not recognized in others where such constructive covenants are not known, although such a claim might support an equitable action to compel the obligor to execute a formal hypothecation. Liens on movables are extinguished by removal, though eminent jurists have maintained that real rights should not be so defeated. It is also admitted that a lien unknown at the place of contract can not be created by a mere removal of a chattel. Whether it may be asserted by special proceedings depends upon whether the lien be regarded as a part of the contract or as extraneous to it, and simply a matter of procedure. The priority of liens "depends upon the place where the property lies and where the court sits."

Incorporeal chattels—e. g. letters patent, copyrights, and trade-marks—are the creatures of local laws, and clearly have no validity beyond the territory of the authority conferring them, unless extended by treaty stipulations. Thus it has been held in France by the court of last resort that a Frenchman may stamp the unprotected trade-mark of a foreign manufacturer upon his wares with impunity; but the number of treaties relating to patents, trade-marks, and copyrights, show the extent to which such international protection is carried.

Obligations, in the sense of international jurisprudence,

include all legally coercible duties, whether arising by act or accident, voluntarily or involuntarily, conformably to good morals or the reverse. A normal or unilateral obligation restricts the liberty of one party, debtor, obligor, and enlarges the rights of the other, creditor, obligee. While the essential properties of obligations are, from motives of public policy, held beyond the interference of parties making engagements, no small freedom is allowed in the determination of their natural properties. Among the latter is the law by which the obligation is to be governed, and which, under certain restrictions, is left to the choice of the parties themselves. Whenever, therefore, it may be assumed or shown that the parties have chosen a particular territorial law, their obligations are to be determined by that, so far as they are at liberty so to elect, and have their will respected at the place of suit. Two palpable facts are distinguishable in every obligation—inception and fulfillment. The law of the place of inception under most circumstances regulates, according to very general agreement, the formal conditions of a transaction. It is commonly said, therefore, that an obligation valid at the place of its origin is valid everywhere. The converse, that a transaction invalid at the place of origin is invalid everywhere, is also asserted, though subject to more exceptions, in that courts are disposed to recognize engagements in accordance with their own laws, even if formally defective under the law where actually entered into. The law of the place of performance governs, according to most jurists, the obligation itself. Plausible and ingenious arguments are put forward for other rules, particularly that of the debtor's domicile, but it is urged in opposition and with reason that the parties presumably purpose, unless stipulating otherwise, to be governed by the law of the place where a specific act is to be done or thing delivered. Where other indications of an intended submission to a particular law are at hand, these are to be respected; thus the obligations arising out of a continuous course of business are to be determined by the law obtaining at the permanent seat of that business—e. g. liabilities under a foreign policy of insurance are subject to the law of the place of the permanent seat or principal office of the company whence it is issued, though the obligation to pay the premium is subject to the law of the domicile of the insured. So, again, an obligation arising under circumstances warranting the expectation that it will be discharged at the same place is governed by the local law—e. g. that of a guest to pay his hotel-bill. In other cases the applicatory law is that of the debtor's domicile at the time of contracting the obligation.

Obligations arising from delicts or torts—wrongful acts as connected with private redress—can not, of course, be considered subject to a certain law because the same has been chosen by the obligor (wrongdoer, *tortfeaser*). The principle of many of the foregoing conclusions is therefore inapplicable to them. Wherever a wrong is done, there the perpetrator of it, whether a transient passenger or a domiciled subject, is justiciable, and must answer for the consequences. The law of the place of commission of an admittedly wrongful act determines the measure of damages. It has been judicially intimated that an act unnoticed by the law of the place of perpetration, but treated as tortious by the English law, would sustain a suit for damages in England. The more approved doctrine is, that what is legally innocent where it occurs can not be made a delict elsewhere. Courts of both Great Britain and the U. S., holding the principle of the territoriality of crime, prefer not to assume jurisdiction over torts committed abroad, where the suitors were non-resident foreigners.

The consideration of every valid obligation should be meritorious. To vitiate an engagement on its account the moving cause must offend against universally accepted views of public morals and public safety, and not be illegal only by reason of special statutes. Thus claims arising from sales of lottery-tickets in Kentucky are enforced in New York, where such sales are contrary to law. Still further, a foreigner, unless he be an accomplice, can recover in England the price of goods sold with the explicit understanding that they were to be smuggled into the latter country. What is intrinsically contrary to public morals is far from well settled. It might be supposed that a polygamous promise would be disregarded throughout Christendom, but a learned and respected judge has said from the bench that the proclivities of a Turk would be protected in North Carolina. Yet it is believed that as a rule polygamy would not be recognized by the law of a state which puts a plurality of wives under the ban. The belief as to the best means to attain the same end is as varied as nationality. In this wise the consideration of illicit cohabitation is so variously treated that it has given rise to more conflicts than any other. In France and some other countries regard for decency and morality interdicts all inquest concerning paternity; in others, as Scotland, obligations arising therefrom are considered but "obediential and natural."

In actual practice the application of recognized legal principles is embarrassed by the fact that a majority of obligations are not simple or unilateral, but reciprocal or bilateral. However involved the process, the separation of the latter into the several unilateral obligations of which they are composed will often prove the most convenient if not the sole solution of the problem. Thus each party to commercial paper is liable according to the law governing his particular engagement; so again, as has been intimated already, premium for insurance may be collectible by a very different law from that deciding claims under the policy—often a vital distinction in states forbidding insurance by foreign companies.

Marriage is so hedged about, from reasons of moral and religious policy, by positive coercitive statutes as to lose much of the nature of a contract, and become an institution differing widely in different states. Admittedly, it must be a conjugal union between competent parties for life. The conditions—or, as they are commonly discussed, the impediments—to it depend, according to the Anglo-American and elder doctrine, upon the capacity of the spouses under the laws of their respective domiciles. On the ground that the bride submits herself to the bridegroom's domicile, this is regarded by the later German opinion as controlling both, excepting where her domicile can not be changed by her own act. The formal conclusion of marriage is regulated by the law of the place of celebration. The true seat of the relation (wherever contracted) is the domicile of the recognized head of the family, the husband. Mutual rights of property are fixed by the man's domicile at the consummation of the marriage, for it could not be endured that the husband should be able to change the rights of his wife over her own property by a change of residence. Laws restricting liberality during marriage depend upon the domicile at the time of the act; being intended for the protection of moral purity, they are designed to control all persons in the territory. Intestate succession between the spouses is regulated by the last domicile of the deceased.

Divorce is governed by the law of the country where it is sought, in that the law, resting upon the moral nature of the union, is strictly positive and compulsory upon the court, which, too, must be that of the actual domicile, as it alone can have jurisdiction.

Paternal power over legitimate children depends upon the law of the domicile of the father at the time of the birth; over children legitimated by subsequent marriage, upon the domicile of the father at the time of filiation.

Guardianship is to be instituted under the law of the ward's domicile. There is a strong presumption in favor of the competency of an administering court.

Succession, testamentary and intestate, to immovables, is governed by the law of their situation. Movables commonly pass by the law of the decedent's last domicile. But the disposition of personalty in a will validly executed under the law of a former domicile is respected in Europe; it is otherwise in most of the U. S.

Civil jurisdiction is called contentious or voluntary according as it is exercised in litigated causes and the execution of decisions, or in affording public authentication to matters not in controversy. Of the voluntary jurisdiction of magistrates and officials the foreigner may commonly avail himself equally with the native, and a compliance with formalities required by local law is accepted every other where as sufficient. In most countries, and saving such restrictions as giving security for costs, an alien can ordinarily contend in the courts on the same footing as a subject. In France, however, non-domiciled foreigners can sue their fellows only for certain causes of action—e. g. commercial obligations. Subjection to a certain jurisdiction is a question of territory. Nothing, movable or immovable, can be judicially disposed of unless it lie within the purview of the court. Power to pass upon property abroad has been asserted in England and in some States of the American Union, but such decrees are of no foreign force. Judicial power over persons can be had only through personal service and domiciliation in the country; domicile in the lesser

sense of commorancy will suffice. By English laws English courts assume jurisdiction over causes of action arising in England, although the assumption is disregarded elsewhere. Procedure is regulated solely by the place of suit; if a particular remedy be essential to the enforcement of a right, resort must be had to a court administering the remedy. Evidence is admissible or inadmissible according to the law of the country of the court, albeit tribunals are prone to admit foreign modes of proof when indispensable to the judicial establishment of facts. Foreign judgments have no effect unless sanctioned by domestic authority. If the competency of the court pronouncing them be unimpeachable, they may, as conclusive upon the merits, be enforced by new judgments of the same tenor or made directly executory. As regards the effect of foreign judgments some European states adopt the rule of reciprocity. U. S. courts as a rule give effect to foreign judgments without regard to reciprocity, but retain the right to examine the circumstances under which they were rendered and the jurisdiction of the courts rendering them.

Criminal jurisdiction depends upon the relation of the government to the place of the offense and to the person of the offender. The former consideration has been magnified in Great Britain and the U. S.—the latter upon the European continent. To meet modern exigencies, both systems have been modified, by statute and interpretation, into a very general approach to the rule that courts of the country of arrest have jurisdiction over all offenses committed within its territory, and also over those perpetrated abroad distinctively against its sovereignty. Independent states administer only their own penal laws. They assist the enforcement of others by surrendering foreigners upon presumptive proof of crimes not political. That the obligation so to do does not arise purely from treaty provisions was aptly set forth when an eminent Frenchman said, "Le principe de l'extradition est le principe de la solidarité, de la sûreté réciproque . . . contre l'ubiquité du mal."

Revised by T. S. Woolsey.

International Workingmen's Association, The: an association of labor-unions intended for the defense of the interests of workingmen against the encroachments of the power of capital, and aiming ultimately at the abolition of all labor paid with wages as a form of slave-labor, and the establishment of associated labor on a national scale. It was founded Sept. 28, 1864, at a large meeting of workingmen from nearly all European countries in St. Martin's Hall, London, at which the manifesto and statutes, as drawn up by Dr. Carl Marx, were adopted for publication, and a provisory administration established. The statutes of the association were not finally adopted, however, until sanctioned by the first general congress, held at Geneva Sept. 3–7, 1866. Here the programmes of Mazzini and Bakunin were rejected, and that of Marx adopted. As reasons for the formation of such an association it was proclaimed that the emancipation of the working classes must be wrought by the working classes themselves; that the struggle for the emancipation of the working classes means not a struggle for class privileges and monopolies, but for equal rights and duties and the abolition of all class rule; that the economical subjection of the mass of labor to the monopolizer of the means of labor—that is, the sources of life—lies at the bottom of servitude in all its forms, of all social misery, mental degradation, and political dependence; that the economic emancipation of the working classes is therefore the great end to which every political movement ought to be subordinated as a means; that all efforts aiming at that great end have hitherto failed from want of solidarity between the manifold divisions of labor in each country, and from the absence of a fraternal bond of union between the working classes of different countries; that the emancipation of labor is neither a local nor a national, but a social problem, embracing all countries in which modern society exists, and depending for its solution on the concurrence, practical and theoretical, of the most advanced countries. The next general congress was held at Lausanne, Sept., 1867; the third in Brussels, Sept., 1868; the fourth in Basel, Sept., 1869; but the fifth, planned to take place in Paris, Sept., 1870, was prevented from meeting by the Franco-German war. Of these meetings that at Brussels was the most important. It declared that land, mines, and means of transportation should become the property of the state, by which it should be intrusted to associations of workingmen to be exploited for the common good. It protested against all war, and advocated a general strike if war broke out between France and Germany. In different countries, especially in France and Austria, the Government interfered, but this only made the association more popular among the workingmen. It received a severe check from the Franco-German war. Many members of the Paris Commune belonged to the association, and the excesses of the Commune were defended by the association, both in a pamphlet written by Marx and published by the general council in London, and in other ways. A congress held at The Hague in 1872 was split by irreconcilable differences with regard to the acts of the Commune and other allied questions, as well as the theory of socialism. The association was dissolved by this, but most of the independent societies of which it was composed have continued to increase in numbers.

Revised by A. T. Hadley.

Interplead'er: in law, the right which a person who holds a fund or has possession of property, or owes a duty or obligation, has, when there are rival claimants to the fund, etc., and he can not determine to whom it belongs, to require them to settle in court their conflicting claims as between themselves, and to be allowed on his part to make over the property, etc., to the court, to abide the events of the litigation or to hold it under its direction. The jurisdiction of courts of law over this subject is very limited and imperfect, and this branch of jurisprudence may now, in practice, in the absence of statutes, be said to be exclusively administered in courts of equity. The method in which relief is obtained is by bill in equity. These bills are of two kinds—strict interpleader, and bills in the nature of an interpleader.

(1) *A Strict Bill of Interpleader.*—The function of such a bill can be most clearly stated by putting the propositions appertaining to it in the form of rules. *Rule 1.* There must be two or more persons claiming from the plaintiff the same debt, duty, or thing. This rule is of easy application when a specific thing is in dispute. It is, however, quite difficult in some cases to ascertain whether the same debt or duty is claimed. An illustration may be found in the case where a tenant under a lease is called upon by his lessor for rent, and at the same time a third person asserts that he is the owner, and that the amount of the rent should be paid to him. This would not be a proper case for a bill of interpleader, since the lessor claims under a contract, while the stranger asserts that the tenant is in possession by wrong. On the other hand, if a person is taxed in two different towns for the same property when he is only liable to be taxed in one, and it is doubtful to which town the right to tax belongs, he may file a bill of interpleader to compel the tax-collectors or towns to settle the rights as between themselves. In this case the debt or duty is the same. *Rule 2.* As a general rule a bill of interpleader will not lie when the holder of a fund stands in contractual relations toward one of the claimants, and the other is a mere stranger, claiming by an independent and paramount title. Thus, if an agent, consignee, or bailee have goods committed to his care, in legal phrase there is a privity of contract created, which will prevent him while he retains possession from disputing the title of the person for whom he acts. The agent or bailee must defend himself from conflicting claims as well as he may. This has been changed in England. (See *Attenborough* vs. *St. Kath. Dock. Co.*, *Law Reports*, 3 Common Pleas Division 450.) *Rule 3.* The second rule must be confined to the case where the agent, consignee, etc., seeks to dispute or test the original title of his principal or consignor. It frequently happens that after such a contract relation has been created the title by subsequent acts of the principal or employer becomes complicated. He might, for example, make conflicting assignments of doubtful validity to different persons. So his assignee in bankruptcy might claim the goods as against one to whom it was insisted that the owner had made a transfer in fraud of the bankruptcy act. In such cases as these the holder of the goods might demand an interpleader. *Rule 4.* In cases where both claimants assert wholly distinct and independent titles, according to the weight of authorities no interpleader will lie. The ground of this rule appears to be that there is an objection to the interference of a court of equity in trying legal titles upon a dispute between parties where there is no privity of contract. It has been held that a sheriff who seizes property on an execution can not bring an action of interpleader upon account of an adverse claim existing to the property seized by him; for as to one of the claimants he necessarily admits himself to be a wrongdoer. This rule appears to be highly technical, and the narrow con-

struction put upon the jurisdiction of the court is much to be regretted. This action is plainly a beneficial one, and should have been encouraged rather than discountenanced. *Rule 5.* It is not necessary that the claims of the respective parties should be both legal in the sense of being recognized in courts of law. One may be legal, and the other equitable, or both may be equitable. *Rule 6.* The rights of the respective claimants must be doubtful. If the case shows no claim of right in one of the co-defendants, there is no ground for an interpleader. Nor will the plaintiff be allowed an interpleader, after acting in a partisan manner as between the claimants. (*Hinckley* vs. *Pfister*, 83 Wis. 64.) *Rule 7.* The holder of the fund, etc., may begin an action, although he has not yet been molested by either of the claimants. It is enough that he is in danger of sustaining injury from conflicting rights. He may, however, wait until an action is brought against him by one of the claimants, and then in turn commence his action of interpleader, making all of the rival claimants parties. *Rule 8.* A matter of detail should be referred to in connection with this. There should be in the bill an affidavit that there is no collusion between the plaintiff and any of the other parties; and in the case of money it should be brought into court, or there should be at least an offer to bring it in. See Daniell's or Barbour's *Chancery Practice.*

(2) *Bill in the Nature of an Interpleader.*—A suit of this kind may be instituted by one who is not strictly a stakeholder. It may be brought by a person who is interested in a fund to ascertain his own rights, and at the same time to settle the conflicting rights of third persons. An illustration is supplied by the case of a mortgagor who desires to pay off a mortgage, while different parties lay claim to the mortgage-money. It is plain that he would naturally seek to accomplish a double result—to redeem his property from the lien of the mortgage, and at the same time to pay the money to the party who was really entitled to it. An important instance of a bill in the nature of an interpleader is one filed by an executor or trustee to obtain the construction of a will when there is a doubt or uncertainty as to the meaning of its provisions. In this case the provisions of the will are set forth, and the conflicting claims of the parties interested, accompanied by the statement that the executor can not safely proceed in the matter without the direction and judgment of the court. In these cases the duty of the executor is said to be performed when he has brought the parties in interest before the court, and they may appear by counsel, who represent their respective claims under the will. As a general rule, in a strict bill of interpleader, the stakeholder is entitled to be paid his costs from the fund in controversy as a matter of right; costs in a bill of the nature of an interpleader are discretionary.

In England the courts of law have jurisdiction to a certain extent in matters of interpleader. (See 23 and 24 Vict., ch. 126, § 12.) So, under similar statutes in the U. S., a defendant against whom an action is pending upon contract or for specific property may at any time before answer, upon affidavit, that a person not a party to the action, and without collusion with him, makes against him a demand for the same debt or property, upon notice to such person and to the adverse party to the action apply to the court for an order to substitute such person in his place and discharge him from liability on his depositing with the court the amount of the debt, etc. This statute does not supersede the regular jurisdiction in equity, but is an additional remedy given to a stakeholder who has been actually sued, by allowing him to assert his rights in an answer, and by way of defense, instead of instituting an action. The rules applied are substantially the same as in the bill of interpleader.

Revised by P. M. Burdick.

Interpolation [from Lat. *interpola'tio*, modification, corruption, falsification, deriv. of *interpola're*, refit, make over, falsify (as writings); *inter'polis* or *inter'polus*, made new, polished up (as clothing); *inter* + *poli're*, polish]: in mathematics, the act of computing omitted terms of a series of quantities, when a sufficient number of their terms are given. For example, if the right ascension and declination of the moon are computed for every twelve hours through the course of a month, it is always possible to determine those quantities for any intermediate hour. The method may be conceived as consisting in a determination of the general law according to which the quantities vary, from a knowledge of the values which they have for every twelfth hour. By the aid of this law the values can be found at any time. The formulas necessary in applying the method will be found in the works on practical astronomy by Chauvenet and by Loomis, and in the introduction to Newcomb's tables of five-place logarithms.

S. Newcomb.

Interpretation [from Lat. *interpreta'tio*, explanation, deriv. of *interpreta're*, deriv. of *inter'pres*, agent, go-between, interpreter, hence in applied sense, exegete, explainer. The original use of the word seems to have been commercial, and hence connection with *pre'tium*, price, is probable]: in law, the employment by courts of justice of the familiar logical process of ascertaining what another has intended by the written or spoken words in which he has expressed his meaning. This process is essentially the same whether employed by a judge on the bench in reading a will, a deed, or a contract, or by a private person in reading a letter or a book. It consists merely in the application of reasoning to the words and sentences under consideration. The difference between the two processes in their actual application is that in the forum of private discussion the reader or listener is left perfectly free to apply the methods of comparison, inference, and judgment, as these reside in his own mind, with no restraint save such as may be afforded by the laws of thought; while in courts of justice, where uniformity of interpretation and certainty as to the signification of words and phrases are of the first importance, where the same words must always be taken in the same sense, and where the personal equation of the presiding judge might do infinite harm, these laws of thought have been supplemented and the application of them controlled by certain rules of law. These rules constitute the law of interpretation. Using the term in its legal sense, then, interpretation signifies the process of ascertaining the meaning of the language employed by a party by the application of sound reason, guided and controlled by certain rules of law.

This definition makes it clear that the object of legal interpretation is not, as it is usually conceived, to ascertain at all events the intention of the party whose language is under consideration. The object is to ascertain this intention only (1) so far as it is expressed in the words before the court; (2) so far as it is compatible with the rules of law which have been developed to govern the process; and (3) so far as it can have legal effect. The first of these qualifications results from the rule of law that extrinsic evidence will not be admitted to contradict, vary, or control the terms of a written instrument, as well as from the rule of reason that a party shall be presumed to have intended the language actually employed by him; the second is involved in the very existence of a science of interpretation, and of a body of rules governing the application of that science in courts of law; the third is a necessary consequence of the fact that the sole object of the judicial interpretation of an instrument is to give the instrument legal effect. Interpretation which does not have this object in view will be academic and, in legal contemplation, futile. An illustration may make clearer the operation of these legal restraints upon the logical process of ascertaining the intention of a party. "A" grants an estate to "B and his children." At common law this will have the effect of vesting only a life estate in "B," and his children get nothing, the technical word "heirs" not having been used. In the first place, "A" will not be permitted to show that it was his intention to write the word "heirs," and that the word "children" was used by him inadvertently. The word must stand as it was written. In the second place, the parties can not show that the word "children" was used in the sense of "heirs," and that they understood and intended the word in that sense. It is a rule of interpretation that words shall ordinarily be taken in their usual and popular meaning, and a strained and unusual signification will not be attached to them. In the third place, the parties to the deed will not be allowed to claim that a fee simple estate was intended, notwithstanding the omission of the word "heirs." It is a rule of the law of property that a fee simple can be created in no other way than by using the term "heirs," and the actual intention of the parties, however apparent it may be in fact, can not have legal effect.

This, as above defined and explained, is *interpretation* in its more restricted sense. It is, however, frequently employed in a more extensive signification to include the analogous process of *construction*. Although these two terms (interpretation and construction) are usually employed

loosely and interchangeably without recognizing any difference of meaning between them, they are, nevertheless, to be carefully distinguished. The process of *interpretation*, as above defined, is the ascertainment of the intention of the writer from an inspection of the language employed by him. The court indulges in no speculation, and draws no inferences beyond those furnished by the words employed. The question which it asks and answers is, What do these words and sentences mean? It is therefore a process merely of definition and logical reasoning. In applying the process of construction, on the other hand, the end in view and the method of attaining that end are both different. The question now becomes this: The grammatical and logical signification of these words and sentences having been ascertained, what is their legal effect? The ascertainment of this legal effect is the familiar judicial process of applying the law to the facts of a case. It is therefore a process of legal rather than of merely logical reasoning. The difference may be illustrated by a reference to a well-known rule of property law. Land is conveyed by a description which carries it to a highway or stream. A measurement of the land by the courses and distances given in the deed shows that no part of the road or stream is included in the description. This is as far as interpretation, pure and simple, will carry us. But now comes into play the rule of law above referred to—namely, that when land is conveyed bounded by a stream or highway the deed conveys the fee to the middle line of such stream or highway, unless a contrary intention expressly appears on the face of the instrument. In other words, the deed is *construed*, according to the *presumed intention* of the parties, to convey a strip of land which is not comprehended within the description in the deed, and which no reasonable *interpretation* of the *language* of the deed could have included within the intention of the parties. Accordingly, in the case supposed, interpretation gives us the *expressed* intention of the parties; construction, their *presumed* intention.

The Roman lawyers recognized this double process under the generic term *interpretatio*. This interpretation of the civil law, as afterward defined by the mediæval lawyers, was either *grammatical* (corresponding to our interpretation as above defined) or *logical* (corresponding to our use of the term construction). It is to this process of logical interpretation or construction that we owe the enormous development of the Roman law from the time of the Twelve Tables to that of the later legislative era. Indeed, this process of construction has in every legal system been a prolific source of new law, the commentators or judges having, under cover of interpreting the written law, constantly modified it by construing it so as to fit the new conditions to which it was to be applied. The results of this process are well displayed in the body of law which has resulted from the judicial construction of the Statute of Frauds in England and the U. S.

A conspicuous example of construction as distinguished from interpretation, and one which illustrates in a marked way the nature of the process, is afforded by the doctrine of *cy pres* or of approximation. It is frequently resorted to in the construction of wills or of statutes. Thus if a person should be prohibited by law from creating a trust in property for a child whereby the income of a fund should be converted into principal beyond the attainment by the child of the age of twenty-one, and the parent should direct the accumulation of the profits until the child reached the age of twenty-five, the last four years might be discarded by the courts, and the direction be sustained until the age of twenty-one. This doctrine requires that the illegal direction should be in its nature capable of separation from that which is legal. Otherwise, the entire provision will be void. This doctrine has had in England a large application in the construction of wills endowing charitable institutions or creating charitable trusts, e. g. for the support of colleges, hospitals, schools, etc. (See TRUSTS.) The intention of a donor, instead of being carried out, has frequently been perverted by the court; yet when properly applied, the doctrine is both rational and useful.

It will be seen from what has been said above that, though the two processes of interpretation and construction usually go hand in hand and must ordinarily both be employed in the judicial consideration of a writing, either one may, in a proper case, be employed without invoking the aid of the other. Thus the language of an instrument may be perfectly clear and unambiguous, so as to afford no room for interpretation, while it may nevertheless require to be construed with reference either to the circumstances to which it is to be applied, or to the law governing the transaction of which it forms a part, or to both the law and circumstances. An illustration of this will be found in the case of the deed conveying land bounded by a highway or stream, above referred to. On the other hand, the only question involved in the case may be the question of fact as to the meaning attaching to the words of the instrument, the application of those words being perfectly clear when their sense has once been determined. Thus where a testator has bequeathed a legacy to his cousin, John Doe, and two cousins bearing that name claim the legacy, the court has only to ascertain which of the two is the one referred to in the will. This fact having been determined the application of the law follows as a matter of course.

Both of these operations of interpretation and construction are to be performed by the court, and the jury has ordinarily no part in them. The process of interpretation proper, though it is only reasoning from one fact to another, and therefore within the general scope of the jury's functions, has always been one of the reserved powers of the judge on the bench. This practice is probably a survival from a time when this duty was of necessity performed by the judge, as being the only member of the court who was able to read the writing under consideration, or who had sufficient education to understand the meaning of the "clerkly" terms employed, though the practice must have been powerfully sustained by the confusion of this grammatical process with that of construction, which latter is purely judicial. It should be added that the interpretation, though not the construction, of an oral declaration (as a parol contract or a nuncupative will) is for the jury, and also that a judge may sometimes call in the assistance of the jury to interpret a written word or phrase which has a local or technical signification.

It is clear that neither the rules of grammar and logic, nor those of positive law, which have been framed to govern these processes of interpretation and construction, will always have a uniform operation. So long as scope is left for the exercise of the judicial reason in making the required inferences of fact or of law, the result must be greatly influenced by the mental structure of the court or by the nature of the instrument under examination. One judge is naturally disposed to a narrower interpretation and a closer construction than another. A will, which is often the work of a person unskilled in the legal signification of words and phrases, may and should be dealt with in a different spirit from that which would be appropriate to a statute, the work of a skilled draughtsman, or a deed, the work of an experienced conveyancer. These facts have been recognized in the law by the adoption of a highly technical and refined terminology, descriptive of various degrees of narrow or liberal interpretation. Thus we have "literal," "close" or "restrictive interpretation," "liberal," "extensive" and "extravagant interpretation," "predestined," "artful" and "transcendent interpretation." Most of these terms serve only to emphasize the difference between true and false methods of dealing with the subject-matter. So long as the object of interpretation is, within certain limits, to get at the mind of the writer, not to substitute for it the mental processes of the interpreter, a "literal," or "extravagant," or "predestined" reading of the instrument in question is but illy calculated to attain the objects which that process has in view. The only one of the distinctions above enumerated which has any practical value is that general and somewhat indefinite one, already described, between close and extensive interpretation. As has been said, the nature of the writing under consideration and, sometimes, the circumstances of the case may, in order to reproduce as nearly as possible the mental state of the writer, require the process to be governed by a more or a less liberal spirit. One other variety of interpretation remains to be mentioned. Interpretation or construction is said to be "authentic" when it proceeds from the person whose meaning or intention is sought to be ascertained. When this can be obtained it is of course obligatory on the court, as it dispenses with the necessity of the judicial process for ascertaining the writer's meaning. Obviously, however, this authentic interpretation of a writing can not often be secured, because, ordinarily, the author is not allowed to say what his meaning was. The doctrine finds its principal application in the interpretation of statutes. An act of the legislature, passed for the purpose of interpreting the terms or defining the scope of a previous statute, is an act of authentic interpre-

tation or construction, and such legislation is not uncommon. So, too, where the parties to a deed have subsequently erected boundary-fences to define the limits of the property conveyed, such conduct is dealt with by the courts as an authentic construction of the description in the deed.

The principal classes of writings which the courts are called upon to interpret are four in number, viz., contracts, deeds, wills, and statutes. The subject of constitutional interpretation and construction, of transcendent importance in the United States, with its written organic law, is so closely related to that of statutory interpretation that they may be considered together. Each of these four classes of writings has developed a body of rules peculiar to itself; but there are rules of general application, to which reference will first be made. It may be observed at the outset of this inquiry that many of the rules of interpretation, as they appear in legal text-books and reports, are merely a restatement by judges of well-known and obvious rules of grammar, or of logic, or of common sense. It may be doubted whether the judicial recognition of these rules has added much to their binding force in the forum of law or of reason, and we shall therefore confine ourselves to a brief statement of the leading principles. It will be noticed that the general rules which follow are essentially of this order. In enumerating these leading principles and rules no attempt will be made to distinguish between those which have a particular bearing on interpretation and those which are more particularly concerned with construction. The reader can readily make the necessary discrimination. Most of the rules, it will be observed, apply equally to both processes.

Rules of Interpretation.—1. The meaning of a writer is to be gathered not only from what he states, but also from all that is implied in his language by usage or otherwise. It would be intolerable if every subordinate proposition included within the written statement were required to be expressed. 2. The whole of the writing bearing upon the subject in hand must be taken into account. The several writings constituting the entire document, or the several parts of one writing, are to be read together, so as to give every part its due effect. 3. Only the writing and its implications are to be considered. The court can not go outside the "four corners of the instrument," as the phrase is, for the supposed sense of the writer; neither can it allow the writer to contradict, vary, or add to the terms of the instrument by oral evidence as to his actual intention. This rule has been referred to and illustrated in another connection. 4. Where there is nothing in the writing or in the circumstances out of which it springs to impress upon it an exceptional and technical character, its words are to be taken in their ordinary and popular sense. On the other hand, if the subject of the writing is a matter of art or of science or other technical nature, the presumption is that the words are used in a special and technical sense. 5. Good faith and sound sense must preside over the whole process of interpretation and construction. The great object of the proceeding, to ascertain the intention of the writer, and, if possible, to give that intention legal effect, must ever be borne in mind, and the inquiry conducted with reference to those ends. Out of this principle spring a number of subordinate rules; such as, where two interpretations are possible, one of which is agreeable to law, the other being opposed to it, the former is to be preferred. So, inadvertent omissions may be supplied, apparent repugnancies are to be reconciled; words inconsistent with the main intention will be rejected, and stress will not be laid on accuracy in matters of grammar or orthography.

In addition to these general rules, which apply to all classes of writings, there are innumerable special rules which have been devised to meet the peculiar needs of the several classes. These are too numerous to find place here, but a few of the most important of them may be mentioned. This will be done without any attempt at elaborate classification. 1. A contract is to be neither closely nor liberally construed, but the intention is to be sought dispassionately, upon a consideration of the instrument itself and of all the circumstances surrounding it. It is deemed to have been drawn with reference to the customs of the time, place, and business with which it is concerned, as well as to the political and social conditions then and there prevailing. 2. A deed or conveyance of lands is usually to be strictly construed and, in cases of doubt, against the maker of the deed. The words of a conveyance are deemed to have been employed in their technical sense. Nevertheless, it is the practice of the courts, if a deed can not have the legal effect contemplated by the parties, to sustain it wherever possible on some other theory which will render substantial justice to the parties. 3. Wills should be liberally construed. A testator is not held to the technical signification of the words employed by him, but is supposed to use language in a popular sense. Thus, in the case before put of a conveyance of lands to "B and his children," if the instrument creating the estate had been a will instead of a deed, it would have taken effect according to the intention of the parties, the technical word "heirs" not being essential to create a fee simple in a will. 4. The construction of a statute is close or extensive according to the nature and object of the act in question. Penal statutes, statutes in derogation of the common law, statutes affecting private rights, are to be strictly construed. On the other hand, statutes to prevent fraud are interpreted liberally in order to relieve the injured party from the consequences of the fraud. It is a cardinal rule of interpretation that a statute shall in general be construed to operate as a rule for the future, and thus not have a retrospective operation. The rule is particularly strong when the retrospective operation would destroy vested rights. In that case the words giving a retrospective operation to the act must be extremely clear. On the other hand, if the words are used to confirm existing rights defective in form or to add to the means of enforcing existing obligations, a retrospective effect will readily be allowed. In the U. S., if the words are plainly retrospective and affect vested interests, another question may arise. They may be repugnant to some provision of the U. S. or State constitution, and for that reason be inoperative. In the interpretation of a statute it is often essential for the court to know the circumstances existing at the time of its enactment, or, in other words, to become familiar with contemporary history, to understand existing defects in the law, and to ascertain what evils the legislature designed to remedy. This rule is well illustrated by the interpretation of the recent suffrage law in England, where the question was whether the word "man" as used in the act included "woman," so as to give her the right to vote. The court, in deciding the case, had much recourse to the general history of the right of suffrage in England as tending to show the legislative intent. The words in a statute, though of a general character, must be confined in their application to the defects to be remedied. One branch of this rule is referred to by law-writers in the technical expression that regard must be paid to the "old law, the mischief, and the remedy." A single illustration may be useful. Suppose that a former law permits the bishop of an established church to lease church-lands for any length of time and any rent that he may see fit. The "mischief" of this rule may be that he may lease them for a very long term and at a low rent, and thus *impoverish his successors* in the bishopric, whose income may be reduced to a minimum. A statute is passed preventing a bishop from making a lease for more than twenty-one years. After this a lease is made for the bishop's own life, which may, of course, exceed twenty-one years. This lease is not within the "mischief" of the statute, as it does not tend to "impoverish his successors." It is thus necessary in many instances to go beyond the letter of the statute and to discern its true intent and spirit.

Although the general and special rules above set forth are by no means exhaustive, they will serve to indicate the scope of the legal science of interpretation. It may be proper to add that the rules of this science are the same both in courts of equity and of law. While the equity tribunals exercise the special power of correcting mistakes in written instruments, they are nevertheless, when engaged in the humbler task of interpreting and construing an instrument, bound by the same rules as courts of law. The only comprehensive treatise on the subject of this article is Lieber's *Legal and Political Hermeneutics.* See, also, Story and Wharton, *Contracts*; Jones, *Construction of Commercial and Trade Contracts*; Elphinstone, *Interpretation of Deeds*; Hawkins and Wigram, *Wills*; and Dwarris, Sedgwick, and Wilberforce, *Statute Law.*

GEORGE W. KIRCHWEY.

Interstate Commerce (in the U. S.): commercial intercourse and dealings between persons resident in different States of the Union. Power "to regulate commerce . . . among the several States" is vested in Congress by the Constitution (Art. I., sec. 8, ch. 3). The word "commerce" as

here used is interpreted by the Federal courts in its widest sense, so as to include not merely traffic but commercial intercourse of any kind whatever; and it is held that the power to regulate commerce of necessity includes the power to regulate the means by which it is carried on, so that the scope of the great authority given to Congress by this clause enlarges with the development of the industries of the country and of the means of communication. (*Gibbons* vs. *Ogden*, 9 Whaton 1861.) The effect of this provision is to prohibit legislation in any State discriminating by taxation or otherwise against residents of other States, or against business carried on by them in the State, or imposing directly or indirectly a tax upon interstate commerce or passenger traffic even without discrimination (as by the imposition of a license fee, or a tax on receipts); or in any way interfering with it, except by laws passed in the exercise of its police power, to protect life, limb, health, and property of its citizens, or by laws affecting interstate commerce only incidentally, as those regulating highways; or by inspection laws for regulating or restricting the sale of goods injurious to the health or morals of its people, or by those imposing a tax upon persons or employments and not in effect regulating interstate commerce; or those imposing taxes upon all property in the State. *Robbins* vs. *Shelby Taxing District*, 120 U. S. 489.

The best known of the acts passed under the clause referred to above is that which is specifically known as THE INTERSTATE COMMERCE ACT, which became law on Feb. 4, 1887, and was intended to regulate interstate transportation. It prohibits (1) discriminations or arbitrary differences in favor of one shipper against another; (2) free passes and other discriminations in passenger rates; and (3) pools or combinations for the division of traffic. It also provides for the administration of the act by a commission of five members, to whose discretion it intrusted a somewhat vague provision with regard to relative rates for long and short distances, known generally as the "short-haul clause," and it contains a variety of other less important provisions with regard to the posting of rates, publicity of accounts, etc.

When the framers of the Constitution invested Congress with this power to regulate commerce between the States, they had no idea of the use which would be made of that right a hundred years later. They intended it as a check upon the arbitrary power of the State Legislatures, rather than upon private corporations or transportation agencies. They feared that the States might impose customs duties upon one another's products, and intended to prevent this result. They had no fear that private corporations doing business in several States would attain to such a power that the common-law and State statutes could not adequately control them. Interstate commerce, in the modern sense, did not then exist, as almost all business was local, and the expense of transportation was so great that few producers could sell any considerable quantities of their product outside of the limits of their own State, except in seaboard cities.

This condition of things was somewhat changed by the development of internal water routes, whether natural or artificial; but it was not until railways had become highly organized that interstate commerce presented difficult problems for the legislator. The rates on canals and rivers could be regulated by competition. Railway rates, however, were almost necessarily controlled by monopoly to a greater or less extent; and, as railway transportation passed beyond the limits of State lines, the need of some more general means of regulation became every day clearer. It was no longer possible to apply the common-law principle of judging of the reasonableness of each rate by itself. The question of relative rates became one of supreme importance. So long as many of the rates were wholly outside of the control of State authorities, State legislation was powerless to prevent unfair relative rates, or discriminations, as they are technically called. Each improvement in transportation increased the possibility of developing long distance traffic, and lessened the effectiveness of State control. Inquiries made in the year 1885 showed that nearly all the improved railways of the country derived the greater part of their revenue from interstate traffic, and that a system which should regulate less than one-third of the traffic in question would be of little or no use. It was realized also (as was said in the report of the special select committee of the U. S. Senate) that the public interest demanded regulation of the business of transportation (*a*) because, in the absence of such regulation, the carrier is practically and actually the sole and final arbiter upon all disputed questions that arise between shipper and carrier as to whether rates are reasonable, or unjust discrimination has been practiced; and (*b*) because of admitted abuses in its management and of acknowledged discriminations between persons and places in its practical operation. These evils could be reached and remedied only through the exercise of the powers granted by the Constitution to Congress, because the operations of the transportation systems of the country are, for the most part, beyond the jurisdiction of the States, and also because the business of transportation is essentially of a nature which requires that uniform system and method of regulation which the national authority alone can prescribe.

The first attempts to secure congressional regulations of interstate commerce date from the year 1873, previous to which time the Granger movement had secured the enactment of severe State laws throughout the Northwest; but it was not until the year 1878 that a series of bills was introduced in the House of Representatives by Judge Reagan, of Texas, which culminated in the Interstate Commerce Act of 1887. The original bill was an extremely crude one, it being intended to prevent any railway company from charging more per mile for a short distance than for a longer one. This was obviously unfair, because it often happens that the cost of mere transportation is the smallest part of railway expenses, so that the cost of shipping goods 200 miles is not very much greater than that for 100. For this and other reasons the bill was defeated, but the matter was kept constantly before the attention of Congress in successive sessions (1884–86), until two distinct schemes of railway regulation had been developed and placed before Congress. They were alike in the endeavor to prohibit special rates to individual shippers, whereby the influential or unscrupulous business man gained an advantage over his rivals. But on three points the advocates of the two schemes differed. The extremists (mainly Western men) wished to reduce railway tariffs to an equal mileage basis (as far as might be practicable), to prohibit absolutely all pools and similar combinations of railways, and to leave the administration of the act to the U. S. courts, claiming that they formed an adequate and effective means for enforcing the act and preventing any injustice which might arise under its provisions. The moderate men (mainly Eastern men), on the other hand, wished to regulate the question of rates by general provisions for control by the courts, to place its administration in the hands of a special commission, and were opposed to prohibiting pools, claiming that they were necessary to the efficient handling of freight and the maintenance of equality of rates. A compromise was adopted in 1887, when the present act was passed, in which the moderate men sacrificed their views on the pooling question, and the extremists withdrew their opposition to a commission. As to the relative rates for short and long distances, a compromise was effected by the adoption of a provision of which no man living could tell the meaning.

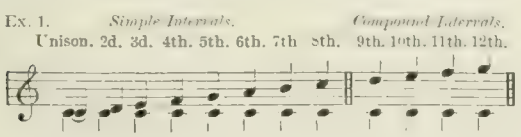
Little as it was expected at the time, the vagueness in the law concerning rates for long and short distances proved the most important feature of the whole act; for it laid the foundation for a kind of authority on the part of the Interstate Commerce Commission which no one had contemplated. No sooner did the act go into effect than the Interstate Commerce Commission was besieged by applications to suspend the objectionable provision. The commissioners declined to suspend it for a longer period than sixty days, but proceeded to interpret it in such a way as to indicate to the railway companies under what conditions the prohibition of that section would probably apply, and under what conditions it would not apply. They laid special stress on the fact that the prohibition of a greater aggregate charge for a part of a route than for the whole was modified by the phrase "under substantially similar circumstances and conditions." If the through traffic of a railway was subject to competition of carriers outside of the control of the act, such as a Canadian road or by a water route, the commission held that the circumstances and conditions of the through traffic of that railway were not substantially similar to those of its local traffic, and that it would therefore be unfair to subject the railways to injurious restrictions which would do no good to the local shipper. This opinion of the commission, given in June, 1887, in what is known as the "Louisville and Nashville decision," was at once so ably presented and so sound in its practical consequences that the railways and the public all but universally acquiesced in it. This acquiescence laid the foundation for similar decisions

on the part of the commission with regard to the meaning of other sections of the act, and there was thus created a body of transportation law which was at once new and sound. The growth of this law is all the more interesting from the fact that the commission had no technical authority to make any official interpretations of this kind, and that its power to compel the production of evidence was slight and its power to enforce its decrees almost *nil*.

This jurisdiction of the commission was, for the first year of its existence, at any rate, wisely and conservatively exercised, but subsequently it was difficult to meet the increasing complexity of the problems, and the commission attempted, in the opinion of many impartial judges, to carry out wider schemes of regulation than were practicable at the time. Under these circumstances many of the decisions of the commission were evaded by the railways, and one or two were reversed by the Federal courts. Other causes added greatly to the difficulty of the situation. The Legislatures of several States, stimulated by the example of Congress, passed laws far more stringent than the Interstate Commerce Act itself; and the resistance of the railways to these provisions to some extent increased the difficulty of enforcing the Interstate Commerce Act. Another and often more serious difficulty was the reckless competition arising from the fact that owing to excessive building of new lines of railways, etc., in the year 1887 there was not enough business for all. The clause of the bill to which most exception has been taken is that prohibiting pools. (See MONOPOLIES and TRANSPORTATION.) The change in public sentiment has permitted what is virtually an evasion of the prohibition of pools on the part of almost all the railways in the U. S., while the very moderate railway building since 1890 has enabled the business of the country to grow up to its transportation facilities. For an account of similar schemes of regulation in other countries, see TRANSPORTATION. See also RAILWAYS and COMMERCE.

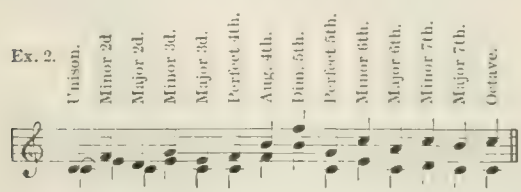
A. T. HADLEY.

Interval [from Lat. *interval'lum*, space between (walls); *inter*, between + *vallus*, wall, *vallum*, fortifications]: in music, the distance or difference between any two sounds in respect to depth or height, or of any two notes as measured on the degrees of the diatonic scale, both extremes being counted. Thus from A to B above is a second; from A to C, a third; from A to D, a fourth, and so on. Intervals are either *simple* or *compound*, the former being those which are comprised within the limits of an octave, as the second, third, fourth, fifth, sixth, seventh, and eighth; and the latter, those which extend more or less into the region of a second octave, as the ninth, tenth, eleventh, etc., as in Ex. 1:



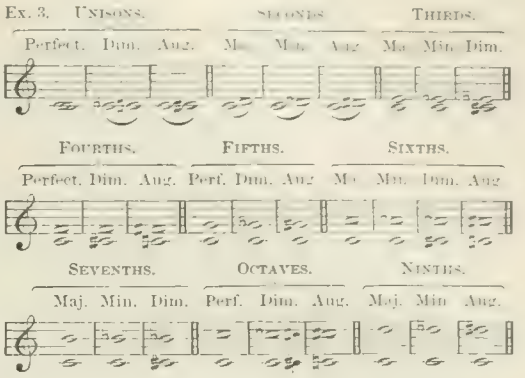
In another sense the term "simple" interval is applied to a *semitone*, because this interval is practically indivisible in the modern system of music, and *whole* tones, as thirds, fourths, etc., are said to be "compound," because they comprise two or more semitones. Of semitones also there are two denominations—viz., the *diatonic* and the *chromatic*, called also *major* and *minor*. When the semitone includes an advance from one degree of the scale to another (as from C to D♭ or C♯ to D), it is diatonic, but when the degree on the scale is unaltered (as from C to C♯ or B♭ to B♮), it is chromatic.

In the classification of intervals they are regarded as *perfect*, *imperfect*, *diminished*, or *augmented*; to which some add the *double* (or *extreme*) *diminished*. In Ex. 2 the nature of most of these distinctions will be perceived by reckoning the number of tones or semitones comprised in the various thirds, fourths, fifths, etc.



Of each of these intervals, except the augmented fourth and the diminished fifth, the scale furnishes several instances. Thus, e. g., the perfect fifth is made not only by C—G, but also by D—A, E—B, F—C, and in two other cases.

A more full and accurate view of intervals, as now recognized by all composers and schools of music, is given in Ex. 3 (in which abbreviations are used for the terms major, minor, diminished, and augmented):



Intervals larger than these, as tenths, elevenths, etc., are (except in a few peculiar cases) regarded and treated as merely octaves of the third, fourth, etc. The *unison*, though not strictly an interval, being merely the concurrence of two similar sounds, or of two notes on the same grade of the scale, is nevertheless treated in harmony as an interval, because it frequently happens that two parts or voices meet on the same degree, and such cases are subject to certain rules regulating their progression. By a close analysis of Ex. 3 it will be found that several of the intervals are identical in the number of tones and semitones which they comprise, though named and treated as of different magnitude. Thus the augmented *second* and the minor *third*, or the augmented *fourth* and the diminished *fifth*, are struck upon the same keys on the organ or pianoforte, and appear thus to be identical. But they are not so in reality, because they belong to the scales of different keys, and take their designations from such scales. For the same reason each particular finger-key on the organ, etc., is used for several distinct notes, according as the music performed is in one key or another. Thus the finger key for F is used also for E sharp, and a D key may become C double-sharp or E double-flat. A perfect or major interval becomes *augmented* by the *addition* of a semitone, and a perfect or minor interval becomes *diminished* when *reduced* one semitone.

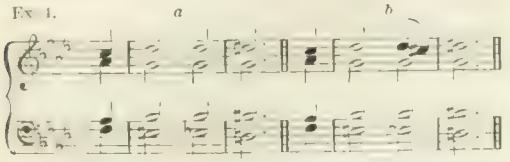
The next distinction of intervals is into *consonant* and *dissonant*. The ear immediately recognizes a difference between one interval and another in regard to their connection and relation. Some are pleasing, satisfactory, and conclusive in themselves; while others, though equally pleasing, are so indefinite as to create a kind of yearning for something further, or rather for a line of progression in a particular direction, forming what is called their *resolution*. Those intervals, then, which are more or less conclusive or independent are said to be *consonances*, while the others are known as *dissonances*. There is also a distinction of consonances themselves into *perfect* and *imperfect*, as already noticed. The former are the perfect unison, fourth, fifth, and octave, which can not admit of change without converting them into dissonances. The latter, or imperfect, are the minor and major third and the major and minor sixth. Among consonances also are the fifth in the diminished triad, and its inversions. The dissonances are the remaining intervals—viz., major and minor seconds, major and minor sevenths, ninths, elevenths, and all diminished and augmented intervals. By some theorists, fourths of all kinds are ranked among the dissonances; by others the *perfect* fourth is treated as a perfect consonance. See HARMONY.

The fundamental *intervals* are four in number—viz., the unison, fifth, third, and seventh. When inverted, their corresponding intervals will be the octave, fourth, sixth, and second.

Enharmonic intervals, or those which are less than a semitone, are not practically in use, but theoretically, and in musical composition the distinction is still observed, as, e. g., in cases of enharmonic changes, where one and the same chord (or component of a chord) is taken in two different relations, thereby serving to effect a transition into some

unexpected key. Thus in Ex. 4 the seventh on the dominant at *a* is assumed to be the augmented *sixth* on E♭ (which it exactly resembles in sound), and the harmony is then suddenly thrown into the key of G major. In this case the D♭ at *a* is supposed, while sounding, to change into C♯, as explained at *b*:

Ex. 4. *a* *b*



Revised by Dudley Buck.

Intestacy: See Administration and Executor.

Intestine [from adj., *intestine*, internal, from Lat., *intes'tinus*, internal, cf. *inter*, between, and *in'tus*, within]: that portion of the alimentary canal which extends from the stomach to the anus. It consists of two distinct portions, the small and the large intestine. The former passes from the pyloric orifice of the stomach to the ileo-cæcal fold. The intestine consists of three layers: (1) an outer, serous layer, continuous with the peritoneum by means of the mesentery, a fold of serous membrane which connects the bowel to the spinal column; (2) a muscular coat of pale, non-striated, involuntary muscle-fiber, whose contractions give the small intestine a peculiar movement called "vermicular motion"; (3) an inner or mucous coat, having (*a*) folds called *valvulæ conniventes*; (*b*) the glands called glands of Brunner; (*c*) the follicles of Lieberkühn; (*d*) the solitary glands; (*e*) the agminated glands called "Peyer's patches"; and (*f*) the intestinal villi. The small intestine is divided into the duodenum, the jejunum, and the ileum; the large, into the cæcum, the colon, and the rectum. The intestinal tract is generally much larger in vegetable-eating than in flesh-eating animals. It measures 150 feet in a full-grown ox and is but three times the length of the body in the lion, and six times in man. The total length in man is not far from 30 feet, three-fifths of which length pertains to the small intestines. The more important of the above-mentioned divisions are described under their alphabetical heads. See Histology. Revised by William Pepper.

Intibucat, ĕen-tĕe-boo'kăat, or **Intibuca**: a department of Honduras, bounded N. by Santa Barbara and Comayagua, E. by La Paz, S. by Salvador, and W. by Gracias; area less than 700 sq. miles. The surface is high and broken by mountains inclosing fertile valleys. Coffee, cacao, and tobacco are the principal products. Pop. (1889) 17,942. Intibucat or La Esberanza, the capital, is a small town on a plain 5,200 feet above the sea. H. H. S.

Intonation: a musical term denoting, in a general sense, the utterance or delivery of any series of sounds formed on the scale. This, when correct in time, accurate in pitch, and refined in taste and expression, is said to be *pure*. The contrary, but more especially a failure in correctness of pitch, is called *false* intonation. In church music the name of "intonation" is given to the two or more notes leading up to the dominant or reciting note of a chant or melody, usually rendered by the priest or precentor, or else by one or more leading voices. Revised by W. S. Perry.

Intoxication [from Mediæv. Lat., *intoxica'tio*, poisoning, deriv. of Lat., *intoxica're*, poison; *in*, into + *toxicum*, poison = Gr., *τοξικόν*, arrow-poison, deriv. of *τόξον*, bow]: the injurious effect of poison on the animal economy. The term is most commonly used to designate the condition of a person who has been brought so much under the influence of alcohol by successive imbibitions during a short space of time as to be unable to control his actions intelligently and sensibly; but it should not be confined exclusively to poisoning by alcohol. A number of other substances, such as ether, chloroform, and drugs like opium, belladonna, hyoscyamus, stramonium, and cannabis Indica, will produce intoxication very much like that of alcohol when taken in sufficient quantity, and the term "intoxication" is now used by physicians to signify the state produced by almost anything capable of producing serious disturbance of the animal economy.

Alcoholic intoxication may be divided into the acute, subacute, and chronic varieties. Acute intoxication is rarely seen, even by the physician. It is produced by drinking a large quantity of some spirituous liquor in a very short space of time. This is followed soon afterward by sudden coma, which may be complete or incomplete. We have present here the symptoms of coma—viz., stertorous respiration, deviation of pupils, frothing at the mouth, etc. Unless assistance speedily arrives, these symptoms generally terminate in death in from half an hour to five or six hours. Every endeavor should be made to arouse the patient from his lethargic condition. An active emetic, such as sulphate of zinc, may be administered, or, better still, the stomach-pump should be used to evacuate the stomach. Ammonia, well diluted, may be given as an antidote, and if the patient be able to swallow he should take large draughts of tea. The subacute form is often seen. It is the ordinary form of intoxication indulged in by persons either voluntarily, for the pleasant and exhilarating effect on the senses during one of its stages, or involuntarily, in consequence of a depraved appetite growing out of the former method. Some men and women are seldom or never in a sober condition; others imbibe a little at all times, and get intoxicated whenever they are under undue excitement or depression; and still others go on a "spree" at more or less regular intervals, and in the mean time totally abstain from intoxicants. Alcohol, taken to a degree to produce subacute intoxication, excites the vascular and nervous systems; all the secretions are at first arrested, and the temperature of the body is lowered, and not, as has been generally believed, increased. If taken by a person who is not accustomed to it, it occasions derangement of the stomach, and nausea and vomiting may be the result. The principal effect, however, is noticeable upon the nervous system. There is a general feeling of increased physical power, and the mental faculties are exhilarated. The patient at first talks rationally, but afterward at times becomes loquacious and silly, at others absurdly dignified. Incoherence follows upon this, and then delirium and sopor. The effect on the cerebellum is shown by the impairment of the power of co-ordination, causing at first a staggering gait, and ending in complete loss of muscular power. When this stage occurs the individual generally falls into a deep sleep, from which it is almost impossible to waken him. When consciousness is restored there is a feeling of depression, which the patient may seek to relieve by a renewed resort to stimulants. Little can be said of the treatment of this variety of intoxication because it is usually entered upon deliberately and passes off without serious consequences. If it should become important to bring to a speedy end this state of moderate intoxication, this may be accomplished by means of several teaspoonful doses of aromatic spirits of ammonia in water, or a half tumblerful of plain vinegar. In some cases an emetic may be used.

The habit of using alcoholic drinks to the point of intoxication may lead to a form of disease known as delirium tremens, which is the expression of a profound impoverishment of the vitality of the nervous system, or to *mania-à-potû*, which is a sort of explosive manifestation of cerebration. Besides this, the habit called "drinking" may lead to serious functional or organic diseases of the brain, heart, liver, kidneys, and stomach, or to such impairment of their health as to make them especially liable to other forms of disease. It is well known that the habit often affects the will and the moral sense so that its victims exhibit a weakness or a tendency to criminality which is directly traceable to their excesses in alcohol. Furthermore, modern investigations confirm the belief that a proneness to yield to the habit of intemperance or drunkenness is handed down from parents to children, and thus the effects of habitual intoxication may be transmitted to one's posterity.

The extent of the habit of drinking can not be accurately stated, but Prof. Villard, of the Hôtel-Dieu in Marseilles, in a volume of lectures on alcoholism (*Leçons sur l'alcoolisme*), estimates the deaths from alcoholism each year, in the countries named, as follows:

France from	5,000 to 6,000
United States	30,000
Germany	40,000
United Kingdom	60,000
Russia	160,000
Total	295,000 to 296,000

These figures are probably only approximately correct, but they indicate how widespread are the ravages of intoxication in civilized countries.

Revised by Charles W. Dulles.

Intoxication (in law): the legal effect of one's intoxication will vary according as it attaches to his contract, to his tort, or to his crime.

Contracts.—According to Lord Coke, a man's "drunkenness doth not derogate from his act, as well touching his life, lands, and goods, as anything that concerns him." If this view was ever supported by judicial decisions it has long been overruled. In fact, the first reaction from this extraordinary doctrine carried the courts to the conclusion that contracts entered into by one who was so drunk as not to know what he was about were absolutely void—not even susceptible of ratification after he became sober. This opinion in turn has been modified, and the prevailing doctrine now is that a party may relieve himself from a contract by showing that he entered into it while intoxicated, provided that such intoxication was brought about by the other party, or that an undue advantage was taken of his condition. The contract is voidable, and not void. Hence commercial paper executed in a state of extreme intoxication should be enforceable against him by a *bona fide* holder; and there is considerable modern authority for this view. Any degree of drunkenness will not relieve its victim from a QUASI CONTRACT (*q. v.*). In some of the U. S. statutes provide for the appointment of committees for habitual drunkards, and absolutely incapacitate the latter for contracting.

Torts.—It is sometimes said that while drunkenness is not a general defense in actions on torts, it may be available where the wrong is of a particular sort, requiring a special intent; but it is difficult to find any judicial authority for the proposition. On the other hand, it has been expressly decided that intoxication is no defense in a case of defamation. It has also been held that drunkenness may be treated by the jury as aggravating an assault and battery, and thus subject the defendant to the payment of heavier damages than if he had been sober, on the ground that the person assaulted might be more terrified by the attack of an intoxicated than of a sober assailant. (*Reese* vs. *Barbee*, 61 Miss. 181.) If a person wilfully or negligently injures another in person or property, it will be no defense in a civil suit that he was intoxicated at the time, nor even that he was made drunk by liquor sold to him by the plaintiff. One's drunkenness may prevent his recovery for injuries, because it has contributed to produce them. Whether it has so contributed is a question of fact in each case. It is not negligence as a matter of law for an intoxicated person to be in a dangerous position; and if another knows of his intoxication and consequent inability to act with care, the other is bound to exercise precautions that would not be incumbent on him were he dealing with a sober man.

Crimes.—It is the general rule that voluntary drunkenness is no excuse for the commission of a crime. According to Lord Coke, "it doth aggravate the offense," but this view is not now maintained. Voluntary drunkenness, being itself a wrong, satisfies the requirement of a general criminal intent; but if a specific intent is an essential ingredient of a particular crime—as the intent to commit a felony in the case of burglary—the intoxication of the criminal may be shown to disprove such intent. It is to be remembered, however, that the conduct of one who commits a crime without provocation, although in a frenzy of drunkenness, is subject to the same construction and to the same legal inferences upon the question of intent, even as affecting the grade of his crime, as are applicable to a person entirely sober. (*People* vs. *Flanigan*, 86 N. Y. 554). If a legal provocation has been given, intoxication may be considered in determining whether the criminal act was induced by such provocation or resulted from the malice of the prisoner. Where drunkenness, though voluntary, has resulted in *delirium tremens*, its victim is deemed insane, and his responsibility is determined by the rules which are stated in the article on INSANITY. Intoxication produced without one's consent or fault exonerates him from criminal responsibility for acts which it induces. In such cases neither the general nor the specific criminal intention exists.

FRANCIS M. BURDICK.

Intrados: See ARCH.

Intrenched Camps: originally, intrenched areas connected with and under protection of fortified places; later, large intrenched areas containing in their center a fortified nucleus. An intrenched position without nucleus, but defended by permanent works, as that of Lintz, takes likewise the designation of an "intrenched camp." Camps which, though intrenched, are to be occupied merely for the period of a campaign, or which serve as refuge for a few days only to an inferior army, are styled "lines" or "temporary positions." These designations apply to the camp of Bunzelwitz and the "lines" of Torres Vedras, constructed by order of Frederick II. and of Wellington. From the earliest times armies have enveloped by intrenchments positions which they defend or which they temporarily occupy. Such camps or such fortified positions, of which the Romans made frequent and remarkable use, do not, however, constitute what are known at the present day as *intrenched camps.*

Permanent intrenched camps, destined to serve as pivots of operations or as places of refuge to an army operating in the field, are of modern creation. Not even the germ is to be found in the memoir of Vauban (1696) upon *Les camps retranchés.* In this memoir the illustrious author advocates small provisional camps for 10,000 or 12,000 men, connected with and auxiliary to fortresses. More modern writers, as Montalembert d'Arçon, Bousmard, Carnot, Noizet de Saint-Paul, Dufour, etc., recognized only in intrenched camps an agency for prolonging the defense of places, and of giving to small fortresses properties inherent to those of the first order. Modern strategy has singularly augmented the importance of intrenched camps. In the time of Vauban what were so styled were merely excrescences, so to speak (*annexes*), of fortresses, which consequently played the principal part. "They must," said Feuquières, "be protected by the place which they protect, and their flanks must be secured by the artillery of the place and outworks, and under the fire of musketry from the 'covered way.'" Such is exemplified in the typical plan of Vauban in his *Traité de la défense des places.* (See Fig. 1.) The camps of this epoch served to augment the defensive and offensive power of fortresses; and they were, in the language of Vauban, "the surest expedient for hindering the siege of a place."

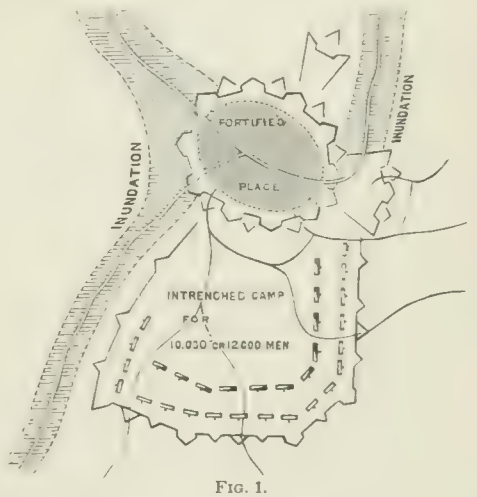


FIG. 1.

Modern intrenched camps, on the other hand, have for their sole object the augmentation of the defensive and offensive powers of armies in the field; and in them the fortress, instead of being the principal, become only an accessory of so little importance even that, as at Linz, it is sometimes suppressed, while distinguished engineers have proposed vast intrenched camps without a fortified nucleus. It should be remarked, however, that Vauban took a larger view of the question, and that in connection with the defense of Paris he laid down principles which have since been carried into effect in construction of intrenched camps destined to serve as pivots of manœuvers or places of refuge to entire armies. These principles are set forth in his remarkable memoir entitled *De l'importance dont Paris est à la France*, in which are found the fundamental ideas which in 1840 received the sanction of the French legislature in its ordinances concerning the then initiated fortifications of Paris. Vauban counted, however, on having for the defense of that capital an army of only 30,000 regular troops and 10,000 indifferently good auxiliaries raised within the walls, estimating that this force would suffice to render Paris (provisioned for one year) impregnable even though besieged by an army of 250,000 men. But in 1840 it was assumed that the capital of France would have, in such an emergency, a much larger garrison; hence the substitution

for the external enceinte, proposed by Vauban, of a girdle of large forts with free intervals of 1,500 to 2,500 meters.

The first engineer to set forth the properties of camps intrenched by isolated works with intervals was Gen. Rogniat in his work *Considérations sur l'art de la guerre*, published in 1816. "Intrenched camps should be capable," he says, "of containing, at need, 100,000 men, while they demand but few troops for mere defense; they should allow for the army that takes momentary refuge in them perfect liberty of action and free development when it desires to resume the offensive. These conditions are best fulfilled by establishing four forts about each place (fortress), forming an immense square of which the place occupies the center." "These forts, wholly inclosed, should be established on the most advantageous summits or commanding points, at distances of about 1,200 to 1,500 *toises** from the works of the place, and of 2,000 to 3,000 *toises* from each other." "The interval between one fort and the next would form a position of battle for an army of from 50,000 to 100,000 men which may be considered impregnable." "The forts armed with heavy cannon would give perfect support to the wings. As to the center, where, on account of their distance, the aid of the forts would be little felt, it may be strengthened by field-works thrown up for the emergency and supported by the guns of the place. Thus these four forts would constitute a vast intrenched camp presenting four different positions of battle, in which to confront a hostile army coming from whichever quarter." The ruling idea of this project is the creation of four fields (or positions) for battle around fortresses, having their wings sustained by forts and their front by field-works. That the idea should be realized, it would be necessary that the four positions constituting the intrenched camp should be as they are affirmed to be—impregnable; which is far from being the case. Small forts 2,000 to 3,000 *toises* apart and field-works along the interval would doubtless furnish efficacious support to the center and wings of the defensive army, without, however, rendering the position inexpugnable; especially if the army had fallen back after a reverse, disorganized and shaken in *morale*. The designers of the fortifications of Paris of 1840 did not draw their inspiration from the ideas of Rogniat; they preferred rather to improve upon the project of Vauban by substituting a line of forts for the external enceinte of that project. Better advised than the author of *Considérations sur l'art de la guerre*, they have spaced the forts 1,800 and 2,500 meters apart, instead of 2,000 and 3,000 *toises*, giving at the same time to the detached works more development and defensive strength.

The only intrenched camps established before the publication of Rogniat, and realizing in some degree the combinations now received as essential for the fortification of great strategic pivots, are that of Ulm, which enabled Kray with 80,000 men to arrest for five weeks the advance of Moreau (with an army equal in numbers, but greatly superior in the *morale* of success) upon the Danube; and that of Genoa,† in which Masséna was able with 15,000 men not only to hold his own for two months against quadruple forces, but to harass them incessantly, to pursue them to considerable distances, killing or making prisoners in his different sorties 18,000 Austrians. These camps, more especially those of Genoa, approximated more to modern intrenched camps than that of Bunzelwitz constructed by Frederick II. upon an eminence 2 miles distant from the fortress of Schweidnitz; more also than that of Torres Vedras, constructed by Wellington from the Tagus to the ocean, covering Lisbon.

The camp of Bunzelwitz was composed of a line of temporary works skirting the crest of the plateau on which the Prussian army had taken position, making a rectangle of about 3,000 meters base and 5,000 meters depth. Large intervals were reserved in this line to facilitate the exit and *entrée* of the troops. In advance of all, and upon commanding points, there were lunettes and redoubts for taking in reverse all practicable approaches. This camp, defended by 460 guns, enabled Frederick with 60,000 men to arrest the march of 130,000 Austrians, and finally to compel their retreat (1761). It was, however, rather a provisional camp, like those of the Romans, than a great strategic pivot in the modern acceptation.

The lines of Torres Vedras approximated more nearly this last type, not only by the disposition of their works, but by the part they played. They were composed of two lines of redoubts. The first had a length of 9½ leagues*, and the second 12 km. in rear, a length of 8 leagues. At 25 km. in rear of the second was another intrenchment enveloping the Fort St. Julien, intended to cover, if necessary, the re-embarkation of the troops. When Masséna arrived before these lines in 1810 they comprised 126 closed works, defended by 29,751 men and 247 cannon. In 1812, when entirely finished, there were 152 forts, armed with 537 cannon, and defended by 34,125 men. The works of Fort St. Julien had an armament of 94 guns and a garrison of 5,350 men.

It has been deemed necessary to give a sketch of these camps all prior in date to the project of Gen. Rogniat, to show that the last is far from constituting a progressive step, and that, though its author may have been instrumental in bringing to notice the tactical properties of intrenched camps, it is the essay of Vauban on the defense of Paris which more than any other writing has established the principles applied to the construction of modern intrenched camps. The triumph of these principles was the result of long and arduous discussions, in which the most distinguished engineers of Europe took part, and by which the arguments adduced in favor of a system of which the works should consist of a single enceinte were demonstrated to be untenable. At the present day when the armies of occupation, instead of consisting of 50,000, as Vauban contemplated, reach three or four times that number, and when mortars of 2,500 or 3,000 meters' range are replaced by rifled cannon of 8,000 meters' range, the last-named system is totally out of the question, owing to the enormous development required for the enceinte. It has become indispensable to constitute intrenched camps of detached works established at distances sufficiently great to shelter the place which they environ from bombardment.

"Detached works with large intervals can alone prevent blockade, prevent offensive returns, and oblige the enemy to abandon the position." On this there is no longer question, but not so as to other conditions to be fulfilled. The questions in controversy are: 1. Ought intrenched camps to be constituted by a line of forts only, or by a line of forts and an enceinte? 2. What should be the character of the enceinte? 3. What that of the intrenched camp? We will examine in succession these questions, which subdivide into several others.

I. Concerning the first. Since the time of Vauban to the present the most distinguished generals and engineers have, with rare exceptions, pronounced in favor of the combination of a line of detached forts and a continuous enceinte. Nevertheless, during the Franco-German war the investments of Metz and Paris gave rise to indications of opinion, sufficiently marked, in favor of the suppression of the enceinte. Therefore the question must be discussed from the standpoint of governing principles. When there is only a line of forts, or when there is only an enceinte, the decisive battle will be waged (after the fall of one or two of the forts or after the assault of the enceinte) in the interior of the place, and always under unfavorable conditions for the defense. To avoid this, Vauban provided his grand enceinte with a fortified nucleus, which would allow the defensive army to deliver battle outside of the place upon ground well adapted to the action of the three arms. The great utility of enceintes was clearly exhibited in 1870 at Metz and at Paris. There is no doubt that if these two intrenched camps had been destitute of a fortified nucleus, the Germans, after the battle of Gravelotte and the combat of Châtillon, might have made themselves masters of the two cities immediately and forced the beaten armies to capitulate or to evacuate their positions. The intrenched camp of Linz was the only one which had not a fortified nucleus.

In the work published by the writer in 1863, *Études sur la défense des États*, etc., he suggested, in addition to arguments already furnished by Gen. Jomini and others, the following consideration, which alone would decide for the system of Paris in preference to that of Linz: "After a fatal disaster, such as those of Ulm, Jena, Leipzig, or Waterloo, it may happen that the defensive army falls back, precipitately and in disorder, on one of the places of refuge or on the fortified capital. In such a case an energetic pursuit may enable the victor to penetrate into the intrenched camp before the beaten army can offer effectual resistance. The wider the intervals between the forts, the greater this danger. A new battle must be accepted, therefore, in the rear of the defen-

* The French *toise* slightly exceeds 6 English feet.

† A chain of forts had been constructed around Genoa in 1747 to prevent the close investment of the place; thus was constituted the intrenched camp.

* The French league is about 2· English miles.

sive envelope, and as the defensive army must necessarily be, physically and morally, inferior to that of its enemy, it can not be expected that its advantages of position will counterpoise this double inferiority. Suffering another defeat, this time without place of refuge, it can not fail to become —men, material, everything—the prey of the victor. An intrenched camp without nucleus is only a line of defense returning into itself; now, every line once forced is irretrievably lost. Hence the Duke of Wellington took the precaution to construct behind his first line of Torres Vedras a second line, and in rear of this last the continuous intrenchments of St. Julien, destined to cover a forced re-embarkation."

In writing these lines it could not be foreseen that the disasters of the French army in 1870 would furnish such vivid illustration of the correctness of the ideas expressed. If Metz and Paris had been fortified only by a line of detached forts, the first of the places would not for two and a half months, the second for four months, have held at bay the victorious German armies. These armies, after Gravelotte and Châtillon, must have penetrated within the line of the forts, closely pursuing the defeated forces, and would have compelled them to lay down their arms, or to continue their retreat in abandoning to their fate the great dépôt and capital which these intrenched camps inclosed. The existence of an interior enceinte, armed with cannon and proof against assault, sufficed to render impossible this prompt solution.

II. The character which should be given to this enceinte or nucleus must be considered. This enceinte to an intrenched camp, destined to serve as a pivot of manœuver or place of refuge for the army of a great military power, will fulfill all necessary conditions if it be proof against assault (*attaque de vive force*). Such was the opinion of Vauban, of the generals Bernard, Schneider, Paixhans, and Rogniat—of Marshal Soult and of the various commissions which since 1818 have met in France for the study of the defense of Paris. The *actual enceinte* of that capital is on a greater scale (*a plus d'importance*) than necessary. This is due to the necessity of enlisting in support of the project of the government the advocates of an enceinte alone made strong enough for protracted defense. That government might have contented itself with a much simpler and (hence) less costly enceinte. The type which it adopted is not only heavy and costly (*onéreux*), but at the same time very defective. In fact, it presents high scarps exposed to plunging fires, flanks subject to ricochet, uncovered guns (*à ciel ouvert*), ramparts without traverses or sheltering masses (*abris*), and an interior (*corps de place*) destitute of casemates and bomb-proof quarters. As a mere enceinte of support it would have accomplished its purpose at half the expense if it had been composed of rectilineal fronts, each of about a kilometer in length, flanked by small caponieres, and secured against escalade by a detached scarp.

An exception to the principle just laid down for the constitution of the enceinte may be made in the case of intrenched camps destined as places of refuge for the troops, in field, of small states, and especially when these camps are near the frontiers. Surprised by a sudden invasion in the midst of preparations for hostilities, the sole army may be defeated or cut off from its pivot. In this case an enceinte is desirable which can be held by the usual garrison alone till the succor of friendly powers be received. Such are the reasons which induced the Belgian engineers to provide the intrenched camp at Antwerp with an enceinte capable of sustaining a siege.

III. The problem of constituting the perimeter of the intrenched camp has received different solutions. At times a system of small forts, reciprocally flanking and defending each other, has been advocated; at others, a system of forts each self-defensive. The towers of Linz, connected by a palisaded covered way, and the little forts of Gen. Paixhans, connected by epaulments, belong to the first system. The forts of Paris, of Verona, Cracow, and Antwerp belong to the second. The best intrenched camp being that which offers the greatest resistance to an assault preceded by a hot cannonade, the system of large forts, self-flanking, is preferable to that of little forts, reciprocally flanking. This last mode of flanking fails to give confidence to the defenders, because it is more distant, more uncertain, and sometimes wholly ineffectual, as at night and in time of fog or snow. The garrison of a little fort will never have a high *morale*, depending as it does on the ability and vigilance of the commanders of the neighboring forts, and being necessarily weak in its own numbers. For such and other reasons it is now conceded that intrenched camps should be constituted of a line of forts of sufficient magnitude to be self-defensive; but there is yet room to discuss—1, the dimensions of the forts, their lines, and their internal organization; 2, the intervals between them; 3, their distances from the enceinte.

A fort will possess its maximum value when, while occupying a favorable position, the neighboring forts cross their fires before its fronts of attack. The intervals of the forts must therefore be regulated by the effective range of artillery; this finds a limit in the difficulty of clearly distinguishing troops and works of attack at more than 3,000 meters. Hence the intervals from fort to fort will be taken at about 2,500 meters, in order to secure a thorough mutual protection; but frequently the nature of the site and the too great multiplication of works justifies a departure from this rule. In this case the following rule is obligatory: The forts ought not to be so far separated that the guns of the lateral fronts can not efficaciously sweep the intervals. Under this rule the forts may have about 5,000 meters' distance between their axes. In determining the dimensions of the forts and their internal organization it must suffice here to state in general terms that the greater the distance of a fort from its neighboring works and from the place (or nucleus), the greater the strength (or power of resistance) it should have. In virtue of this principle, to the fort of Mont Valérien—the most remote and the most isolated work of the intrenchments around Paris—has been given dimensions greatly exceeding those of the other forts. The distance from the forts to the enceinte must be sufficient to place the inclosed area of the enceinte out of reach of bombardment. Before Paris it proved that the long rifled gun of 15 cm. (6 inches) caliber of the German system has a range of 7,500 meters (8,250 yards), and later experimental firings have indicated that still greater ranges must be guarded against. Hence intrenched camps should have a depth of 7,000 meters (from enceinte to line of forts), by which there will be about 9,000 meters' distance between the enceinte and the enemy's batteries, which can not be established under favorable conditions nearer than 2,000 meters from the line of forts.*

So far as there may be choice, the more remote points for locations of forts should be preferred, to give more area and to allow of the troops being encamped out of range of shells; but this choice will be especially determined by the necessity of sweeping with fire all the ground in advance of the line to a distance of 2,500 or 3,000 meters. The more perfectly this external zone is exposed, the greater will be the difficulty of investment or of regular attacks (siege). Hence, sites in rear of ground furrowed by ravines or wooded should be avoided. To sweep portions of the ground which may escape the action of the guns of the forts, temporary batteries may be thrown up in the intervals, or permanent batteries, according as they may or may not be near enough to effectually protect them. The enormous depth now required for intrenched camps has this advantage—that it renders more difficult the investment; but it has also the disadvantage of increasing the number of the forts, and of exacting for their ordinary garrison too great a proportion of the defensive army.

To the end of diminishing the cost of construction, the armament, and the ordinary garrison, it has been proposed to substitute for the large permanent forts little forts destined to serve as *réduits* to large field (or provisional) forts, to be thrown up at the outbreak of war; but this solution, so seductive in appearance, is inadmissible, because the time is, in most cases, not allowed for their construction. The experience of erecting such works at Florisdorf, at Dresden, and at Paris in 1866 and 1870, proves that to construct works of the character required (*bonne fortification mixte*) six to nine weeks are necessary; now, modern wars run their course so rapidly that it would be rash to count upon being allowed such a period of time. Besides, temporary works are ill suited to resisting a regular attack (*pied à pied*), or even a prolonged cannonade. Their parapets of fresh earth offer less resistance to projectiles than those of permanent works, their gun-platforms have less stability, their batteries less command above the natural ground, their ditches less depth, their scarps and flanking batteries less resistance against plunging fires; finally, their traverses, covering masses, magazines, and barracks are weak against the action of rifled projectiles, so formidable for blindages

* Peculiar circumstances rendered it practicable to establish the batteries much nearer at Paris, but such will not present themselves in future.

and new masonry. Moreover, the weaker a work is in profile and internal organization, the greater number of troops and guns it needs for its defense. The resort to temporary works is therefore not an effectual means of diminishing the pecuniary expenditure for intrenched camps, nor the number of troops for their ordinary garrisons. It will, then, be proper to construct beforehand the forts of the intrenched camp, and to reserve for the moment of war only the batteries and intrenchments necessary to complete the defenses of the intervals. With whatever care the forts be constructed, there will always be some external area which their batteries will not see or will but imperfectly sweep. It will, hence, generally be necessary to throw up epaulments between the forts, not only for this reason, but also in order to divide the fire of the attacking batteries, which otherwise will be concentrated on the batteries of the forts, which they will promptly silence. The experience of the siege of Paris during the Franco-German war proved that it is a matter of great importance; it also proved that these low batteries, thrown up during the siege, the lines and internal organization of which are unknown to the enemy, are more difficult to destroy than the elevated batteries of the forts.

We now consider the principles which determine the disposition of the works, or, in other words, the form of intrenched camps.* The application of the foregoing statement of principles leads to the circular, or approximately circular, form of these camps. Such are the intrenched camps of Paris, Verona, Cracow, Metz, Portsmouth, and Antwerp, and those which the Germans have constructed since 1870. The writings published in France and England upon the defense of Paris and of London are all based on the same notions. The project of Commandant Ferron, who proposes to surround Paris with a girdle of 37 forts on a perimeter of 32 leagues; that of Gen. Tripier, who proposes for the same capital, with a tactical line of defense (a girdle of forts to protect from bombardment) and a strategical line of defense (a line of 150 km., or 30 leagues development), serving as base of operations to the defensive army when it moves outside of the intrenched camp (properly so called); that of Col. Jervois, for the defense of London (50 forts on a circumference of 4 leagues radius); that of Maj. Paliser, of 31 forts on an elliptic perimeter (of 20 and 10 leagues, major and minor axes respectively)—are all illustrations. The authors of these projects have removed the forts farther than mere security of the enceinte against bombardment absolutely demands. This is to be commended; where it concerns the defense of a great strategical pivot (the political or military capital of a nation), the capture of which marks the termination of national resistance, an excess of precautions can hardly be taken to retard the fall or to render the attack impracticable. The events of the Franco-German war proved that the principal, if not the only, danger to which intrenched camps are exposed is that of investment—an operation the difficulties of which are proportioned to the extent of the zone of investment. To defend an investing line successfully against the sorties of an energetic garrison requires, generally stated, 4 men to every meter of development. That of the German line before Paris had 83 km., and the numerical force of the investing army did not exceed 236,000 men, or $2\frac{8}{10}$ men per meter. At Metz the line of investment was about 50 km. in development, and the besieging army had a maximum effective strength of 200,000 men, or 4 men per meter. Doubtless increment of perimeter for the intrenched camp entails increased numbers of inactive troops (for garrisons), but these disadvantages are largely compensated by the obligation imposed on the enemy to increase the numerical strength of his army by 4,000 men for every additional kilometer of line of investment.

Admitting the great depth of intrenched camps as an imperious necessity, and accepting as a consequence the obligation of separating the forts by intervals of 4,000 to 5,000 meters, the question has occurred to us whether a better arrangement might not be made than to dispose the forts on a line enveloping the capital to be fortified. Such a line has the disadvantage of offering the enemy a large gap as soon as he has gained possession of one or more of the forts. To remedy that the writer proposed, as early as 1863,* to construct in rear of the forts transversal lines of defense, dividing the intrenched camp into several sectors. These lines were composed of a double epaulment, forming a kind of caponiere, the anterior extremity of which was covered by a fort, and the rear extremity was within range of small-arms of the enceinte. To render this line (which would sometimes be 3,000 or 4,000 meters long) defensible throughout (*pied à pied*), it could be interrupted at intervals by redoubts destined to serve as traverses to the double caponniere, and to flank the epaulments of which it is constructed. In 1863 it was not admissible to remove the forts more than 3,000 or 4,000 meters from the enceinte, but now, when double, triple, and even quadruple these distances are allowed, the palliative offered by these lines of double defense can no longer be entertained. For this reason the writer, in generalizing the idea he advanced in 1859—to defend London by means of an intrenched camp at Croydon, and three double *têtes-de-pont* on the Thames at Gravesend, Woolwich, and Kingston, proposed † to fortify great capitals by means of two or three intrenched camps, disposed as indicated by Fig. 2 (topographical features of the ground, which must necessarily influence the form and location of the camps, are not here considered). The three camps would be established with approximate symmetry at such a distance that between the interior forts and the place there would be a zone of 8,000 or 9,000 meters (extreme range of the cannons of the place) of width. The movable troops would be encamped or placed in cantonments in this zone, in rear of the camps, or preferably in their intervals. A triple railway and two or three paved roads would unite all these camps. By aid of such dispositions one of the three fractions of the defensive army could, in a single night, be re-enforced by the other two, even without recourse to the encircling railways.

The form of these camps, the number, location, and character of the forts, are: A. Each camp has four sides. The most important, facing the enemy, is called the exterior side; the opposite one, facing the place, the gorge; the two others, facing the intervals between the camps, lateral sides. B. The exterior side is longer than the others, and the forts which constitute it are the most important; the intervals are about 5,000 meters. If for local causes greater intervals be given, one or two permanent batteries, proof against assault, are to be interpolated. C. Besides these batteries, there are provided, in all the intervals of threatened attack, epaulments for siege and light guns, to be thrown up simultaneously with other preparations for immediate defense (*au moment de la mise en état de défense*). The use of low batteries is likewise recommended, established on each side of the forts, at the foot of the glacis of the lateral fronts in the prolongation of the gorge front. D. The forts of the gorge are arranged to serve as depots of provisions, arms, ammunition, and supplies of all kinds. On account of this destination, and so that there may be in each camp a zone exempt, by distance, from the fires of the attack, these forts are placed at more than cannon range from the line of the exterior forts. To these forts of the gorge are given simply that degree of resistance to exempt them from being carried by *coup de main*. They may be placed 7 to 8 km. apart. Let us assume that the capital city has a radius of 5 km., and the central zone 9 km. of depth. The circumference which defines the position of the gorges of the camps will have a development of about 84 km. Giving to these gorges a length of 14 km., occupied by 3 forts, and to the exterior sides a length of 20 km., occupied by 5 forts, and supposing that the mean distance between the sides be 9 km., we shall have the arrangement shown by Fig. 2. The lateral sides are broken in direction, so that the forts $x\,x$ are thrown forward into the intervals, the better to sustain the contiguous forts $y\,y$. The troops of the defense are divided into three armies of two corps each. One of each of the two corps is employed, alternately, on the external line (*cordon de surveillance*); the other is established in close cantonments, or in barracks constructed either in rear of the camps (a, b, c, Fig. 2), or in rear of the intervals (a', b', c'). E. If the zone of investment has 7,500 meters of depth, and if it is 2,500 meters beyond the exterior forts, the axis of this zone will have about 35 leagues of development. Suffice it to say that it would be impossible for the largest army in the world, and even to an aggregate of several allied armies, to invest a place like Paris, London, Berlin, or Vienna, to which has been applied the model plan here sketched.

* We necessarily omit here all that concerns the lines, internal organization, dimensions, profiles, the arrangement of the ramparts and of flanking batteries, and the computation of garrisons, etc., as belonging to a more technical treatment of the subject, and also to that of permanent fortification. See FORTIFICATION.

* *Étude sur la défense des États*, etc.

† *Étude sur la fortification des Capitales* (1873).

This plan would doubtless require a greater number of forts than that for a single camp constituted by a girdle of forts, and therefore more expensive—more guns, more troops for garrison; but, on the other hand, it would afford much

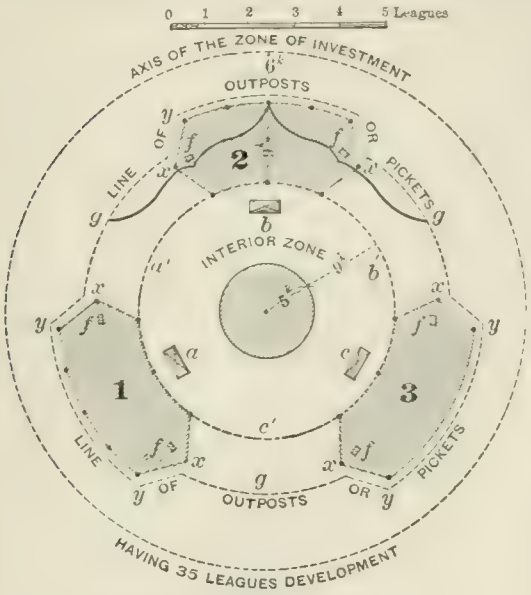


FIG. 2.

greater certainty to the defense. In the one case the besieging army after having carried two or three of the forts of the single camp may crush the army within, and begin his approaches upon the interior enceinte if there be one, or if not, penetrate at once into the city. In the other, these operations would be impossible on the hypothesis of a triple intrenched camp; for if the enemy, after taking two or three forts, should seek to penetrate into one of these camps, he would be taken in flank by the forts of the lateral sides and confronted by the forts of the gorge. The defending army may decline battle by withdrawing into the other camps, without detriment to its own safety or that of the place (*rien dès lors ne serait compromis*). The besiegers must obtain possession of the lateral forts and of the forts of the gorge in order to make themselves masters of the evacuated camp; then begin similar operations against the other camps. Such a succession of efforts and of sacrifices would exhaust the most powerful army.

To give the same properties to an intrenched camp constituted by a girdle of forts, it would be necessary—1, to provide the capital with a safety-enceinte (*enceinte de sûreté*); 2, to construct several radiating lines of forts from the enceinte to the line of forts, enabling the defensive army to withdraw laterally in order to continue the struggle. These radiating lines, by dividing the single camp into several intrenched and juxtaposed camps, would realize indeed, though in an incomplete and defective manner, the germinal idea of our model plan. One great advantage of this latter plan is the exemption of the defensive army from the dangerous agitations of the population, and to make its existence independent of the seditions which sometimes break out in the populace before or during the siege; for if there be three camps the capital is not included in any one of them; whereas if there be but one it occupies the center of that single camp. Finally when there is only a girdle of forts, the great dépôts of supplies and arms are exposed to the attacks (*coups de main*) of the enemy as soon as the line is pierced by the capture of two or three forts, and to the enterprises of a populace desirous of hastening the surrender by obstructing the defense. On the hypothesis of three isolated camps this double danger is not to be feared, because the dépôts comprised in the forts of their gorges are secured against such enterprises (*coups de main*).

While the armies are operating in open field the garrison of this great central camp will be made up of the troops essential to the guard of the forts, and of a reserve of three divisions. These divisions will establish themselves in the intervals of the intrenched camps (*a*, *b*, *c*, Fig. 2), so that they can be promptly united to confront and repulse hostile corps which might seek to penetrate the capital to lay contributions or to produce a moral effect by a bold dash. The possibility of invading the city after beating the central reserve seems to afford a powerful argument for a safety-enceinte; but there are so many chances against such an enterprise—which, besides, if successful, is so little decisive—that this possibility need not be dwelt upon. It may, too, be guarded against by throwing up intrenchments in time of war covering the most exposed portions of the perimeter, as a substitute for a safety-enceinte. See works already cited and *L'Influence du Tir plongeant*. A. BRIALMONT.

Intro'it [Lat., he is coming in; *intro*, within + *it*, third pers. sing. pres. indic. of *ire*, go]: in the Roman Catholic liturgy, an antiphon, with a verse generally taken from the Psalms, sung by the choir at the beginning of mass, and recited by the priest when he has ascended the altar.

Introspection [Lat. from *introspicere*, to look into; *intro* + *spe'cere*, to look]: the act of examining one's own consciousness to obtain knowledge of one's self. The "method of introspection" is opposed to the "objective method" in psychology, the latter proceeding by experiment, observation of others, inference, etc. Psychology differs from all other sciences in that it has to appeal to introspection or self-examination for the final testing of its truth about the mind. See the article PSYCHOLOGY. J. M. B.

Intuitionalism [from Lat. *intu'itus*, partic. of *intue'ri*, look on]: the theory, in its broader sense, that fundamental principles of being are known directly without the intervention of either sense-experience or discursive logical processes; in its narrower sense, the theory that moral distinctions are known in this direct fashion. The common use of the word in philosophical discussion seems to date mainly from Price, but the idea is at least as old as the philosophy of Aristotle. Complication arises in defining the word from the fact that most modern intuitionalists have modified the theory, and use the term to denote the existence of *à priori* principles native to the structure of the mind and regulative of its operations, but not necessarily brought before consciousness save through experience and reflection. In this sense "intuitionalism" is often used to designate any theory which holds that there are universal and necessary principles either of knowledge or of being, the mode in which these principles come to consciousness being held *sub judice*.

Theory in the Greek Period.—A history of the development of the conception will show the transformations through which the idea has gone in the history of thought. As the development of the ethical concept of intuitionalism has, upon the whole, determined the metaphysical concept, attention will be paid mainly to the former. The concept takes its birth from the discussions carried on by the Sophists as to whether law is by nature or by institution and convention. If the former, then there must be some power of mind which shall deal with moral distinctions. The efforts of Socrates, Plato, and Aristotle to solve the problem in the direction of the independence of law from arbitrary institution did not, however, at once give birth to a full-fledged intuitionalism. Emphasis was indeed put upon reason as the power which alone could insure the intrinsic validity of the moral life, but reason was not conceived as a faculty of immediate instruction. On the contrary, with Socrates, in whom the emphasis upon knowledge is at its height, the attaining of rational moral ideas is regarded as the most difficult of problems, the end of philosophy, and their adequate attainment conceived as the solution of the whole moral problem, since the man who knows the good will certainly follow it. Plato retains the conception of the good as the object of all philosophic endeavor, and brings it into relation with the philosophy of nature, thus extending its range and making its adequate discovery still more difficult; at the same time he adds the idea that its discovery by the philosophers can be made available to the mass of men only by a complete social reconstruction—so far is he from the idea of fundamental moral distinctions known directly by the reason of every man. Aristotle, while attaching much less importance to a theoretical knowledge of the good as such, still holds that with practical knowledge of it all other virtues are given; hence it is to be regarded as the *terminus ad quem* of the moral life, and not with the intuitionalist as the *terminus ab quo*. In his logical theory, however, Aristotle insisted upon the need of certain fundamental and indemonstrable principles, called, generally, common axioms, as the basis of all demonstration. Since Aristotle himself conceived moral distinctions to be known through the judgment of the man who has already made

ethical attainments, it never occurred to him to apply this theory of axioms known *per se* to morals. With the disintegration of the moral codes of local communities the need of a scientific basis for morality was more and more keenly felt, and thus there was a constant tendency to assimilate the methods of ethics to the principles laid down by Aristotle for the purely theoretical sciences. In this sense he may be regarded as the founder of intuitionalism.

Roman Development.—The later development of the theory took two directions. The Neo-Platonic movement carried to its extreme the postulate underlying all Greek theories of knowing—that like is known by like—and gave rise to the mystical theory of intuitionalism, holding full knowledge to involve a complete absorption of both subject and object into one underived and undifferentiated state of being. This idea leaves its impress upon the whole mystical side of the Catholic faith in the idea of the "beatific vision." The counterpart of mysticism was scholasticism, and the scholastic theory of direct knowledge is derived (aside from dependence upon Aristotle already referred to) from a fusion of Stoic theories with the philosophy of Roman jurisprudence. In the pantheism of the Stoics the two ideas of nature and law were identified, and both meant the one vital, all-comprehensive, and orderly force expressing itself in both the world without and the mind within. The required transformation of this idea was made by Cicero, who is the real, as Aristotle is the putative, father of intuitionalism. The practical development of the Roman people had made necessary an ethical conception of law which should effect two things: First, allow a qualitative reconstruction of earlier codes and practices to meet present needs; and, secondly, permit a quantitative extension of it to the tribes and peoples now brought under Roman jurisdiction. Cicero found the needed instrument in the Law of Nature. This law is objective—that is, existent in the very structure of the universe; it is precedent of, and the norm for, any civil institution whatever; it is universal, binding upon gods and men; it is unqualified in its authority, and is eternal and unchangeable. As the Stoics had already conceived of reason in man as an offshoot of the reason or logos present in nature, the way was prepared for Cicero (without accepting the whole Stoic metaphysic) to give a popular account of the subjective faculty needed in order to make the law of nature available for the practical purposes of life. The law, at least in germ, is *innate* in the human mind, and its main features are known directly to the conscience of man. *Ratio naturalis* comes to mean both the objective structure of law and the mental power by which it is immediately descried. The following description taken from Cicero's oration, *Pro Mil.*, 4, 10, shows the main points: "Non scripta, sed nata lex, quam non didicimus, accepimus, legimus, verum ex natura ipsa arripuimus, hausimus, expressimus; ad quam non docti, sed facti, non instituti sed imbuti sumus."

Influence of Practical Jurisprudence.—That the later development of this idea was under the influence of practical jurisprudence rather than of reflective philosophy, and that it was full of inconsistencies, only the better prepared it for its large historic *rôle*. One of these inconsistencies was in the wider and in the narrower sense given to the term natural law. In the wider sense it was coextensive with instinct, comprehending all activity not the result of acquired experience; in the narrower it was the moral law made known through reason. Another confusion was from the association of natural law with *jus gentium* on one side and with *æquitas* on the other. So far as the law of reason was identified with the law common to all peoples under Roman jurisdiction, the scope of intuition was confined to the fundamental principles of all social morality—to the relations belonging to *societas humana* as such. The tendency to identify the law of reason (or nature) with equity tended to bring about a differentiation of conscience as subjective authority from all social relations and authority whatever, the former being supreme over the latter.

The Mediæval Contribution.—The result of this confusion is most completely found in the moral philosophy of the Catholic Church in the scholastic period. On one hand the power of moral intuition was located completely in the individual, wholly independent of any society (the sense of *æquitas*); while on the other, the strictly jural connotations appropriate to the idea of the law of human society (*jus gentium*) were carried over into the entire structure of moral ideas. The result was the conception of moral law as command given by God to his human subjects after the analogy of laws imposed by a political king on his subjects. These laws were made known through three organs: conscience, the divine command speaking directly to the individual and aiming at natural virtue; civil law, commands expressed with reference to determinate outward acts, and aiming at the coercion of evil characters; and revealed law, or the will of God as made known through the channels of the Church and aiming at man's eternal and supernatural happiness.

With the fall of scholasticism, the channel for the direct knowledge of the moral law became the instrument through which moral science recovered its independence of theology. The argument ran: Since the moral law is rational, God himself follows reason in imposing it. Hence this law may be considered, on the ground of reason, free from any theological consideration whatever. It would still be true and binding even if there were no God. As at an earlier period the intuitional theory was a means by which moral science was freed from the limits of the customs current in particular places, at this period it was one of the main influences permitting an independent growth of moral science.

Moral Reason versus Civil Law.—With Hobbes (1588–1679) the controversy shifted, and intuitionalism had henceforth to contend with new foes. Two factors in Hobbes's theory control all later discussion. Hobbes held that fixed moral obligations were wholly the creation of the sovereign political power; he also held that men are naturally selfish, and aim at the maximum of happiness each for himself. The first of these views elicited the primary reaction. Against the idea that moral distinctions are the creatures of the civil authority, a number of voices protested; the most convenient weapon of attack was the assertion that they are inherent in "nature" or "reason," and are made known directly. Differing among themselves in many particulars, Cudworth (1617–88), in his *Eternal and Immutable Morality*, Henry More (1614–87), in his *Enchiridion Ethicum*, and Clarke (1675–1729), in his *Discourse Concerning the Being and Attributes of God* (vol. ii.), all agree in holding that moral distinctions are not arbitrarily decreed by positive authority, but have objective existence and are known through an intellectual power appropriate to them. All would now be termed "intellectual intuitionalists," holding that distinctions are made known through reason rather than through a sense or mode of feeling, but differ as to the character of this rational power, Cudworth and More holding to the immanence in the individual of the divine reason, Clarke assimilating the process of moral knowledge to that of geometry.

Influence of Psychological Analysis.—Meantime Hobbes's assertion of the purely egoistic character of man's impulses had necessitated a more careful psychological investigation of action. As this became the center of interest, the antithesis between moral distinctions as based respectively upon positive law and upon reason, fell into the background. Hobbes's opponents, in upholding the existence of primary social impulses in man's makeup, tended to resolve man into a system of impulses, some of which aim at self-interest, others at the good either of humanity or of particular individuals. While the three chief representatives of this tendency—Shaftesbury (1671–1713), Butler (1692–1752), and Hutcheson (1694–1747)—all agree that these two classes of impulses tend to coincide, there is still felt the need of some power which shall decide between them in cases of conflict and maintain their due proportion when they agree. All three (in spite of many differences in method and mode of statement) find this in a power called either "moral sense" (Shaftesbury and Hutcheson), or "conscience" (Butler). Intuition now means not the rational knowledge of objective moral law, but the immediate consciousness of the value of our respective impulses expressed in approbation and disapprobation. This tendency to identify moral intuition with a direct feeling of worth is at its height in Hutcheson, who expressly makes moral sense a feeling of the relations of harmony or the reverse among sensations and impulses, and thus tends to identify it with a feeling of beauty or ugliness. This emphasis upon feeling called out an emphatic protest within the intuitional school from Price (1723–91), *Chief Questions and Difficulties of Morals*, who makes right and wrong distinct qualities, incapable of definition or analysis, and holds that moral knowledge is simply a special case of the immediate discernment of truth by the understanding.

Influence of Utilitarian Theory.—It is an example of the irony of history that the next foe which intuitionalism had

to meet was a product of its own arguments against Hobbes as to the existence in man of disinterested impulses for the welfare of others. The rising UTILITARIANISM (*q. v.*) carried the argument a step further, asserting that if man's nature may be resolved into a system of impulses aiming at personal and social happiness, the tendency of an act to produce such happiness is a sufficient test of its morality, and there is no need of any intuitive faculty. This tendency was intensified by the baldness with which Price held that rightness and wrongness are unanalyzable qualities of acts themselves. This seemed, on one side, to reduce moral science to sheer dogmatism, and, on the other, it came in conflict with the regnant psychological theory which was analyzing all ideas into complexes of sense-qualities and associated experiences. Intuitionalism thus assumed the form which it still retains to-day—the assertion that moral distinctions flow from, and are reached by an inspection of, acts themselves and not from a consideration of results.

Influence of Kant.—Kant (1724–1804) added another signification to the kaleidoscope of meanings now attaching to the word. He shifted the center of interest, both in metaphysics and ethics, from the question of the psychological origin of knowledge to the question of its *validity* when attained. In coming to the conclusion that its validity could be maintained only in case it is not the result of experience, he substituted the idea of an *a priori* determination of experience for the concept of an immediate knowledge of truth, and thus gave a new argument for intuitionalism (in a widened sense of the term) and a new confusion to its definition. The confusion was intensified from the fact that the Scotch school, reacting like Kant from the empiricism of Hume, asserted the *a priori* partly in its old psychological sense, and partly as the practical doctrine of "common-sense." The only essentially new factor the nineteenth century has added to the discussion is the contention of Spencer that by the doctrine of biological evolution and heredity he is enabled to reconcile empiricism and intuitionalism, fundamental moral distinctions being now intuitive for the individual, but the product of experience for the whole race.

Present Position and Criticism.—It should now be obvious that intuitionalism has no fixed meaning, but has gone through a series of changes during its history, according to the center of ethical interest at the time, and the foes with which it has had to contend. At present its meaning in popular discussion (and to a considerable extent even in its philosophic representatives) is a fusion of all its various historic meanings. The sense which is uppermost is undoubtedly that which it derives from its opposition to utilitarianism—the idea that knowledge of moral distinctions is derived from an inspection of the moral act itself, and not from a calculus of results. But reminiscences of Kant's metaphysical *a priorism*, of Butler's conscience, of the Roman natural law, and of the Platonic and Aristotelian *Nous* are inextricably interwoven. Just what form the doctrine would take if purified from this historic fusion it is impossible to say. It is altogether probable, however, that intuitionalism, as a system, derives much of its force from its confusion, on one side, of intuition with the theory of the objective and determining character of moral law, and, on the other side, with the psychological doctrine of unreflective knowledge or immediate tact. It is probable that the mass of men decide most cases of action without a process of conscious reflection upon past experience, or calculation of probable consequences; but this is a psychological, not a metaphysical or moral fact; it affords no presumption as to the validity of the conclusion reached, since this process depends, in the main, not upon abstract reason, but upon the habits or established disposition of the agent. On the other hand, it is quite possible that moral distinctions may have objective validity and yet not be made known by intuition. The law of gravitation is none the less true of bodies possessing mass because it has been arrived at by a laborious process of inquiry, and the same may hold of moral truths.

A history of intuitionalism is a desideratum. References to the subject will be found in all the standard histories of ethics. (See MORAL PHILOSOPHY and the works mentioned in the body of this article.) For natural law and its relation to intuitionalism see Voigt, *Die Lehre vom jus naturale der Römer* (Leipzig, 1856); Hildenbrand, *Geschichte und System der Rechtsphilosophie* (Leipzig, 1860), part ii.; Sir Henry Maine, *Ancient Law* (New York, 1864), chs. iii. and iv.; Stahl, *Geschichte der Rechtsphilosophie* (Tübingen, 1878). For the influence of Cicero upon the official ethics of the Roman Catholic Church see Ewald, *Der Einfluss der Stoisch-Ciceronianischen Moral auf die Darstellung der Ethik bei Ambrosius* (Leipzig, 1881). The modern representatives of the intuitional school are found mainly among the members of the Scottish school. Prominent names here are McCosh, *The Intuitions of the Human Mind* (New York, 1866), and Calderwood, *Handbook of Moral Philosophy* (14th ed., London, 1888). Most of the textbooks current in U. S. colleges during the past generation are written from this standpoint. Among these it may not be invidious to single out as representing a modified intuitionalism Porter, *Elements of Moral Science* (New York, 1885). The chief philosophical upholders of intuitionalism at present are Sidgwick, *Methods of Ethics* (3d ed., London, 1884), and Martineau, *Types of Ethical Theory* (Oxford, 1885). Green, *Prolegomena to Ethics* (Oxford, 1883), is often classed among the intuitionalists, but this involves an extension of the term to include *a priorism* of the Kantian type.

JOHN DEWEY.

Intussusception: See ILEUS.

In'ulin [from Mod. Lat. *in'ula*, a genus of plants yielding it]: a substance ($C_{12}H_{20}O_{10}$) similar to starch. It is widely distributed in plants, occurring especially in the roots of elecampane, dandelion, chicory, feverfew, meadow saffron; in the tubers of the potato, the dahlia, and the Jerusalem artichoke; in Serp manna, in certain lichens, and probably in the seeds of the sunflower and of mustard, etc. It is prepared by washing the rasped root on a sieve, and allowing the inulin to settle from the liquid, or by boiling the sliced root with water and filtering while hot; the inulin separates on cooling. The juice of dahlia-tubers pressed in the winter becomes semi-solid on standing from the separation of inulin. Inulin is a soft, white, tasteless, odorless powder, resembling starch, which it appears to replace in plants. Unlike starch, it exists in plants in a solution which has the consistence of a thin oil. If a slice of the plant is soaked in alcohol, the inulin separates in spherical granules which can be recognized by the microscope. It is very hygroscopic, and adheres to the teeth and to moist paper. It is but slightly soluble in cold water, freely in boiling water, from which it separates, on cooling, without forming a jelly. It is insoluble in alcohol, which precipitates it from its solution in water. Heated with water, it is changed slowly to lævulose. Dilute acids change it to sugar even in the cold. Inulin is not altered by diastase nor by other ferments. It is colored brown by iodine, is soluble in cuprammonia and in nickelammonia, and it reduces salts of lead, copper, and silver.

Revised by IRA REMSEN.

Inundations: See FLOODS.

Invariable Plane, The: a term of theoretical dynamics, used pre-eminently in regard to the solar system, signifying the plane through the center of gravity of the solar system on which the sum of the projections of the areal velocities of all the bodies of the system is a maximum. Conceive lines drawn from the center of gravity of the system to each of the bodies which compose it, the sun included. Let these lines all be projected upon any plane through the center of gravity. By the motion of the bodies each line will, in a unit of time, sweep over a certain area on the plane. The product of this area (or sometimes twice this area) by the mass of the body at the end of the line is the areal velocity for that body; the sum of all the products thus formed is the total areal velocity of the system and remains invariable forever. There is one plane for which the sum is a maximum, the invariable plane.

S. NEWCOMB.

Invariant [*in-*, un- + *variant*, from Lat. *va'rians*, pres. partic. of *varia're*, vary]: as defined by Sylvester, a function of the coefficients of one or more forms, which remains unaltered, when these undergo suitable linear transformations. To speak more definitely, a homogenous algebraic expression of any degree in two or more variables is said to be linearly transformed when for each variable, x, y, z, linear functions of new variables, such as $\lambda_1 X + \mu_1 Y + \nu_1 Z$, $\lambda_2 X + \mu_2 Y + \nu_2 Z$, for y, etc., are substituted. If the expression be homogeneous in the variables, any function of its coefficients is called an *invariant*, if, after such transformation, the same function of the *new* coefficients is equal to the old function multiplied by some power of the *modulus of transformation* (which is a function of the *coefficients of transformation* only, $\lambda_1 \mu_2 \nu_3 : \lambda_2 \mu_3$, etc.). It is an *absolute invariant* when, the value of this power being unity, the func-

tion is absolutely unaltered by transformation. The invariance of discriminants was first pointed out by Dr. Boole (*Cambridge Math. Jour.*, Nov., 1841), and "modern algebra" may be said to have had its origin in this discovery. Cayley took up the more general problem, *what* functions possessed this property of invariance, and brought to light many others (some of which involving the variables) which are unaffected by linear transformation. Those containing the variables are called *co-variants*, or *contra-variants*, according as the substitution is direct (as above), or *inverse* (a distinction which can not here be explained). The important uses of these functions can only be briefly illustrated. If, for example, the equations of two conic sections are, by transformation, brought to their simplest (or "canonical") forms, and their invariants (which for these forms are comparatively simple) calculated, any homogeneous relation found to exist between them may be predicted for them, no matter to what axes the equations are referred. By this means we can with facility obtain *general* solutions for—e. g., the condition that two conics shall touch each other; that a triangle inscribed in one shall circumscribe the other; the equations of tangents to a conic at its intersection with any right line; the equations of the four common tangents to any two conics, etc. The first-named condition—or, more generally, the condition that any two curves should *touch*—is expressed by the vanishing of an invariant function of the coefficients of the curve-equations, called the *tact-invariant*.

Revised by S. Newcomb.

Invention [from Lat. *inven'tus*, partic. of *inveni're*, find; *in*, in, upon + *venire*, to come]: a new discovery, of a mechanical kind, as opposed to a natural truth. The so-called faculty of invention is not a distinct mental power, but is a function of well-developed constructive Imagination (*q. v.*). See Genius. J. M. B.

Inverness': the capital of Inverness-shire, Scotland; near the mouth of the Ness, which flows into the Moray Firth, and at the northern end of the Caledonian Canal; 108 miles by rail W. N. W. of Aberdeen, and 190 miles N. N. W. of Edinburgh (see map of Scotland, ref. 6–G). It has considerable manufactures of linen and hemp stuffs and extensive shipbuilding docks. With Aberdeen, Leith, and London, on the eastern coast, and by means of the Caledonian Canal with Liverpool and Glasgow, on the western coast, it carries on a considerable trade, exporting sheep, wool, and agricultural produce, and importing coal and provisions. Though an old city, it has in general an elegant and modern appearance. On a hill to the S. W. of the town stood the castle in which Macbeth murdered Duncan; on Craig Phadraig hill, about a mile W. of the town, stands a ruined fort which was the residence of the Pictish kings. Pop. (1891) 19,214.

Inverness-shire: county of Scotland; bounded N. and W. by Ross-shire and the Atlantic, and S. and E. by the counties of Perth, Aberdeen, and Nairn. Some of the Western islands, among which are Skye and Harris, belong to it. Area, 4,088 sq. miles. The western part is wild, rugged, but well-wooded mountain-land; Ben Nevis, the highest peak in Great Britain, is 4,406 feet high. In the eastern part are extensive tracts of heath, yet 126,306 acres are under a regular rotation of crops, wheat, barley, and oats, and the county contains excellent pastures, especially for sheep. Wool and oats are its chief exports. There are extensive deer-forests, and the rivers and lakes afford excellent fishing. The climate is very diversified. The Gaelic language predominates in this county. Pop. (1891) 89,317.

Inversion (in chemistry): See Fermentation.

Inversion: in music, a term of frequent use to denote certain changes in melodies, chords, or harmonies, by which (1) the motion of an air is reversed, or (2) an interchange is made between the upper and lower terms of single chords, or of voices in a composition consisting of two or more parts. A *melody* is said to be inverted when its *motion* upward or downward is reversed, as if it were turned upside down. This is also called *reversion*. A *chord* is inverted when the lower note is *not* the root or fundamental bass, but is the original third, fifth, or seventh, etc.; just as, in an arrangement of the figures 1, 3, 5, we might "invert" them thus, 3, 1, 5, or 5, 3, 1. A *harmonized theme* or subject is inverted when any two or more of its parts change places, the higher becoming the lower, and the lower the higher.

1. The inversion of a *melody* affects nothing but the upward or downward motion in its progress. Each *upward* step is answered in the inversion by a *downward* step corresponding to it, interval for interval. Of such inversions (or reversions) of melody there are two kinds—viz. the *simple* and the *strict*. In "simple" inversion it is sufficient that the same motion from degree to degree on the scale should be preserved, even though a step of a whole tone in the theme may often become a semitone in the reply, and *vice versa*. In "strict" inversion the reply is the *exact contrary* of the theme. The whole tones are answered by whole tones, and semitones by semitones, so that the intervals made from note to note in the progress of the inversion are precisely like those of the original theme or subject.

2. *Inversion of Chords.*—The normal or natural position of a chord is that in which the lowest note is its fundamental bass, prime, or root, the other several elements (third, fifth, etc.) being built upon this, and deriving from it their names, uses, and relations. So long as the *actual* bass of a chord is the prime or root, such chord retains its fundamental form, whatever may be the "changes of position" assumed by the upper parts; but when a new form is given to the chord by placing its original third, fifth, etc., in the bass, and putting the fundamental note among the higher parts, the chord is said to be *inverted*.

3. The inversion of a *harmonized subject* consisting of two or more parts or voices is when a higher and a lower part change places—e. g., when the bass is so elevated as to become the treble, and the treble so lowered as to become the base. Inversions of this nature constitute what is called "double counterpoint," and the simplest kind is that in which one of the parts is removed an *octave* toward the other. Of course, in this process all the intervals are reversed, a third becoming a sixth, a fourth a fifth, and so on. By such inversions major intervals become minor, and minor become major; diminished intervals are changed into augmented, and *vice versa*.

Another species of inversion is that called *retrograde*, in which a composition is so ingeniously constructed as to be read, first, in the usual manner, and second, in a *backward* direction. *Reverse retrograde* is that in which the parts are not only to be read backward, but are also *inverted*.

There is also a *double reverse retrograde*, in which the construction is such that the copy may be *turned upside down*. Under such a process it is evident that not only are the notes read backward, but the upper and the lower parts change places, the order of letters on the stave is changed, the clefs are altered, and the rhythmical movement of the notes exactly reversed. Of course these latter forms constitute technical puzzles. As music they possess little or no value. Revised by Dudley Buck.

Invertebra'ta [Mod. Lat., neut. plur. of *invertebra'tus*, unvertebrated, without a back-bone; Lat. *in-*, un- + *ver'tebræ*, plur. of *ver'tebra*, joint, especially of the spine, deriv. of *ver'tere*, turn]: a term introduced by Lamarck to include all animals which lack a vertebral column. The group has long been recognized as not possessing a natural character, but as containing a most diverse assemblage of forms, but the name has been retained as a matter of convenience, and we still have "anatomies of the invertebrata" and the like. The groups which are included under this heading are the Protozoa, Cœlenterata, Sponges, Worms, Echinodermata, Mollusca, and Arthropoda (*qq. v.*). J. S. Kingsley.

Investiture [= Fr., from Mediæv. Lat. *investitu'ra*, deriv. of Lat. *investi're*, invest, clothe; *in*, in, into + *vestire*, clothe]: as a feudal custom, the open delivery of possession ("the livery of seisin") of a fief by the lord to his vassal. This, in an age when writing was rare, was effected by means of some visible ceremonial and symbol, such as giving the branch of a tree or some material object that would evidence the conveyance to public knowledge and permanent remembrance. In the Church, after the analogy of feudal custom, investiture was an open confirmation in ecclesiastical office by some symbolical act or emblem, such as the bestowment of the pallium or crosier and ring, as ensigns of official honor or of pastoral charge and spiritual espousals. The claim of the prerogative of such investiture of an ecclesiastic by the political ruler was for centuries matter of controversy between the hierarchy and the monarchy—a controversy of interest not only as an important factor in the history of mediæval Europe, but as a reflex of its condition and ideas as respects the relations between the secular and spiritual powers. This right of investiture was claimed in behalf of secular power as an appanage of the monarchy inherited from the old Roman empire, and also on the ground that the episcopal office, with the temporalities attaching in

the feudal ages of manorial estates, privileges, honors, and emoluments, was to be regarded in the nature of a fief, and to be bestowed with a like ceremonial by the lord paramount. The claim was resisted on the allegation that laymen could not bestow the authority for priestly functions, as was betokened by the ring and the crosier, and that the degradation and corruption of the Church sprang from this usurpation and the simoniacal practices and oppressive exactions inevitably attendant on lay investiture.

In the early Church, Constantine and the Christian emperors, as inheritors of the pontifical rights of their pagan predecessors, undoubtedly exercised the prerogative of confirmation, after episcopal elections. After the fall of the empire of the West the Gothic and Lombard kings claimed the same power as successors to the prerogatives of the Roman empire. After them this claim was exercised by the Frank monarchy—by the Merovingians, the prerogative of even direct episcopal nomination; by the Carlovingians, that of the investiture of the pope himself. It was the aim of Charlemagne to establish a theocratic monarchy, in which the emperor was to be supreme lord so far as earthly organization or administration was required. That Charlemagne, as well as his predecessors, occasionally appointed bishops of his own choosing to sees in his own dominions is no more than had been done by the Greek emperors long before. The successors of Charlemagne claimed, and often exercised, the same rights of suzerainty over the Church. This claim, however, was contested, resisted, or eluded on every opportunity; and such opportunity constantly offered during the dissensions of the descendants of Charlemagne, which often led them to seek the aid of the clergy and to appeal to the Church and the pope as arbiters in their controversies with each other. So for centuries the prerogative of investiture was asserted and exercised, denied and resisted, according to the character and position of individual monarchs and popes. In 875 Charles the Bald formally renounced his claims as superior of the states of the Church and all control of elections to the papacy, and accepted a papal vicar as primate for all Germany. Otho I. (936–73) made the Romans swear on the relics of St. Peter they would never afterward elect or consecrate a pope without the permission and approbation of the emperor. Sylvester II. (999–1003), on the other hand, directly assailed lay investiture as the source of simony and the cancer of the Church, and himself sent the crosier and the ring directly to Arnulf, elected as Archbishop of Rheims. Again, Henry III. in 1047 received of the Romans the admission of his perpetual right of choosing the pope, and their oath that they would never consecrate a pope without the emperor's consent. This controversy was brought to a crisis when Hildebrand, as prime mover of the papacy, or as pope (Gregory VII., 1073–85), developed his policy of making the Church independent of all secular power, and ultimately supreme amid the governments of the world. Under his instigation, Alexander II. (1061–72) issued a decree against all lay investiture. In the Lateran Council, held by himself as Gregory VII. (1075), it was again denounced, and every bishop or abbot accepting it was deposed and those bestowing it were excommunicated. These decrees brought the papal and imperial power at direct issue, and the factions that arose therefrom, the Guelphs and the Ghibellines —the former the party of the pope, the latter that of the emperor—distracted Germany and convulsed and wasted Italy for a long period with civil discord and war. The fortunes of this controversy were various, but, owing to the disaffection of the German princes toward the emperor, the advantage was at first on the side of the pope. In 1077 Henry IV. was reduced to the humiliation of standing, in a cold winter, from the 25th to the 27th of January, barefoot and in the garb of a penitent, in the open court of the castle of Canossa, before Gregory would accept his repentance and submission and give him absolution. Presently the strife was renewed still more fiercely, and the pope died in exile. The dispute was continued under his successors, until, under Henry V. and Calixtus II., it was settled by the concordat of Worms (1122) that henceforth all episcopal elections should be conducted by the laws of the Church, but in the presence of the emperor or his representative, and that spiritual investiture by the crosier and the ring should be bestowed by the pope, but for temporalities, enfeoffment should be by the emperor with the scepter. In other countries of Europe the controversy respecting lay investiture had like fortunes and results. In France investiture by the ring and crosier was relinquished by the monarchs, and episcopal benefices were bestowed through written instruments or orally. The question, however, never assumed so important an aspect there as in Germany, partly because the French bishoprics partook less than the German of the nature of secular principalities, partly because the contest sprang up there at a moment when the French king was unable to carry it through. In England, Gregory VII., having the controversy with Germany on his hands, forbore to press the question to an open breach with the iron will of William the Conqueror. It came to open quarrel between William Rufus and Anselm, Archbishop of Canterbury, and Pope Paschal II., but was finally adjusted by an agreement that for investiture with the crosier and ring should be substituted the simple oath of fealty. Compromise is, and always was, the character of English policy. The ascendancy which the Church gained through the murder of Thomas à Becket was very brief; as a rule, the Church had to submit. Thus everywhere, in the issue, the symbols of strictly priestly investiture were relinquished by the secular authority, but the feudal obligation was asserted for temporalities attached to ecclesiastical benefices. See the *Novels* of Justinian, cxiii., 3, and Du Cange and Thomassin.

Revised by W. S. Perry.

Invitatorium: In the Gregorian and Benedictine offices the psalm *Venite exultemus Domino* (numbered in the Vulgate xciv., in the English version xcv.) is used every day at the beginning of Nocturns, prefaced by an antiphon known by the name *Invitatorium*. Though of the same nature with other antiphons, and varying with the day, it is said differently from other antiphons and is repeated several times during the course of the psalm, as well as at the beginning and end. The *Venite* is known as the "Invitatory Psalm."

W. S. Perry.

Involucre: See Bract.

In'volute [from Lat. *involu'tus*, wrapped up, past partic. of *involvere*, wrap up; *in*, in + *volvere*, roll]: the curve generated by any point in a string when the latter is unwound under tension from a given curve. This mode of generation implies that the given curve is represented by a pattern cut out of some rigid material, as wood or metal. Thus, to draw an involute of a circle, we cut out a circular pattern, around which we wrap a string; we then lay the pattern on a plane surface, attach a pencil or tracing-point at some point of the string, and unwrap the string; the pencil or point will trace out the required involute. It is obvious that the same curve may have an infinite number of involutes; hence to find any particular involute we must know one of its points.

I'o (in Gr. Ἰώ): in Greek mythology, a daughter of Inachus, the river-god and first king of Argus; she was transformed into a beautiful white heifer by Zeus, who was enamored of her, and wished to conceal the affair from his jealous wife. Hera became suspicious, and set Argus with the hundred eyes to watch her; and when Hermes slew Argus, she sent a gad-fly, which pursued Io from place to place all over the earth, and across the sea, called after her the Ionian Sea, until at last she found rest in Egypt. There Io gave birth to Epaphos, was worshiped as Isis, and married the king Telegonos, a marriage from which sprang the royal families of Egypt, Phœnicia, Crete, Argus, and Thebes. Io appears in *Prometheus* and *The Suppliants* by Æschylus. By the symbolical school of modern mythologists she is identified with the moon, as Argus with the starry sky, and Hermes with the morning; but this interpretation is also denied. See Plew in *Neue Jahrbücher*, 1870, p. 665 ff.

Revised by J. R. S. Sterrett.

Iodine [from Gr. ἰώδης, like a violet; ἴον, violet + -ωδης, like]: an element discovered by M. Courtois, of Paris, in 1812 in the mother-liquor from the kelp or ash of seaweed which had been burned in order to obtain sodium carbonate. Its atomic weight is 127; its symbol is I. It is found in many mineral waters, in sea-water, in seaweeds, especially Laminariæ and Fucoids—in sponges, oysters, and other forms of marine life. Cod-liver oil contains from 0·03 to 0·04 per cent. of iodine. It is found also in many land-plants, as tobacco and water-cresses, and even in potatoes, beans, barley, and oats. Certain minerals also contain it, though those containing it as an essential constituent are comparatively rare. Such are iodyrite, or silver iodide, found among silver deposits in Mexico, Chili, and Spain, and coccinite, or mercury iodide, found in Mexico. Iodine also occurs as an accidental constituent in some dolomites, where it is combined with calcium and magnesium; in several deposits of alkaline salts, as Chili saltpeter and rock-salt. In some cases it has been found in the products from gas-works.

Preparation of Iodine.—The sources from which the iodine of commerce is derived are kelp and Chili saltpeter. The former contains 0·162 to 0·175 per cent. The carbonization of the seaweed is usually conducted in closed vessels, in order to prevent loss by volatilization. The kelp is lixiviated, and the liquors are concentrated and cooled, in order to crystallize out the sulphates, chlorides, and carbonates of potassium and sodium; and from the mother-liquor the iodine is extracted either by heating with concentrated sulphuric acid, with or without manganese dioxide, or by precipitation as copper subiodide by iron and a salt of copper; from which product the iodine is expelled by treatment with sulphuric acid and manganese dioxide. Chlorine is also sometimes used to precipitate the iodine from the mother-liquors. An excess of chlorine must be carefully avoided, since that would cause the iodine to go into solution again as iodine chloride. Washing and a second sublimation of the iodine is usually resorted to in order to purify the product for market. Glasgow is the chief port for the manufacture and export of iodine from kelp. Chili saltpeter is at present the chief source of iodine. It is contained in this mineral in the form of sodium iodate to the extent of about 0·2 per cent. The present output is estimated at 6,000 cwt., which is about five times as much as is produced in Great Britain and France from kelp.

Properties.—Commercial iodine, especially when obtained from kelp, often contains cyanogen iodide, sometimes to the extent of 1 per cent.; it also may contain up to 15 or 20 per cent. of water. It is sometimes adulterated with coal, charcoal, plumbago, or manganese dioxide. Iodine is a dark crystalline solid, with a color and luster resembling plumbago. Its odor is like that of chlorine. It fuses at 113°–115° C. (235°–239° F.), and boils above 200° C. (392° F.). It is volatile at ordinary temperatures, the vapor having a fine violet color, whence the name is derived. The vapor is one of the heaviest known, its gravity referred to air being 8·716. It dissolves in alcohol, ether, and carbon disulphide; also in water containing soluble iodides, or ammonium chloride, or nitrate. In pure water it dissolves only in the proportion of 1 part in 1,000. With starch it forms an intensely blue compound, and this is one of the most delicate tests used for the detection of its presence, as the color is apparent when but 1 part of iodine is present in 450,000 of water. It is displaced from its compounds by chlorine and bromine. It destroys vegetable colors but slowly; its action on organized tissue is more rapid. Taken into the stomach in large quantity, it produces ulceration of the mucous membrane, and death. Starch or starchy substances are the usual antidotes.

Compounds.—Iodine combines with hydrogen, forming hydriodic acid, which has very similar properties to hydrochloric (muriatic) acid. It also combines directly with metals, forming iodides. The principal compounds with oxygen and the metals are the iodates and periodates. The oxides corresponding to these salts are I_2O_5 and I_2O_7. These compounds decompose readily, giving up their oxygen, and some explode violently on being struck or heated. With ammonia, iodine forms a compound, NI_3, which, when dry, explodes violently with the slightest friction. One-fifth of the iodine which comes into the market is used in the manufacture of ANILINE COLORS (*q. v.*), principally Hofmann's violet and aniline green. A small quantity is used in PHOTOGRAPHY (*q. v.*), but its chief use is in medicine.

Revised by IRA REMSEN.

IODINE, MEDICINAL USES OF.—Iodine is used in medicine in simple solution in alcohol, or dissolved in water by the aid of potassium iodide (Lugol's solution). Locally, iodine is a powerful irritant, and its solutions stain the skin yellowish-brown. Inhaled, its vapor is irritant to the mouth, throat, and air-passages, causing coryza, cough, watering of the eyes, and headache. Internally, in single dose, the effects vary according to the quantity swallowed—from mere uneasiness in the stomach to severe gastric pain, with vomiting and purging, headache, giddiness, and, rarely, even general prostration and death. In continued administration of large doses a form of chronic poisoning, called *iodism*, occurs. In mild cases, the effects are more or less gastric disturbance, with increase of the secretions, irritation of the mucous membrane of the eyes, nose, and throat, with frontal headache, and sometimes an eruption on the face around the eyes, and about the nose and chin. In severe types there may be also a general febrile condition, vomiting and purging, with abdominal pain, various nervous disturbances, and, according to some observers on the continent of Europe, a tendency to absorption of some of the tissues of the body, shown by emaciation and wasting of certain glands. This latter effect, however, must be very exceptional, as it is seldom seen. Iodine is rapidly eliminated from the body, and the poisonous effects just described speedily cease on discontinuance of the drug. Preparations of iodine are used locally as counter-irritants, and internally they have some unknown influence over nutrition, proving useful in goitre, certain forms of scrofulous disease, affections of the fibrous and muscular tissues, etc. For internal administration, however, the alkaline iodides, especially potassium iodide, are now far more frequently used than solutions of iodine. These salts are free from the irritant local effect of iodine, but in continued dose may cause some of the milder symptoms of iodism described above. Medicinally, they are used in the conditions just mentioned under iodine and in syphilis, chronic mercury, and lead-poisoning, and indeed in a great variety of diseases. They are often given in very large quantities, and with almost perfect safety.

Revised by H. A. HARE.

Iodoform [*iodo-*, compounding form of *iodine* + *form* (by analogy of last syllable in *chloroform*)]: a methenyl ether, CHI_3, formed by the mixing of alcoholic solutions of potassa and iodine. It is in the form of small, glittering, scaly, yellow crystals of a sweet taste, and strong, peculiar, very persistent, saffron-like odor. It is slowly volatile, nearly insoluble in water, but soluble in alcohol, ether, and oils. It is decomposed by alkalies and by a heat of 250°. Iodoform is a valuable medicine, being a local antiseptic and anæsthetic. It is totally unirritating, even to mucous membranes or abraded surfaces. On account of its solid form it can not be employed as a general anæsthetic by inhalation, but it is exceedingly useful as a local application to relieve pain, as in painful ulcers, sores, irritated or inflamed mucous membranes. It seems also, in many such cases, to promote healing directly, and is a valuable local antiseptic.

Revised by H. A. HARE.

Io'la: city; capital of Allen co., Kan. (for location of county, see map of Kansas, ref. 7–J); on the Neosho river and the Atch., Top. and S. Fé. and the Fort S., Wich. and W. railways: 100 miles S. of Kansas City. It is in an agricultural region; has natural gas, quarries of building, sidewalk and monument stone, an artesian well supplying a mineral water of high medicinal value, and three weekly newspapers; and derives power from the river for manufacturing. Pop. (1880) 1,096; (1890) 1,706; (1895) 1,565.

EDITOR OF "REGISTER."

Iola'us (in Gr. Ἰόλαος): in Greek mythology, son of Iphicles and Automedusa, the charioteer and companion of Heracles, to whom he was the first to pay divine honors after his death. He assisted Heracles in his fight with the Lernæan Hydra, with Cycnus, with Geryones, and in his expedition against Troy. With the horses of Heracles he became the first victor in the Olympian games, which had just been instituted by Heracles. He was a member of the Argonautic expedition and of the Calydonian boar-hunt. When Heracles was about to marry Iole Iolaus became the husband of Megara, the wife of Heracles. He rendered the last services to Heracles at the funeral pyre on Mt. Oeta. With the children of Heracles he colonized the island of Sardinia, where he founded Olbia. He was worshiped not only in Sardinia as hero-founder, but in many other places along with Heracles.

J. R. S. STERRETT.

Iol'cus (in Gr. Ἰωλκός): in mythical times a city in Thessaly, situated on an eminence at the base of Mt. Pelion and at the head of the Gulf of Pagasæ, now probably Episcopi. It was distinguished in antiquity as the birthplace of JASON (*q. v.*), and the port from which the Argonautic expedition sailed in search of the Golden Fleece.

J. R. S. S.

I'olite: a mineral crystallizing in the trimetric system; essentially a silicate of alumina, magnesia, and protoxide of iron. Its hardness is from 7·0 to 7·5; specific gravity 2·6; in color it occurs of various shades of blue, and exhibits in a marked manner the property of dichroism, or of presenting, when viewed in different directions, different colors. Also called *dichroite* and *sapphire d'eau.*

Iolo Morganwg: See WILLIAMS, EDWARD.

I'on (in Gr. Ἴων): in Greek mythology, a son of Apollo and Creusa, the daughter of King Erechtheus of Athens. He was brought by Hermes to his father's temple at Delphi, where he was educated. When Creusa married Xuthos, but bore him no children, a false oracle made Xuthos be-

lieve that Ion was his son, and he took the youth into his house. Creusa, not recognizing him, tried to poison him, and fled to Delphi, where a priestess told her that Ion was her own son. This myth has been treated by Euripides in his tragedy *Ion*. Revised by J. R. S. STERRETT.

Ion (in Gr. Ἴων) : a native of the island of Chios (484–421 B. C.) who was ranked by ancient scholars as one of the five poets of the canon. He was contemporary with Æschylus, Sophocles, and Pericles, was an intimate friend of Cimon, and on one occasion carried off both the dithyrambic and the tragic prizes. In his joy over the victory the poet, who was a wealthy man, is said to have sent every Athenian a jar of Chian wine. A graceful and airy genius, Ion exhibited a rare versatility such as we encounter nowhere else in classic Greek literature, and composed not only tragedies, elegies, hymns, and dithyrambs, but prose as well as poetry, a *Founding of Chios*, a *Journal of Travels*, of which we have precious fragments. See Müller, *Fragmenta Historicorum Græcorum*, vol. ii., pp. 44–51. The tragic fragments are in Nauck's collection, the elegiac in Bergk's. See Köpke, *De Ionis Chii vita et fragmentis* (1836).

BASIL L. GILDERSLEEVE.

Io'na, or **Icolmkill'** : the most famous island of the Hebrides. It is 3½ miles long by 1½ broad, and is situated about 8 miles S. of Staffa and 1½ miles W. of the southwest promontory of Mull, from which it is separated by the shallow sound of Iona. The original name of the island was *Hy*, *Hii*, or *I*, the Irish of "island." Adamnan, in his *Life of St. Columba*, called it *Ioua insula*, but some transcriber mistook the *u* for an *n*, hence the name "Iona." The later *Hu-colum-kill*, or Icolmkill, means simply the "Island of Columba of the Cell." It was colonized in 563 by St. Columba of Ireland with twelve disciples, it having been granted him by the kings both of the Scots and of the Picts. He built there the celebrated monastery, which was regarded by the Picts as their mother-church, and from which Christianity was introduced into Scotland and the north of England. Iona was ravaged several times by the Norsemen, who plundered and burned the monastery. In the eleventh century the monastery was repaired by Queen Margaret the Saint, and in 1097 a pilgrimage was made to it by King Magnus of Norway. For two centuries thereafter the jurisdiction was disputed between the bishoprics of Scotland, Ireland, and the Isle of Man. About 1507 it became the seat of the bishopric of the Scottish isles, and was repeopled with monks from Cluny. Many kings of the isles, some of Northumbria, and even of Norway, were buried on this sacred island, which has been long nearly deserted, the present population being about 240. The oldest buildings of which ruins exist appear to be of the eleventh and twelfth centuries. Of the cathedral church a great portion of the walls and the central tower, 75 feet high, are still standing. To the N. are some remains of conventual buildings, which, to judge from a Norman arcade still standing, seem to have been built before the cathedral. See Dr. Johnson's *Tour to the Hebrides*.

Io'nia [= Lat. = Gr. Ἰωνία, deriv. of Ἴων, an Ionian] : the ancient name of a portion of the western seacoast of Asia Minor (Modern Anatolia), upon the Ægean Sea. It derived its name from its inhabitants, the supposed descendants of a mythic hero, Ion, son of Apollo. Ionia extended from Phocæa and the river Hermus to Iassus, S. of Miletus, and was the seat of the Ionian league of twelve cities, chief of which were Ephesus, Smyrna, Clazomenæ, Erythræ, Colophon, and Miletus. Smyrna, however, which subsequently obtained so prominent a position in the league, was originally an Æolic colony, but was captured by an Ionian band and incorporated with the Ionian union. Miletus, which was at one period the most flourishing city belonging to the league, existed long before it, and was originally founded, it was said, by Carian colonists. According to tradition, Ionia was colonized about 1050 B. C. by settlers from Attica; but Dr. E. Curtius, in his *History of Greece*, has shown reasons for believing that the Ionians had resided there from time immemorial. All the cities of Ionia were conquered by Crœsus, after whose overthrow they passed into the hands of Persia (557 B. C.). In 500 B. C. an attempt was made to throw off the Persian yoke, but it failed, and the Ionians were forced to fight with the Persians against the Greeks. They deserted the cause of Persia in the battle of Mycale in 479 B. C. and were finally emancipated from the Persian yoke by the battle of the Eurymedon in 469 B. C. But after the peace of Antalcidas Ionia once again became subject to Persia and so continued until Alexander overthrew the Persian empire. Ionia, as well as Asia Minor in general, was never capable of self-government, but under a strong paternal government the prosperity and wealth of the country was very great. Ionia produced many men distinguished in poetry, philosophy, and history; she gave the world a Homer, not to mention Anacreon, Anaxagoras, Thales, and many other philosophers, as well as the painters Apelles and Parrhasius. J. R. S. STERRETT.

Ionia : city; capital of Ionia co., Mich. (for location of county, see map of Michigan, ref. 7–I); on the Grand river and the Detroit, G. H. and Mil. and the Det., Lans. and N. railways; 35 miles E. of Grand Rapids, 38 miles N. W. of Lansing. It is in an agricultural and lumber region; contains the State Asylum for Insane Criminals, State House of Correction and Reformatory, 2 libraries, public-school property valued at more than $60,000, and 2 daily and 3 weekly newspapers; and is becoming an important manufacturing place. Pop. (1880) 4,190; (1890) 4,482; (1894) 5,021. EDITOR OF "SENTINEL."

Ionian Islands : a chain of islands extending along the western and southern coast of Greece, of which the largest are Corfu, Paxo, Santa Maura, Theaki, Cephalonia, Zante, and Cerigo. Area, 1,041 sq. miles. From the beginning of the fifteenth century to 1797 they belonged to Venetia. From 1797 to 1815 they changed masters five times, but were then formed into a republic under English protection. In 1864 they were ceded to Greece by the British Government, the inhabitants being Greeks. The islands are fertile and well adapted to the cultivation of vines and olive-trees. Currants and olive oil are their main exports. Pop. (1890) about 250,000. Revised by J. R. S. STERRETT.

Ionians [Gr. Ἴωνες, sometimes lengthened into Ἰάονες] : a race of Greek descent who resided chiefly in Asia Minor and the adjacent islands, but spread themselves to all parts of the Eastern Mediterranean, to the delta of the Nile, and to India as far as Orissa. According to the prevailing legend, their ancestor was Ion [Ἴων], the son of Apollo and Creusa, who may perhaps be identified with the Javan of the Mosaic table of the founders of nations. The Greek legends speak of the Ionians as migrating from Attica about the eleventh century B. C., and settling in Asia Minor, incorporating with themselves some of the original inhabitants and driving out the others. The Ionians were ever a maritime race, and some writers urge with much plausibility that they went to Attica from the East, and that their migration to the shores of Asia Minor was a remigration to their original abode; and indeed the Egyptian monuments of the fifteenth century B. C. contain the same group of hieroglyphics by which the Greeks were designated in the time of the Ptolemies. The ancient Sanskrit books speak of the Yavanas, who are supposed to be Ionians who penetrated India from the region of the Euphrates, by way of Kashmir. The Greeks who were left behind by Alexander the Great to hold his fortress on the banks of the Indus were also called Yavanas; and in Northern India all Mohammedans are thus designated. It would thus seem that the Sanskrit term came to be applied in time to all foreign races, of whom the Ionians were the earliest, who reached India from the West, just as throughout the Orient all Europeans are designated as Franks.

Revised by J. R. S. STERRETT.

Ionian Sea : the name of that part of the Mediterranean between Italy and Sicily to the W. and European Turkey and Greece to the E. It forms the gulfs of Taranto and Patras, and communicates with the Adriatic by the Strait of Otranto.

Ionic Dialect : See GREEK LANGUAGE.

Ionic Order : one of the three orders of architecture common to ancient Greek and Roman architecture, and brought again into use in the renaissance of architecture in the fifteenth century. The Ionic is characterized by a capital having volutes, as though an abacus of great length had been curled up in a scroll on either side the shaft. Under this, inclosed between the volutes, is a carved echinus, capping a deeply fluted shaft having flat arrises between the flutings, the shaft standing on a richly molded base. The entablature has an architrave in three bands, a broad frieze, plain or adorned with carving, and a cornice which in some Greek and all Roman examples is decorated with dentels under the corona. All the moldings are richly carved, and there is less difference of detail between the Greek and Ro-

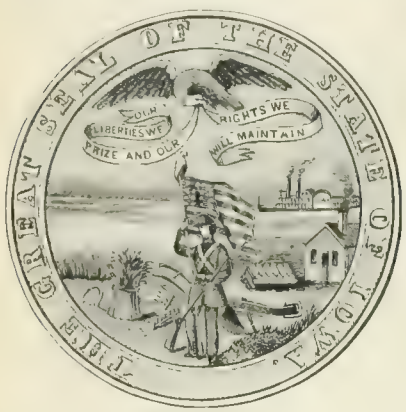
man types than in the case of the Doric and Corinthian orders. See ARCHITECTURE and ORDERS OF ARCHITECTURE.
A. D. F. HAMLIN.

I'os (in Gr. Ἴος): an island of the Ægean, now, but not anciently, reckoned as one of the Cyclades. Its modern name is Nio. It lies N. of Theara and S. W. of Naxos, and is 11 miles long and 5 broad. Area, 20 sq. miles. It is rough, but quite productive, and has a fine harbor, and some 4,000 inhabitants. Homer was said to have been buried on the island, and his grave was shown throughout antiquity. His mother, Clymene, was born on the island, which claimed to be the birthplace of Homer also. Revised by J. R. S. STERRETT.

Io'wa: a river in the State of the same name. It rises in Hancock County, near the Minnesota line, flows S. E. for 300 miles, passing by Iowa City, the former capital of the State, and enters the Mississippi 35 miles N. of Burlington. It is navigable for small steamers to Iowa City, 80 miles from the mouth.

Iowa: one of the U. S. of North America (North Central group); in the upper Mississippi valley; popularly known as the "Hawkeye State."

Situation and Area.—It lies between the Mississippi and Missouri rivers, between 40° 36′ and 43° 30′ N. lat., and 89° 5′ and 96° 31′ W. lon.; is bounded N. by Minnesota, E. by the Mississippi river, which separates it from Wisconsin and Illinois; S. by Missouri, except for a short distance where the Des Moines river forms the boundary; W. by the Missouri and Big Sioux rivers, which separate it from Nebraska and South Dakota; greatest length from E. to W., 306 miles; greatest breadth from N. to S., 204 miles; area, 56,025 sq. miles, or 35,856,000 acres. By the census of 1890 Iowa ranked tenth among the States in population, and first in value of grain and meat products.



Seal of Iowa.

Topography.—The elevation of the State above sea-level varies from 444 feet at the southeast corner of the State to 1,694 at the highest point on the summit divide near Spirit Lake, Dickinson County. The watershed between the waters of the Mississippi and the Missouri crosses the State diagonally, its general course being from the N. W. to the S. E., and the great plateau which forms the State has likewise a gentle and generally even slope in the same direction. The river valleys have in many places steep and rocky bluffs along the river banks, due to the wearing away by the streams of the drift, and in many localities of the underlying rocks also. There are, properly speaking, no hills, the bluffs and slopes in all cases marking depression below the general level of the surface. Iowa is a prairie State, a gently undulating, gradually sloping plane, without large forests, or swamps, or barren wastes. The extensive planting of trees by settlers has already considerably altered the face of the country, and large portions of the State are fast becoming well wooded. Considerably more than half the State is drained by the Mississippi river, into which flow all the longest and largest streams. The more important of those belonging to the eastern or Mississippi system are the upper Iowa, Turkey, Maquoketa, Wapsipinicon, Cedar, Iowa, Skunk, Des Moines, Raccoon, and Boone. In the western or Missouri system are the Floyd, Rock river, Little Sioux, Maple, Boyer, Nishnabotna, Nodaway, Platte, Grand, and Chariton. The Big Sioux is a large stream forming part of the State's western boundary. All these rivers have fertile valleys. Numbers of small but beautiful lakes are in the central third of the northern half of the State. The most attractive of these have become popular places of resort for those seeking health and rest. Spirit Lake and Okoboji Lakes, in Dickinson County, are the largest lakes. West Okoboji, which is 15 miles or more in length, displays the most varied and charming scenery. All the lakes are well stocked with fish, and frequented by water-fowl. In Wright and Sac Counties are small lakes, bordered by walls of bowlders, which have given them the name of Walled Lakes.

Geology.—Except where denuded by the erosion of streams, the whole surface of the State is covered with a thick layer of drift deposited by the retreat of two great glacial sheets of different periods. The indurated rocks exposed along river courses show a measurably complete sequence of strata; a complete vertical section of the rocks shows a thickness of about 5,000 feet. Only in the extreme northwest portion of the State is there surface exposure of the metamorphosed, or massive crystalline rocks. The Sioux granite, or Sioux quartzite, found there, is an exceedingly valuable building-stone. Other igneous formations have been found underlying the stratified rocks in various parts of the State in boring for artesian wells. Of Cambrian rocks, that called by Minnesota geologists St. Croix sandstone is found in the extreme northeast of Iowa. It is supposed by most writers to be an extension of the "Potsdam" of the Appalachian region, and has been so designated, but is probably distinct from it. This formation has been shown by borings to be, in places, not less than 1,000 feet in thickness. Belonging to the Silurian age are found many valuable rocks. The Oneoto limestone (or lower magnesian limestone) supplies unlimited quantities of good material for ordinary masonry and for the manufacture of lime. St. Peter sandstone is seen in the famous "pictured rock" along the Mississippi near McGregor. The Trenton is an ordinary blue limestone, interesting for its rich fossil remains. It occurs in the Mississippi bluffs above Dubuque, and as a surface rock in several of the northeastern counties. Galena limestone, a brown dolomite, contains the lead and zinc ores with traces of silver found in the Dubuque region. It is also valuable for heavy masonry and for lime. The Maquoketa shales, which lie next above, appear to be of little value. The Upper Silurian strata furnish some of the best limestones for building purposes and for the making of lime. They are found in unlimited quantities in the northeast. A broad belt of Devonian rocks follows the entire course of Cedar river, and forms one of the most important geologic horizons in the State. The Lower Carboniferous rocks appear as a series of limestones between the Cedar and Des Moines rivers, and furnish building-stone and lime. Above them lie the Upper Carboniferous, or coal measures. These form the most northerly extension of the great interior coal-field of the continent, and cover the southern third of the State. The coals found are of the bituminous varieties, with some small deposits of fairly good cannel coal. As a rule, the coal is rather soft, and contains more or less pyrites and often small flakes of lime or gypsum. Workable beds are underlaid by a soft, white clay, of which fire-brick is made. Above the coal measures are the Cretaceous deposits found in the northwest section of the State. Of these rocks, four formations have been recognized—the Nishnabotna sandstone, a coarse, dark-brown friable stone; the Fort Dodge beds, containing deposits of gypsum from 2 to 30 feet in thickness; the Woodbury shales, which represent shore deposits and furnish quantities of valuable clays, and the Niobrara chalk, found near the Big Sioux river. Gypsum is quarried like ordinary limestone. Brick and potters' clays and building-sand are plentiful. Iron ore is found in various parts of the State, but in quantities too small to warrant mining.

Soil and Productions.—Over a large part of the State the soils are formed directly through the deposits of the Quarternary age. They vary from a foot to 100 feet in depth. About 95 per cent. of the surface of the State is tillable land. The soft, black loam of the prairies is from 1 to 3 feet deep. It is a drift soil, or diluvial deposit, easily worked, and of almost inexhaustible fertility, free from stumps, and generally free from stones. The loess, found along the Mississippi and Missouri rivers, is a fine, clay-like soil, also a glacial deposit. The alluvial soil of the river bottoms is rich, productive, and durable. As a rule, Iowa soils are porous, light, and warm, and have proved able to mature good crops both in seasons of drought and of excessive rainfall. The most common native trees are the oak, in some half-dozen varieties, hickory, elm, black walnut, cottonwood, maple, and linden. The slippery-elm, butternut, sycamore, ash, box-elder, pine, and cedar are also found. Among native fruits are plums, crab-apples, grapes, cherries, blackberries, raspberries, gooseberries, and strawberries. The wild prairie-grass is used for pasturage and for hay. The

MAP OF
IOWA
Drawn and Engraved on Copper Plate
EXPRESSLY
FOR
JOHNSON'S CYCLOPÆDIA
MINNESOTA
DAKOTA
NEBRASKA
ILLINOIS
OSCEOLA
EMMET
KOSSUTH
WINNEBAGO
WORTH
MITCHELL
HOWARD
CLAYTON
O'BRIEN
CLAY
PALO ALTO
HANCOCK
WRIGHT
FRANKLIN
BUTLER
BREMER
PLYMOUTH
CHEROKEE
BUENA VISTA
POCAHONTAS
HUMBOLDT
WEBSTER
HAMILTON
HARDIN
GRUNDY
BLACK HAWK
BUCHANAN
DELAWARE
DUBUQUE
WOODBURY
IDA
SAC
CALHOUN
GREENE
BOONE
STORY
MARSHALL
TAMA
BENTON
LINN
JONES
JACKSON
CLINTON
CRAWFORD
CARROLL
AUDUBON
GUTHRIE
DALLAS
POLK
JASPER
POWESHIEK
IOWA
JOHNSON
CEDAR
SCOTT
MUSCATINE
HARRISON
SHELBY
POTTAWATTAMIE
PAGE
ADAIR
MADISON
WARREN
MARION
MAHASKA
KEOKUK
WASHINGTON
MONTGOMERY
ADAMS
UNION
CLARKE
LUCAS
MONROE
WAPELLO
JEFFERSON
HENRY
DES MOINES
TAYLOR
RINGGOLD
DECATUR
WAYNE
APPANOOSE
DAVIS
VAN BUREN
LEE

following table shows the acreage, yield, and value of the principal crops in 1893:

CROPS.	Acreage.	Yield.	Value.
Corn	7,428,677	251,832,150 bush.	$67,994,681
Wheat	586,889	6,749,224 "	3,307,120
Oats	3,848,719	95,448,231 "	21,953,093
Rye	81,078	1,184,739 "	485,333
Barley	513,233	11,509,066 "	3,827,692
Buckwheat	25,016	330,211 "	201,429
Potatoes	168,195	9,755,310 "	6,340,952
Hay	5,457,335	8,022,089 tons	53,115,148
Totals	18,109,142		$157,225,448

The farm animals in 1894 comprised 1,367,329 horses, value $59,792,200; 36,187 mules, value $1,938,145; 1,278,231 milch cows, value $30,127,905; 2,731,385 oxen and other cattle, value $54,064,497; 775,222 sheep, value $2,004,724; and 5,996,179 swine, value $49,403,718: total value $197,331,189.

Climate.—From its location far from any large bodies of water, from its nearly uniform elevation and its lack of extensive forests, the climate of Iowa is very nearly homogeneous, having only the meteorological variations in different parts of the State which result from latitude and the slight variations in altitude. Its climate is what is known as continental, and is frequently, though not invariably, marked by winters of considerable severity and summers with brief periods of intense heat. The average total annual precipitation of moisture is 35·74 inches, about half of which falls during the months of May, June, July, and August. In spite of the abundant rainfall, Iowa has a large percentage of sunshine. The range of temperature is considerable, being about 120° from the minimum of winter to the maximum of summer, but the extremes are of short duration. The annual mean temperature is about 47°. Tables of vital statistics show the healthfulness of Iowa to be equal to that of any other State.

EXTREME AND AVERAGE TEMPERATURE * AND TOTAL AVERAGE PRECIPITATION IN INCHES FOR 1892. COMPILED FROM OBSERVATIONS AT SIXTY-SIX STATIONS IN ALL PARTS OF THE STATE.

MONTHS.	Maximum temperature.	Minimum temperature.	Mean temperature	Total precipitation.
January	58°	−38°	15·3°	1·07
February	68	−20	27·8	1·19
March	84	−8	31·7	2·29
April	88	14	45·5	4·72
May	88	30	54·0	6·89
June	102	40	68·8	5·35
July	104	38	73·5	5·03
August	102	40	71·4	2·29
September	99	29	64·3	1·66
October	96	14	53·9	1·55
November	70	−31	32·9	1·06
December	64	−29	18·6	1·70

* The table gives the lowest and the highest temperature reported in any part of the State for each month.

Divisions.—For administrative purposes, Iowa is divided in ninety-nine counties, as follows:

COUNTIES AND COUNTY-TOWNS, WITH POPULATION.

COUNTIES.	*Ref.	Pop. 1890.	Pop. 1895.	COUNTY-TOWNS.	Pop. 1895.
Adair	6-F	14,534	15,504	Greenfield	1,244
Adams	7-E	12,292	12,934	Corning	1,769
Allamakee	2-J	17,907	17,981	Waukon	1,852
Appanoose	7-H	18,961	25,383	Centerville	5,564
Audubon	5-E	12,412	12,836	Audubon	1,585
Benton	5-I	24,178	24,244	Vinton	3,150
Black Hawk	4-I	24,219	26,941	Waterloo	8,490
Boone	5-G	23,772	27,039	Boone	8,845
Bremer	3-I	14,630	15,403	Waverly	2,916
Buchanan	4-J	18,997	20,539	Independence	5,142
Buena Vista	3-E	13,548	15,029	Storm Lake	1,924
Butler	3-H	15,463	16,966	Allison	426
Calhoun	4-F	13,107	15,788	Rockwell City	742
Carroll	5-E	18,828	19,493	Carroll	2,829
Cass	6-E	19,645	20,926	Atlantic	4,954
Cedar	5-K	18,253	19,008	Tipton	2,244
Cerro Gordo	2-H	14,864	18,262	Mason City	5,627
Cherokee	3-D	15,659	15,664	Cherokee	3,092
Chickasaw	2-I	15,019	15,696	New Hampton	1,619
Clarke	7-G	11,332	11,515	Osceola	2,176
Clay	2-E	9,309	11,277	Spencer	2,551
Clayton	3-J	26,733	26,570	Elkader	798
Clinton	5-K	41,199	43,308	Clinton	23,377
Crawford	5-D	18,894	20,059	Denison	2,256
Dallas	5-F	20,479	21,023	Adel	1,081
Davis	7-I	13,328	15,015	Bloomfield	2,047
Decatur	7-G	15,643	16,639	Leon	1,651
Delaware	4-J	17,349	18,103	Manchester	2,683
Des Moines	7-K	35,524	37,629	Burlington	25,246
Dickinson	2-E	4,328	5,023	Spirit Lake	1,056
Dubuque	4-K	49,848	60,177	Dubuque	40,574
Emmet	2-E	4,274	7,619	Estherville	2,498
Fayette	3-J	23,141	24,794	West Union	1,801
Floyd	2-H	15,424	17,114	Charles City	4,201
Franklin	3-H	12,871	13,679	Hampton	2,527
Fremont	7-D	16,842	17,176	Sidney	939
Greene	5-F	15,797	16,299	Jefferson	2,200
Grundy	4-H	13,215	13,418	Grundy Center	1,322
Guthrie	5-F	17,380	17,558	Guthrie Center	1,141
Hamilton	4-G	15,319	18,514	Webster City	5,095
Hancock	2-G	7,621	11,141	Concord	
Hardin	4-H	19,003	20,576	Eldora	2,096
Harrison	5-C	21,356	23,091	Logan	1,102
Henry	7-J	18,895	18,278	Mt. Pleasant	3,920
Howard	2-I	11,182	13,221	Cresco	2,789
Humboldt	3-F	9,836	11,431	Dakota	349
Ida	4-D	10,705	11,425	Ida Grove	1,720
Iowa	5-I	18,270	18,964	Marengo	2,027
Jackson	4-L	22,771	23,471	Maquoketa	3,448
Jasper	5-H	24,943	25,891	Newton	3,213
Jefferson	7-J	15,184	16,405	Fairfield	4,026
Johnson	5-J	23,082	23,763	Iowa City	7,526
Jones	4-K	20,233	20,088	Anamosa	2,006
Keokuk	6-I	23,862	23,732	Sigourney	1,777
Kossuth	2-F	13,120	18,345	Algona	2,487
Lee	7-K	37,715	39,528	Fort Madison	10,022
Linn	5-J	45,303	49,905	Marion	3,766
Louisa	6-K	11,873	12,786	Wapello	1,290
Lucas	7-H	14,563	13,545	Chariton	3,322
Lyon	2-C	8,680	11,684	Rock Rapids	1,740
Madison	6-F	15,997	16,597	Winterset	2,703
Mahaska	6-I	28,805	32,496	Oskaloosa	8,551
Marion	6-H	23,058	23,191	Knoxville	2,862
Marshall	5-H	25,842	27,320	Marshalltown	10,049
Mills	7-D	14,548	15,187	Glenwood	2,143
Mitchell	2-H	13,209	14,431	Osage	2,509
Monona	5-C	14,515	16,005	Onawa	1,675
Monroe	7-H	13,666	15,790	Albia	2,388
Montgomery	7-E	15,848	17,119	Red Oak	4,324
Muscatine	6-K	24,504	25,339	Muscatine	12,237
O'Brien	2-D	13,060	15,609	Primghar	839
Osceola	2-D	5,574	7,377	Sibley	1,282
Page	7-E	21,341	22,026	Clarinda	3,024
Palo Alto	2-E	9,318	12,109	Emmetsburg	2,104
Plymouth	3-C	19,568	21,991	Le Mars	5,046
Pocahontas	3-F	9,553	12,442	Pocahontas	991
Polk	5-G	65,410	72,888	Des Moines	56,359
Pottawattamie	6-D	47,430	46,042	Council Bluffs	20,189
Poweshiek	5-I	18,394	18,524	Montezuma	1,231
Ringgold	7-F	13,556	14,095	Mt. Ayr	1,385
Sac	4-E	14,732	15,868	Sac City	1,601
Scott	5-L	43,164	45,869	Davenport	30,010
Shelby	5-D	17,611	17,798	Harlan	2,297
Sioux	2-C	18,370	21,408	Orange City	1,480
Story	5-G	18,127	19,930	Nevada	2,107
Tama	5-I	21,051	22,966	Toledo	1,848
Taylor	7-E	16,384	17,347	Bedford	2,070
Union	7-F	16,900	17,043	Creston	6,630
Van Buren	7-J	16,253	16,829	Keosauqua	1,263
Wapello	7-I	30,426	33,293	Ottumwa	16,761
Warren	6-G	18,269	18,506	Indianola	2,825
Washington	6-J	18,468	18,845	Washington	3,671
Wayne	7-G	15,670	16,155	Corydon	1,058
Webster	4-F	21,582	26,945	Fort Dodge	8,756
Winnebago	2-G	7,325	10,707	Forest City	1,392
Winneshiek	2-J	22,528	22,748	Decorah	3,141
Woodbury	4-C	55,632	46,202	Sioux City	27,371
Worth	2-H	9,247	10,285	Northwood	1,133
Wright	3-G	12,057	16,024	Clarion	1,360
Totals		1,911,896	2,058,069		

* Reference for location of counties, see map of Iowa.

Principal Cities and Towns (1895).—Des Moines (capital), 56,359; Dubuque, 40,574; Davenport, 30,010; Sioux City, 27,371; Burlington, 25,246; Clinton, 23,377; Cedar Rapids, 21,555; Council Bluffs, 20,189; Ottumwa, 16,761; Keokuk, 14,287; Muscatine, 12,237; Marshalltown, 10,049; Fort Madison, 10,022; Boone, 8,845; Waterloo, 8,490; Iowa City, 7,526; and Creston, 6,630.

Population and Races.—In 1860, 674,913; 1870, 1,194,020; 1880, 1,624,615; 1890, 1,911,896; 1895, 2,058,069 (native, 1,727,521; foreign, 330,548; males, 1,065,130; females, 992,939; white, 2,046,180; colored, 11,889, including 114 Chinese and 13 Japanese).

Industries and Business Interests.—Iowa industries are mainly those connected with agriculture. There are 392 coal mines, which in 1890 produced 6,095,358 tons, valued at more than $5,000,000, and gave employment to more than 9,000 men, whose wages amounted to $3,783,572, while the capital invested was estimated at $6,279,779. Of the 1,954 limestone quarries in the U. S. reported by the census of 1890, 143 were in Iowa. Their products in stone and lime had an annual value of $477,222, giving the State the

rank of tenth among the States in value of such products. The product of the gypsum mines and factories in 1889 was valued at $55,250. The value of lead and zinc mined near Dubuque is considerable. Though Iowa is pre-eminently an agricultural State, yet manufacturing industries have not been neglected and their importance has steadily increased. The State produces in great abundance raw materials for many lines of manufacture; the numerous streams furnish water-power, and about one-third of the counties supply coal, so that there is no lack of power obtainable at small cost. In 1893 there were 154 national banks, with capital of $14,325,000 and deposits of $30,491,755; 177 State banks, with assets of $26,120,866; 148 savings-banks, with assets of $34,733,976; 185 private banks, with capital of $14,325,000 and deposits of $30,491,755; and 8 incorporated loan and trust companies, with capital of $2,122,028 and deposits of $1,001,399.

Finance.—The State debt was extinguished in 1892. The assessed valuation of all taxable property in 1893 was $560,000,000, and the taxes levied in the preceding year amounted to $16,909,874.

Post-offices and Periodicals.—On Jan. 1, 1894, there were 1,860 post-offices, of which 7 were first-class, 24 second-class, 156 third-class, 187 presidential, 1,673 fourth-class, 862 money-order offices, 6 money-order stations, and 49 postal-note offices. There were 58 daily, 2 tri-weekly, 12 semi-weekly, 776 weekly, 3 bi-weekly, 10 semi-monthly, 85 monthly, 1 bi-monthly, and 4 quarterly periodicals; total 951.

Libraries.—In 1892 there were 95 libraries of 1,000 volumes and over, which contained 424,856 volumes and 58,160 unbound pamphlets. They were classified as follows: general, 34; school, 22; college, 25; college society, 1; law, 3; public institution, 3; Y. M. C. A., 1, scientific, 3; historical, 1; and society, 2.

Means of Communication.—The first railway was built in Iowa in 1855, when 68 miles were reported. The Chicago and Northwestern was the first line to cross the State, reaching Council Bluffs in 1867. In 1893 there were 8,513·76 miles of railway, estimated by the State railway commissioners to have cost, with equipment, $234,269,763.28. The total earnings for the year ending June, 1893, were estimated at $45,003,680.51. The various railways have received 4,674,744·88 acres of land by congressional grants. The taxes paid by railways in the State amounted in 1892 to $1,279,906.85.

Churches.—The census of 1890 gave the following statistics of the principal religious bodies:

DENOMINATIONS.	Organizations.	Churches and halls.	Members.	Value of church property.
Roman Catholic	425	452	161,684	$3,843,400
Methodist Episcopal	1,342	1,326	111,426	3,344,245
Disciples of Christ	403	387	30,988	708,100
Baptist	417	421	30,901	1,162,640
Presb. in the U. S. of America	369	374	29,994	1,503,400
Congregational	285	293	23,733	1,231,886
Lutheran, General Council	174	174	20,009	420,680
Lutheran, United Norwegian	113	106	14,891	220,100
Lutheran, Synodical Conference	139	82	13,252	194,715
United Brethren in Christ	213	210	10,401	211,323
Evangelical Association	188	201	9,761	299,235
Friends, Orthodox	74	78	8,146	102,632
United Presbyterians	101	101	7,769	274,200
Lutheran, Norwegian	49	42	7,059	97,800
Protestant Episcopal	105	107	6,481	887,400

Schools.—In 1892 the population of school age (5–21 years) was 675,024; the enrollment in the public schools was 509,830; and the expenditures for public schools was $7,190,191. The State University at Iowa City, the Agricultural College at Ames, and the State Normal School at Cedar Falls had a total attendance of 2,157 students. For these institutions the biennial appropriations in 1892 were $158,200. There were 17 denominational colleges and universities which reported a total attendance of 5,214 students; 5 seminaries reported 886 students, and 11 other schools, business and normal schools, academies, etc., reported 3,830 students.

Charitable, Reformatory, and Penal Institutions.—The State maintains a College for the Blind in Vinton; Industrial Home for Adult Blind in Knoxville (opened 1892); Institution for Feeble-minded Children in Glenwood; Soldiers' Home in Marshalltown; Soldiers' Orphans' Home and Home for Indigent Children in Davenport; State School for the Deaf in Council Bluffs; Industrial Reform School, with boys' department in Eldora and girls' department in Mitchellville; hospitals for the insane in Clarinda, Independence, and Mt. Pleasant; and State penitentiaries in Anamosa and Fort Madison.

State Government.—The executive authority is vested by the constitution in a Governor and a Lieutenant-Governor, elected at the same time for terms of two years. The Lieutenant-Governor is president of the State Senate. The legislative authority is vested in a General Assembly, consisting (1894) of a Senate of fifty members, elected for four years, and a House of 100 Representatives, elected for two years. The Legislature meets biennially, and sessions are unlimited as to time. The judicial authority is vested in a Supreme Court, comprising a chief justice and four associate justices, and the usual appellate, county, and minor courts. The right of suffrage is extended to every male citizen twenty-one years old and upward who has been a resident of the State for six months and of the county for sixty days, excepting idiots, insane persons, non-resident U. S. soldiers and marines, and persons convicted of infamous crimes.

History.—The first white men to tread the soil of Iowa were French. Marquette and Joliet visited it in 1673, as they followed the course of the Mississippi to its mouth. Julien Dubuque, with ten others, went there in 1788 to work the lead mines at Dubuque, but the settlement was abandoned at his death. In 1799 Louis Honoré Tesson located at the head of the Lower Rapids in what is now Lee County, but made no permanent settlement. France laid claim in 1673 to all the lands drained by the Mississippi, on the ground of Marquette's explorations. The French claim was transferred to Spain by treaty in 1763, but was again ceded to France in 1800–01, and, as the "Louisiana Purchase," became, in 1803, the property of the U. S. Since then the Territory, now comprising the State of Iowa, has belonged successively to the territorial governments of Louisiana, Indiana, Missouri, Michigan, and Wisconsin, and did not become a separate Territory until 1838. It was admitted to the Union as a State in 1846. The first permanent settlements were made by white men who were attracted by the lead mines at Dubuque. Finding themselves in need of the protection of law, they organized an independent civil government and adopted a brief code of laws. Other voluntary associations for mutual protection and control were formed in other parts of the State, lasting until the land was again taken under the authority of an established government. The Indian claims to Iowa Territory were purchased by the U. S. in several successive treaties, from 1832 to 1843, and for many years previous to 1893 only a small remnant of the Sacs and Foxes has remained of all the original tribes within the State. These occupy a narrow reservation of 419 acres, on the Iowa river, in Tama County, and receive Government annuities. An important Indian raid occurred in 1857, known as the Spirit Lake massacre, when upward of forty settlers near the Okoboji and Spirit Lakes were killed, and most of their dwellings destroyed. The population of the region was then nearly annihilated, and the development of that portion of the State greatly retarded. The State capital was first located at Iowa City, but was removed in 1857 to Des Moines, where, between 1870 and 1880, was erected the beautiful capitol building which cost nearly $3,000,000. Iowa sent 75,519 men into the Federal armies during the civil war (including those enlisted in the regiments of other States), which was one-tenth of its entire population.

GOVERNORS OF IOWA.

Territorial.

Robert Lucas	1838–41
John Chambers	1841–46
James Clark	1846

State.

Ansel Briggs	1846–50
Stephen Hempstead	1850–54
James W. Grimes	1854–58
Ralph P. Lowe	1858–60
Samuel J. Kirkwood	1860–64
William M. Stone	1864–68
Samuel Merrill	1868–72
Cyrus C. Carpenter	1872–76
Samuel J. Kirkwood	1876–77
Joshua G. Newbold	1877–78
John H. Gear	1878–82
Buren R. Sherman	1882–86
William Larrabee	1886–90
Horace Boies	1890–94
Frank D. Jackson	1894–96
Francis M. Drake	1896–

AUTHORITIES.—No complete and worthy history of Iowa exists. The annals and monographs of the State Historical Society and numerous biographical writings are a storehouse of material for such a work. The early diplomatic history of what is now the State of Iowa is included with that of the remainder of the Louisiana Purchase, and is found in the larger histories of the U. S.; the *History of the Discovery and Settlement of the Mississippi Valley*, by John W. Monette, gives from original sources some portion of

that early history. *Institutional Beginnings in a Western State*, by Jesse Macy (Johns Hopkins's *Series of Historical Monographs*, 1886), treats of certain important phases in the life of the earliest settlers. Facts as to the characteristics and resources of the State are to be learned chiefly from official reports and from a large number of purely scientific publications. See also *Handbook of Iowa* (State Columbian Commission, 1893). JESSE MACY.

Iowa Agricultural College: an institution established by an act of the State Legislature in 1858, providing for the purchase of a farm, the erection of buildings, and for experiments in agriculture. In 1859 the trustees secured a section of land for the college farm, near Ames, Story County, 35 miles N. of Des Moines. In 1862 Congress made grants of land under certain conditions to each State that had established or should establish a college of agriculture and the mechanic arts. Those conditions were accepted by the Iowa Legislature in 1862, and the land grants became the basis of the present endowment of the college—about $650,000, yielding an annual cash income of some $45,000. The equipment of the college consists of the farm of 900 acres, worth, aside from buildings, some $35,000; buildings costing about $350,000; apparatus, including shop and farm machinery, live stock, physical, chemical, veterinary, and other apparatus, $100,000; about 10,000 volumes in library; museum has large collections. There are seven courses of study, all leading to degrees. In 1892 there were thirty-three professors and instructors, and 500 students of both sexes.
W. M. BEARDSHEAR.

Iowa City: city; capital of Johnson co., Ia. (for location of county, see map of Iowa, ref. 5–J); on the Iowa river, and the Burl., Ced. Rap. and N., and the Chi., R. Is. and Pac. railways; 54 miles W. by N. of Davenport, 121 miles E. of Des Moines. It is in a stock-raising region; is the seat of the State University (founded in 1847); and contains Iowa City Academy (non-sectarian, opened 1860), the quarters of the State Historical Society, 18 churches, 7 public-school buildings, public-school property valued at more than $60,000, and a monthly, a quarterly, 2 daily and 6 weekly periodicals. It has flour, woolen, flax, and oil mills, glove-factory, and pork-packing plant. It was the capital of the Territory and State of Iowa, 1839–55. Pop. (1880) 7,123; (1890) 7,016; (1895) 7,526. EDITOR OF "REPUBLICAN."

Iowa College: the oldest college in Iowa; situated at Grinnell; founded at Davenport in 1847 by an association of Congregationalists. In 1860 the college was removed from Davenport to Poweshiek County, in the center of the State, where Hon. J. B. Grinnell had founded a colony-town bearing his name, composed of people from the Eastern States entirely. The religious influences of the college have always been very strong, though unsectarian. The aim of the college has been to excel in scholarship, thoroughness, and discipline, rather than in numbers. There is a preparatory academy. Women were admitted in 1857. Its endowment is over $250,000; the value of its buildings, grounds, and equipments is about $200,000 more. It holds a central position in the State, at the crossing of the Chicago, Rock Island and Pacific Railway and Central Railroad of Iowa. On June 17, 1882, the college buildings and equipment were demolished by a tornado. The buildings, of which there are six, were replaced by far better ones. About 500 students are catalogued yearly. GEORGE A. GATES.

Iowa Falls: town (founded in 1850); Hardin co., Ia. (for location of county, see map of Iowa, ref. 4–H); on the Iowa river, which here has a succession of rapids from which the town derives its name, and on the Burl., Cedar Rap. and N., the Chi., Ia. and Dak., and the Ill. Cent. railways; 143 miles W. of Dubuque. It manufactures flour, machinery, and tiles, and has two newspapers. Pop. (1890) 1,796; (1895) 2,234.

Iowas: See SIOUAN INDIANS.

Iowa, State University of: an institution located in Iowa City; on the Chicago, Rock Island and Pacific Railway; 55 miles W. of Davenport. It was opened in 1855, and organized on its present basis in 1860. It has six departments: collegiate, which dates from the beginning; law, established in 1868; medical, in 1870; homœopathic medical, in 1877; dental, in 1882; and pharmaceutical, in 1886. The faculty of the university consists of a president and over eighty professors and instructors. The number of students in 1893–94 was 1,127. It has a permanent fund of about $234,000, derived from the sale of the university land grant. The total income during the year 1893–94 was about $130,000, exclusive of the amount spent in the erection of buildings. Of this, $16,500 was derived from the permanent fund, $46,500 from tuition, and $67,500 from State appropriations. CHARLES A. SCHAEFFER.

Ip'ecac [from Portug. *ipecacuanha*, from Brazilian *ipecaaguen*, the native name]: an important drug, the dried root of *Cephaëlis ipecacuanha*, a small, shrubby, perennial plant, natural order *Rubiaceæ*, growing in Brazil. The root is slender, from 4 to 6 inches long, and marked with annular ridges. The stem is also slender, and rises but a few inches from the ground. The plant seldom bears over six leaves; the flowers are white and very small, and collected into a closely packed group surmounting a round axillary foot-stalk. It yields a fawn-colored powder of peculiar smell and acrid, bitter taste. Its active principle is an alkaloid, *emetine*, which, when pure, is a white uncrystallizable powder, difficultly soluble in water, but soluble in alcohol. The common, impure article of the shops is in transparent brownish-red scales, deliquescent, and very soluble in water and alcohol. Ipecac, locally, is mildly irritant, but some persons are so susceptible that merely opening a bottle of the powder will cause sneezing, and even an asthmatic seizure. Taken internally in minute doses, as one-sixth to one-fourth of a grain, ipecac, like other irritants, tends to increase the appetite and promote digestive vigor. In somewhat larger quantities it disturbs the stomach, and causes relaxation of the mucous membrane of the alimentary canal and air-passages, with accompanying increase of their secretions. In large dose it causes speedy vomiting and nausea, and a still greater effect on the mucous membranes just mentioned. Ipecac is accordingly used in small dose as a stomachic tonic, in somewhat larger as a relaxer of the dry and stiffened condition of the respiratory mucous membrane in the first stage of a catarrh, and in still larger doses as an emetic. With certain precautions the emetic effect even of a large dose may be avoided, and thus given ipecac is a valuable remedy in dysentery. Powdered ipecac and opium, 1 part each, and sugar of milk 8 parts, form the well-known compound ipecac powder or Dover's powder.
Revised by H. A. HARE.

Iphic'rates: Athenian general; born in Athens about 416 B. C., of parents belonging to the lower classes, whose very citizenship was contested, he rose by his genius to the highest honors. When only twenty years old he was appointed commander-in-chief and was defeated by the Spartans at Lechæum in 393 B. C., but, having organized a force of light-armed soldiers, *peltastæ*, and introduced strict military discipline, he turned defeat into victory by destroying the Spartan garrison of Lechæum in 392. In 391 he resigned his command because the Athenians did not approve of his harsh measures against the Argives. The next year he was sent to Thrace with eight ships to defend Athenian interests, and succeeded in annihilating the force of Anaxibius, though his success was nullified by the peace of Antalcidas. He then made war upon the Thracians; was twice defeated by Cotys their king (387–384 B. C.), but he finally came to terms with Cotys and married his daughter (382), a *mésalliance* which the comedians did not fail to ridicule. In accordance with the wishes of Pharnabazus Iphicrates was sent in 379 as commander of the Greek mercenary troops which were to assist Artaxerxes in reconquering Egypt, but a disagreement arose between him and the Persian satrap. Pharnabazus and Iphicrates fled to Athens. The Athenians appointed him admiral in the place of Timotheus, and he proceeded to the aid of Corcyra. He was so successful that the Athenians erected a bronze statue in his honor. But still he was arraigned by Harmodius on the ground that the award of a statue was illegal. Iphicrates defended himself successfully in a celebrated speech which proved him an orator as well as a general. In 369 he was sent against Thebes, but was unsuccessful, and accomplished little against Amphipolis in the following year. He then spent some time with his father-in-law Cotys, but left him when he began to attack the Athenians in the Chersonesus. In 364 he was again made commander against Amphipolis, and was more successful than on the former occasion. He afterward served against the revolted allies of Athens, but was again arraigned on a charge of treachery. His oratorical gifts saved his life. Part of his speech on this occasion has been preserved by Aristotle. Iphicrates returned to Thrace, where he died in 353 B. C. J. R. S. STERRETT.

Iphigeni'a [Gr. Ἰφιγένεια, originally an epithet of Artemis]: in Greek legend, the daughter of Agamemnon and

Clytemnestra, though some of the ancients said that she was the daughter of Theseus and Helen, and that she had been reared by Clytemnestra in order to shield her sister from disgrace. When the Greek fleet lay in Aulis, detained by a dead calm and a plague as well, the seer Calchas declared that both calm and plague had been sent by Artemis in anger because Agamemnon had killed one of her sacred stags in her grove, and had used blasphemous language in regard to the goddess herself. The wrath of the goddess could be appeased, said Calchas, only by the sacrifice of Iphigenia, and though Agamemnon was very loth to sacrifice his daughter, yet he was overpersuaded by Ulysses, and Iphigenia was brought to Aulis under the pretext of marriage to Achilles, but when carried to the altar to be sacrificed, Artemis herself substituted a doe for the virgin, and carried Iphigenia through the air to the land of the Taurians, where she was installed as priestess in the temple of Artemis Taurica, to whom human sacrifice was offered, all foreigners being legitimate victims. In after years Apollo, the god of the Delphic oracle, declared to Orestes, the brother of Iphigenia, that he would be completely cured if he should bring his sister from Taurica. Now, as Artemis was the sister of Apollo, Orestes thought that he had been required to bring from Taurica the old wooden image (*ξόανον*) of Artemis. In company with Pylades he went to Taurica to carry away the image, but both were captured and brought to the priestess to be sacrificed. During the conversation that ensued brother and sister recognized each other, and it became clear that Apollo had required Orestes to bring back home his own sister Iphigenia. Iphigenia died in Megara, where there was a heroon in her honor, though Hesiod says that she did not die at all, but was changed to Hecate by Artemis. J. R. S. STERRETT.

Ipiales, ĕe-pĕe-aa'lāz: a town of Colombia; in the southwestern part of the department of Cauca, close to the frontier of Ecuador; in the plateau of the Andes, 10,108 feet above the sea. It has the only custom-house on this frontier, established to permit commerce with Tulcan and Ibarra, in Ecuador; but the trade in that direction is not large, and much of it is believed to be contraband. Goods, and even travelers, are generally carried on the backs of Indians over dizzy mountain roads. The climate is cold. Pop. of town about 10,000. HERBERT H. SMITH.

Ipomœa: See JALAP.

Ipsambul: usually called Abu-Simbel; the classical Aboccis; the place on the west bank of the Nile, in 22° 20′ N. lat., where Ramses II. cut two temples from the rock at the foot of a precipitous cliff. They are the largest Egyptian structures in Nubia, and are second to none in Egypt itself. In front are four colossal seated figures (55 feet high) representing Ramses II., with smaller figures of members of his family between them. (See ARCHITECTURE, Fig. 1.) The rock was smoothed for a space 119 feet long and 105 feet high. The chambers cut in the rock reach a depth of 185 feet, and contain pillars 19 feet high. The walls are covered with inscriptions and decorations which portray with great detail and vividness some of the deeds and exploits of Ramses II. and his sons. The temples were dedicated to Ra-Harmachis and Amon. CHARLES R. GILLETT.

Ipsara: a small island in the Grecian Archipelago, more often called PSARA (*q. v.*).

Ip'sus [= Gr. Ἴψους, or Ἴψος]: small town of Phrygia, Asia Minor; celebrated for the great battle fought there (B. C. 301) between King Antigonus and his son, Demetrius Poliorcetes, and the combined forces of CASSANDER, LYSIMACHUS, PTOLEMY, and SELEUCUS (*qq. v.*), in which Antigonus was slain and his dominions conquered. In the seventh and eighth centuries A. D. Ipsus was the seat of a Christian bishopric. Its exact site has not yet been found, though it was probably at the foot of Sultan Dagh, in the neighborhood of Tchai or Isaklü, midway between Afium and Ak Shehir. Revised by J. R. S. STERRETT.

Ips'wich: county-town of Suffolk, England; on the Orwell; 69 miles by rail N. E. of London (see map of England, ref. 11–L). It has many educational institutions, among which are a grammar school founded by Cardinal Wolsey, who was born here, a mechanics' institute and a workingmen's college, large iron and soap factories, manufactures of agricultural implements and clothing, and extensive ship-building docks. Ipswich was pillaged by the Danes in 991 and 1000. It has returned two members to Parliament since 1447. Pop. (1891) 57,360.

Ipswich: town of Queensland, Australia; on the Bremer; 24 miles W. of Brisbane (see map of Australia, ref. 5–J). It was incorporated into a municipality in 1860, and is a growing and prosperous place. Pop. (1891) 7,625.

Ipswich: town (settled by John Winthrop in 1633); Essex co., Mass. (for location, see map of Massachusetts, ref. 1–I); on the Ipswich river, and the Boston and Maine Railroad; 3 miles W. of the Atlantic Ocean, 27 miles N. E. of Boston. A meeting-house was built here in 1634 and a free school opened in 1642. Ipswich has manufactures of cotton and woolen goods, shoes, and isinglass; one of the State hospitals for the insane; the Manning High School, endowed with $54,000; the Heard public library, which in 1892 had 11,500 volumes and funds aggregating $32,500; and 2 weekly newspapers. Pop. (1880) 3,699; (1890) 4,439; (1895) 4,720.

Iquique, ĕe-kee'kā: a seaport-town of the province of Tarapacá, Chili; on the Pacific; lat. 20° 13′ S. (see map of South America, ref. 6–C). The harbor is partly protected by a small island. The country back of Iquique is rainless and almost entirely devoid of vegetation; there is no running water, and the town has been inadequately supplied by an aqueduct from one of the high valleys of the Andes. This town in a desert owes its existence and importance to the rich deposits of nitrates in the surrounding country and inland to the Andes; to these have been added important mines of silver lately developed. A system of railways, aggregating nearly 200 miles, connects it with the mineral lands. In the vicinity there are numerous nitrate-refineries and silver-reducing establishments. Until the middle of the eighteenth century Iquique was a mere collection of huts; it has been built up largely by British capital, which also constructed the railways. The place has suffered severely from earthquakes. The Chilians blockaded the port soon after they declared war on Peru in 1879; a naval engagement took place in the bay May 21, and the Chilians bombarded the town in July, took it at the end of the year, and it was ceded to them by the treaty of 1884. It is now the most populous place in Northern Chili. Pop. (1893) about 20,000, largely made up of miners and adventurers. HERBERT H. SMITH.

Iquitos, ĕe-kee'tōs: town in the department of Loreto, Peru; on the left bank of the Marañon, or upper Amazon, at the mouth of the Nanay affluent; lat. 3° 44′ S. and lon. 73° W. The houses are mostly of palm-thatch, and the majority of the inhabitants are Indians, but, since the introduction of steam navigation on the Marañon, Iquitos has acquired considerable commercial importance and it must eventually be the emporium of the Peruvian Amazon. Pop. about 6,000. H. H. S.

Irak-Ajmi, ĕe-raak'aaj'mĕe: the central province of Persia; bounded N. by Azerbijan, Ghilan, and Mazanderan, E. by Khorassan, S. by Farsistan and Khuzistan, and W. by Ardilan and Farsistan. It is traversed by ranges of naked and barren mountains, which by degrees sink down from the high Elboorz in the west into a desert table-land in the east. The valleys along the rivers, some of which lose themselves in the desert, are fertile, and the province contains several of the largest cities of the empire, such as Teheran, Ispahan, and Koom. Administratively it is divided into seven governments. Irak is an Arabic name for a region N. and N. W. of the Persian Gulf. That part which is Arabic is called Irak-Arabi; that part which is Persian is Irak-Ajmi (i. e. non-Arabic Irak).
Revised by M. W. HARRINGTON.

Irak-Arabi: Turkish vilayet (province) of Bassorah. It is an immense tract of territory, bounded E. by Persia, and stretching on both sides the Tigris and lower Euphrates southward to the Persian Gulf. In it are found the sites of Babylon, Seleucia, and Ctesiphon, and it includes ancient Chaldæa. Since its conquest by Khaled (633) nomadic Arabs have formed the majority of its population. Capital, Bassorah (Basra), 60 miles from the mouth of the Euphrates.
E. A. G.

Irala, ĕe-raa'laă, DOMINGO MARTINEZ, de: soldier; b. at Vergara, in Guipuzcoa, Spain, in 1487. He was one of the officers who went to the Rio de la Plata with Mendoza in 1534, and commanded the fleet under Ayolas in the exploration of the Paraná and Paraguay, 1536. Mendoza and Ayolas having died, Irala was elected governor of the nascent colonies on the Plata and Paraguay in 1537; he made his capital at Asuncion, and continued the exploration of

the Paraguay and the adjacent countries until 1542, when Cabeza de Vaca arrived from Spain to supersede him. The new governor was deposed by a mutiny in Apr., 1544, and Irala was reinstated. In 1546 he attempted to lead an expedition overland to Peru, and succeeded in reaching a point whence he sent Nuflo de Chaves to Cuzco; thereafter there was regular communication between the two countries. Irala was obliged to suppress some transient rebellions, but in the main he ruled with great success until his death, at Itá, near Asunción, 1557. HERBERT H. SMITH.

Iran: See PERSIA.

Iranian Languages and Literature: The Iranian languages linguistically are closely allied with the Indic branch, and they form with it the Indo-Iranian division of the Indo-Germanic or Aryan family. The Armenian, which is no longer classed as an Iranian tongue, but as a separate branch in the Aryan family, serves as a connecting link between this division and the European group. Taken as a whole, the Iranian constitutes a family of tongues of special interest and considerable importance. In their historical development three periods may conveniently be distinguished: I., Old Iranian period, several centuries before Christ; II., Middle Iranian, between the third and the ninth centuries A. D.; III., New Iranian, after the tenth century.

I. The Old Iranian linguistic stage comprises (1) the language of the Avesta, and (2) the language of the ancient Persian inscriptions. The Avestan (sometimes erroneously called Zend) is the oldest representative of Iranian speech. (See AVESTAN.) The language of the Old Persian inscriptions, or of the Achæmenian kings, is closely akin to Avestan. Its monuments, engraved in cuneiform characters upon the rocks, cover a period from about B. C. 525 to B. C. 336. From the time, however, of the fall of Achæmenian power until after the Christian era no Iranian literary monument has come down to us. There is practically a gap of five centuries until the restoration of the Zoroastrian religion, under the Sassanian dynasty (A. D. 226), gave rise to the sacred literature known as Pahlavi.

II. Corresponding to what may be called Middle Iranian is the peculiar idiom of Pahlavi, or Middle Persian, as the language of the Sassanian writings may be termed. It fills the space from the second to the ninth century of our era. This language, however, is of such a character that it can not be classified as a distinctly Iranian tongue; its nature therefore (including Huzvaresh, Pazend, and Parsi) is discussed under a separate article. See PAHLAVI.

III. With the tenth century begins the New Iranian development. It comprises (3) New Persian or Modern Persian, among the earliest monuments of which is the *Shāh Nāmah* of FIRDAUSĪ (*q. v.*). The vocabulary of the New Persian is not pure Iranian; it is largely intermixed with Arabic, owing to the Mohammedan conquest of the country. Its composite character presents an exact linguistic parallel to the English tongue as changed by the Norman conquest. In spite of this Semitic admixture the New Persian is a genuine scion of the Iranic stock, as much so as English is of the Teutonic. For details regarding its nature, character, and modern dialects, see PERSIAN LANGUAGE.

Among the other Modern Iranian languages are (*a*) AFGHAN, (*b*) BALŪCHĪ, (*c*) KURDISH, and (*d*) OSSETISH—see respective articles under each. The languages of the Galčas, or mountaineers, of Northeastern Iran present interesting resemblances to the old language of the Avesta. In connection with the former tongues enumerated, these may be classified with Tomaschek, as (*e*) dialects of the plateau of PĀMIR (*q. v.*). Lastly, to the above list may be added, as Iranian, the speech of the districts (*f*) of Māzandarān and Gīlān, bordering on the Caspian Sea.

The close kinship between the Iranic and the Indic group of tongues is an established fact. The Iranian languages have certain characteristics, however, which distinguish them from the Indic, and which give them a decided individuality. Among the common typical phonetic features which mark the Iranian group are the following: (1) The presence of voiceless spirants ḥ, þ, f, answering to Sanskrit aspirates *kh*, *th*, *ph*; (2) the change of voiceless stops *k*, *t*, *p* into the corresponding spirants ḥ, þ, f, before other consonants; (3) the change of original voiced aspirates *gh*, *dh*, *bh* into the corresponding voiced medials *g*, *d*, *b*; (4) the secondary development of voiced spirants ɣ, *đ*, *w*: (5) the development of voiced sibilants *z*, *ž*; (6) the common change of *s* into *h*.

The accompanying examples will serve to illustrate some of these features which contrast the Iranian tongues with Sanskrit. The languages chosen are Avesta, Old Persian, New Persian, Balūčī, Afghān, Kurdish, and Ossetish.

1. Sanskrit *kh*, *th*, *ph*: Skr. *khara*, "ass" = Av. *ḫara*, New P. *ḫar*, Bal. *k'ar*, Afgh. *ḫar*, Kurd. *ker*, *k'ar*, Oss. *ḫarag*. Skr. *pathan-*, "path" = Av. *paþan-*; O. P. *paþ-*, and cf. Av. *paþana-*, "broad," with New P. *pahan*, Bal. *patan*, Afgh. *plan*, Kurd. *pahān*, *pān*, Oss. *fat'an*, *fāt'ān*. Skr. *śaphá-*, "hoof" = Av. *safa-*, New P. *sum*, *sumb* (*sunb*), Bal. (—), Afgh. *sva*, Kurd. *sim*, Oss. *sāft'āg*.

2. Sanskrit *k*, *t*, *p* before a consonant: Skr. *śukrá-*, "bright, white" = Av. *suḫra-*, "red," O. P. *þuḫra-*, New P. *surḫ*, Bal. *suhr* (*sūr*), Afgh. *sūr*, Kurd. *sōr*, Oss. *surḫ*, *sirḫ*. Skr. *putrá-*, "son" = Av. *puþra-*, O. P. *puþra*, New P. *pusar*, Bal. *pusaɣ*, Afgh. (—), Kurd. *pisir*, *pes(mam)*, *pêr*, Oss. *furt*, *firt'*. Skr. *pra*, "forth" = Av. *fra*, O. P. *fra*, Kurd. *hil*, *hal*.

3. Sanskrit *gh*, *dh*, *bh*: Skr. *gharmá-*, "warmth" = Av. *garəma-*, O. P. *garma(pada-)*, New P. *garm*, *garmā*, Bal. *garm*, *garmāg*, Afgh. *garma*, Kurd. *garmah*, Oss. *ɣarm*. Skr. *dhī*, "to see, consider" = Av. *dī-*, O. P. *dī-*, New P. *dīdan*, Bal. *dīđ*, *dīđar*, Afgh. *līdal*, Kurd. *dītin*, Oss. (—). Skr. *bhar-*, "to bear" = Av. *bar-*, O. P. *bar-*, New P. *burdan*, Bal. *barag*, Afgh. *vṛal*, Kurd. *birin*.

4. Sanskrit intervocalic *g*, *d*, *b*: Skr. *mṛgá-*, "deer" = Am. *mərəɣa-*, "bird," New P. *murɣ*, Bal. *murv*, *murɣ*, Afgh. *murɣa-*, Kurd. cf. *mirāwī*, "duck," Oss. *marɣ*. Skr. *padá-*, "track, footstep" = Av. *pađa-*, cf. O. P. *ni-padiy*, New P. *pai*, Bal. *pad*, *padā*, *'pađā*, Afgh. *pal*, Kurd. *pai*, Oss. *fad*, *fād*.

5. Sanskrit *j*, *h*: Skr. *jânu-*, "knee" = Av. *zānu-*, New P. *zānū*, Bal. *zān*, Afgh. *zangūn*, Kurd. *zāna*. Skr. *hári-*, *hiraṇya-*, "yellow, golden" = Av. *zairi-*, *zaranya-*, New P. *zar*, *zarīn*, Bal. *zar*, Afgh. *zar*, Kurd. *zar*, *zir*, Oss. °*zārinā*. Skr. *mīḍhá-*, "reward" = Av. *mīžda-*, New P. *muzd*, *mužd*, Oss. *mizd*, *mizd*.

6. Sanskrit *s*: Skr. *saptá-*, "seven" = Av. *hapta-*, New P. *haft*, Bal. *haft*, Afgh. *ava*, Kurd. *haft*, Oss. *aft*, *avd*. Skr. *sam*, "together, with" = Av. *ham*, O. P. *ham*, New P. *ham*, *am*, Bal. *ham*, *am*, Afgh. *hum*, Kurd. *ham*, Oss. *ām*.

In reference to Iranian literature in general it may be added that the chief monuments of the past are the *Avesta* and the *Pahlavi* books, and of the present the extensive Modern Persian literature. The Old Persian rock inscriptions amount to hardly more than 1,000 lines. The *Avesta* and the *Pahlavi* are written in script quite similar to each other, but this script is of Semitic origin. The Old Persian inscriptions are carved in cuneiform characters. In writing all the modern Iranian tongues the Arabic alphabet is employed as in Modern Persian. For the several literatures, consult the respective articles under the languages already mentioned.

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Iranians, or **Eranians**, ĕē-rā'ni-ans: natives of Iran or Persia in its broadest sense. The term *Iran* is the native name of Persia, and is still so employed as the official designation of the whole kingdom. The word itself is originally connected with *Aryan* and with Strabo's Ἀριανή, Ἀριανοί. In the AVESTA (*q. v.*) the ancient designation for the Aryan home is *Airyana-Vaējah*, Iran-Vej, i. e. the Aryan well-spring. In the same sacred text, moreover, the followers of ZOROASTER (*q. v.*) speak of themselves as *Airyāo daiṇhava*, Aryan nations; and in the Old Persian inscription, NR a 14, Darius calls himself "a Persian, the son of a Persian, an Aryan, and of Aryan stock."

As a geographical designation the name *Iran* applied anciently to the country between the Indus and the Tigris, extending from the Persian Gulf on the southwest to the Caspian Sea and the Oxus on the north, as well as to the Pāmir plateau on the northeast. Much of this land is well watered and fertile, but there are also extensive mountainous regions as well as large tracts of arid barren wastes.

Under the term Iranians to-day are included the Persians, Kurds, Ossetians, Afghans, Balūchīs, and some other peoples of the Pāmir table-land. Their distribution ethnographically over the country is fairly uniform, although the proximity of Iranic territory to Turanian, Indic, and Semitic lands has not been without effect on blood as well as on

language. There are evidences, for example, of some foreign tribes and of borrowed linguistic elements, even in the midst of Iran. The infusion of Georgian and Caucasian blood, for instance, may be recognized among the modern Persians. Representatives of Iranic peoples, on the other hand, have pressed westward beyond their own borders, for we have evidence of their penetrating into Armenia and Asia Minor, or, again, eastward down into India. The best illustration and proof of this is the existence to-day of the Parsi community in Bombay; the PARSIS (*q. v.*) are Zoroastrian refugees from Persia. Furthermore, regarding the commercial occupation and economic life of the modern Iranians, most of the people are agriculturists, cattle-raisers, tradesmen, or artisans. The nomadic portion of the population is chiefly of Turanian blood.

History of Iran.—The Medes and Persians were historically the best-known nations of Iran. Their names were constantly linked together in antiquity, and they stood as the representatives of the western Iranian power. There is good reason, however, for assuming in early times the existence of a great eastern Iranian empire in Bactria, but its real history is wrapped in obscurity. The Medes were in point of time the first Iranian nation known to fame, if we accept as Iranic the conquest of Babylonia by Medes about B. C. 2400, which is mentioned by BEROSUS (*q. v.*), and which established a Median dynasty on the Babylonian throne. This dynasty was expelled after 200 years, and Media was under subjection to Assyria, nominally at least, for centuries. About the eighth century B. C., however, the Medes freed themselves again, and in the seventh century conquered Nineveh and established the Median dynasty of Ecbatana, which may be called the first of the great Iranian monarchies. It is with this, in fact, that Herodotus's history (i., 95) may be said to begin. The Persians under Cyrus next conquered the Medes, about B. C. 550, and established the Achæmenian dominion of Iran. This kingdom fell before the victorious Alexander in B. C. 336, but in turn the Greek rule was destroyed to give way to the Parthian sway, which lasted for nearly 500 years (B. C. 250–A. D. 226). The Sassanian monarchy then ruled Iran for about four centuries (A. D. 226–652); but this empire was overthrown by the Mohammedans (A. D. 652), a conquest which brought the greater part of Iran under the religion of Islam. (See MOHAMMED.) As sources from which the material for constructing this history of ancient and mediæval Iran we must look partly to the classics, especially Herodotus and the fragments of Ctesias, or more directly to the Oriental sources, the Old Persian inscriptions, *Avesta*, Pahlavi books, *Shāh-Nāmah* of FIRDAUSĪ (*q. v.*), and to some later Mohammedan works.

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Irapuato, ĕē-rä̆a-pwaa'tō: a city of the state of Guanajuato, Mexico; on the Central Railroad; 33 miles S. of Guanajuato city and 219 miles by railroad N. of Mexico, at an elevation of about 6,000 feet (see map of Mexico, ref. 7–G). It was founded in 1547, and is a good example of the older Mexican cities, having several large convents, churches, etc., dating from the sixteenth and seventeenth centuries. It was a place of some importance during the early revolutionary struggles. Irapuato is the center of an important agricultural district. Pop. (1889) about 15,000. H. H. S.

Irawadi, ĕē-rä̆a-waa'dēē [Burman *Iravadi*, a corruption of Sanskr. *Airavati*]: a river of Burma; rises probably in Upper Burma, between Assam and Yunnan; flows, after a course of about 900 miles, into the Bay of Bengal, in lat. 16° N. and lon. 94° E. In lat. 17° N. it separates, and between its easternmost branch, the Rangoon, and its westernmost branch, the Bassein, it forms a delta intersected in all directions by its minor branches, comprising an area of 10,000 sq. miles and covered with teak forests and inextricable jungles. The river is navigable for vessels of 200 tons burden as far as Ava, 400 miles from the sea, even at low tide, and canoes ascend safely 180 miles farther up the river. It is completely under British control. Revised by M. W. H.

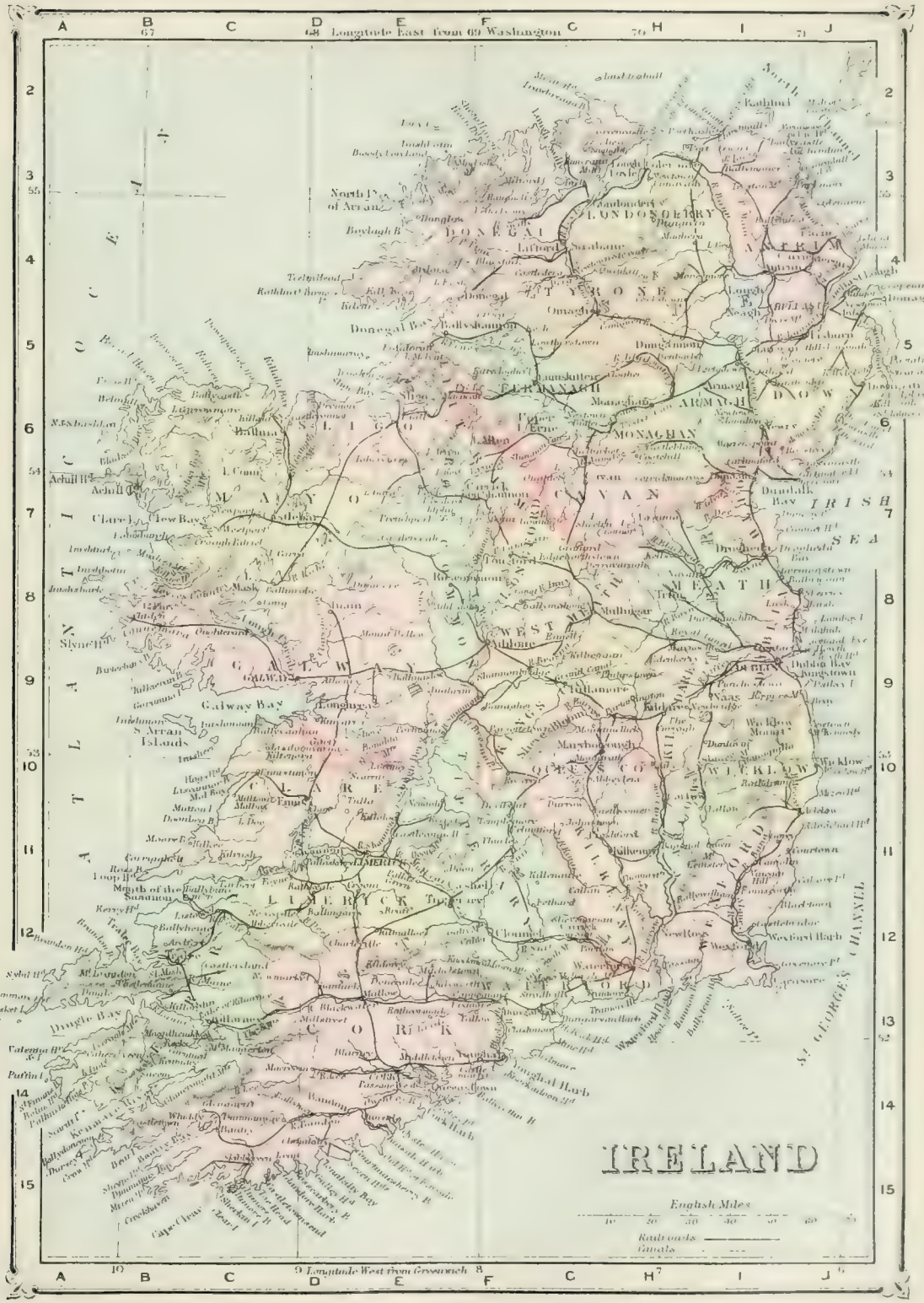
Irbit': town; in the government of Perm, Russia; at the confluence of the Irbit and the Nisa (see map of Russia, ref. 6–I). It is famous for its annual fair, held in the months of February and March, and attended by a great number of European and Asiatic merchants. It is the largest fair in Russia, next to that of Nishni-Novgorod, and goods from China, India, Persia, and Europe to the value of $30,000,000 have been brought together and disposed of. Pop. (1887) 5,628.

Ireland [< O. Eng. *Iraland*, *Iras*, the Irish + *land*, country. *Iras*, from Ir. *Eire*, *Erin*, Erin, Ireland, whence Lat. *Iver'na*, *Hiber'nia*, and Gr. Ἰέρνη, Ireland]: the second largest of the British isles (see GREAT BRITAIN); lies between lat. 51° 28′ and 55° 23′ N., and lon. 5° 20′ and 10° 26′ W. of Greenwich. It is washed on three sides by the open Atlantic, and separated from Great Britain by the Irish Channel or Sea. Its greatest length is 303 miles, its greatest breadth 177, and it has an area of 32,337 sq. miles, exclusive of that of 196 smaller islands belonging to it, whose area is 246 sq. miles.

Relief.—By far the greater portion of the land consists of a level or undulating plain, filling up nearly the whole center from sea to sea, and consisting to a great extent of bogs, which are incapable of cultivation and impart a dreary aspect to the country. The most extensive of these bogs is that of Allen, covering parts of Kildare, Carlow, King's, and Queen's Counties. The hills generally rise in isolated groups near the sea. If we assume the waters of the ocean to rise to the extent of only 500 feet, they would cover 77 per cent. of the entire surface, and the hills would stand out in the midst of them in the shape of more than 100 islands, encircling a shallow central sea. The most elevated of these mountains are in Southwestern Ireland, where the Carn Tual rises to a height of 3,422 feet. The Wicklow Mountains near the east coast culminate in the Lugnaquilla (3,047 feet). In Mayo the mountains attain a height of 2,654 feet; in the county of Donegal they rise to 2,462 feet (Mt. Arrigal), and in the county of Antrim to 1,802 feet (Mt. Trostan).

Hydrography.—The rivers flow for the greater part through plains, enlarging sometimes into lakes, and are navigable in several instances almost to their sources. The Shannon is the most important. It rises in the county of Cavan at an elevation of 345 feet above the sea, and enters the sea below the city of Limerick. It forms several lakes, among which Loughs Allen, Ree, and Derg are the most important, and is navigable as far as the former, a small portion above Limerick excepted, where navigation is obstructed by the rapids of Doonass. It frequently inundates the surrounding country, in spite of expensive engineering works erected to regulate its course. The Lee is only a small river, but its mouth forms the important harbor of Cork. The Barrow enters the sea at Waterford, and is navigable as far as Athy, whence there is a canal to Dublin. The Liffey is remarkable solely because it enters Dublin Bay. The Boyne is the most important river on the east coast. It is celebrated on account of the battle of the Boyne (1690), but navigable only for 20 miles above its mouth. The Bann rises in the Mourne Mountains, and after a course of 40 miles it enters Lough Neagh. It leaves that lake at the northwestern corner and enters the sea below Coleraine. Owing to its rapid course it is navigable only in parts. The Foyle flows into a bay on the north coast, 6 miles below Londonderry. The Erne forms several important lakes, and is navigable almost throughout its entire length. The Corrib forms the discharge of Lough Corrib, and enters the sea at Galway, on the west coast of Ireland. A subterranean river, 5 miles in length, connects Lough Corrib with Lough Mask. The country abounds in lakes, the most important of which are Lough Neagh (158 sq. miles), in the northeastern part of the country; the lower Lough Erne (43 sq. miles); Lough Mask (34 sq. miles); and Lough Corrib (68 sq. miles); Loughs Derg (36 sq. miles) and Ree (50 sq. miles).

Geology.—Ireland may be divided geologically into three regions—viz., the great central plain, Northern Ireland, and Southern Ireland. The whole of the former is occupied by Carboniferous limestone, except where older rocks lie on the surface. It is covered with peat-moss and fresh-water marl, in which the fossils of animals not long extinct have been discovered. In Northern Ireland the Silurian formation is the most prominent. It may be looked upon as a continuation of the same formation in Scotland, and is intruded by granite and basalt, the latter forming the Giant's Causeway on the north coast. Permian, Cretaceous, and Triassic rocks likewise occur in that part of the country, the latter near Belfast containing beds of gypsum and rock-salt. Southeastern Ireland consists mainly of Cambrian


Longitude East from 69 Washington
Longitude West from Greenwich
IRELAND
English Miles
Railroads
Canals
DONEGAL
LONDONDERRY
TYRONE
FERMANAGH
ANTRIM
DOWN
ARMAGH
MONAGHAN
CAVAN
LEITRIM
SLIGO
MAYO
GALWAY
ROSCOMMON
LONGFORD
WESTMEATH
MEATH
DUBLIN
KILDARE
QUEEN'S CO.
KING'S CO.
WICKLOW
CLARE
LIMERICK
TIPPERARY
KILKENNY
WATERFORD
CORK
IRISH SEA
ST GEORGE'S CHANNEL
ATLANTIC OCEAN
Galway Bay
Dublin Bay
Dingle Bay
Bantry Bay
Donegal Bay
Clew Bay
Lough Erne
Lough Neagh
Lough Derg
Lough Ree
Lough Corrib
Lough Mask
Lough Swilly
Lough Foyle
Carlingford Lough
Strangford Lough
Belfast Lough
Dundalk Bay
Waterford Harb.
Youghal Harb.
Kenmare R.
Valentia H.
Slyne H.
Achill H.
Aran Islands
Inishmore
Inishmaan
Inisheer
Tory I.
Rathlin I.
Arklow
Wicklow
Wexford
Enniscorthy
Kilkenny
Clonmel
Carlow
Tullamore
Mullingar
Athlone
Longford
Cavan
Monaghan
Armagh
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Omagh
Enniskillen
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Ballina
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Westport
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Tralee
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Cork
Youghal
Dungarvan
Waterford
Kilmallock
Roscommon
Boyle
Carrick-on-Shannon
Navan
Drogheda
Dundalk
Newry
Downpatrick
Belfast
Lisburn
Coleraine
Londonderry
Letterkenny
Donegal
Ballyshannon
Bundoran
Derry
Tyrone
Fermanagh
Antrim
Down
Armagh
Monaghan
Cavan
Leitrim
Sligo
Mayo
Galway
Roscommon
Longford
Westmeath
Meath
Dublin
Kildare
Queen's Co.
King's Co.
Wicklow
Clare
Limerick
Tipperary
Kilkenny
Waterford
Cork

rocks, equivalent to those of South Wales, upon which the Lower Silurian strata (flags and slates) rest unconformably. In Kerry and Cork the sandstones and slates of the Devonian age are most prominently represented.

Climate.—The temperature of the central part of the country has been estimated at 50° F., that of the south at 51·5°; and of the extreme north at 48·5°, the difference between north and south thus amounting to only three degrees. The mean temperature in winter is 41·5°, in spring 47°, in summer 60°, and in autumn 51° F. The temperature is thus even more equable than that of the British isle, a feature to be traced to the influence of the Atlantic, which is likewise answerable for the greater amount of rain which falls throughout Ireland, and for the greater humidity of the air. These circumstances are most conducive to a luxuriant vegetation, and the name "Emerald Isle" is peculiarly appropriate; but they interfere to some extent with agricultural operations. The average rainfall may be estimated at 40 inches annually; in the west and south, and particularly in the hills of Kerry, it is greatly in excess of this, but on a portion of the eastern coast it barely exceeds 25 inches.

Population.—In no country of Europe has there been exhibited within modern times so vast an increase in the population, succeeded by an even vaster decrease. In 1750 Ireland had a population of 2,372,634 inhabitants. In 1811 this population had increased to 5,937,856, and it continued to increase until 1841, when it numbered 8,175,124 souls. Then came a potato famine; thousands died of starvation and an immense impulse was given to emigration. In 1851 there were only 6,552,385 inhabitants; in 1871, 5,412,377; in 1891, 4,704,750. This decrease was due, in the first instance to famine, but is now brought about entirely by emigration. The average number of emigrants was annually, in 1851–61, 114,912; 1861–71, 76,886; 1871–81, 54,271; 1881–91, 71,667; and in 1892 it was only 52,902. The area and population of the counties in 1891 were as follows:

COUNTIES.	Area in sq. miles.	Population.	Population per sq. mile.
Carlow	349	40,936	117
Dublin	354	419,216	1,184
Kildare	654	70,206	107
Kilkenny	796	87,261	110
King's County	772	65,563	85
Longford	421	52,647	125
Louth	316	71,038	225
Meath	906	76,987	85
Queen's County	664	64,883	98
Westmeath	708	65,109	92
Wexford	901	111,778	124
Wicklow	781	62,136	79
Leinster	7,622	1,187,760	156
Clare	1,294	124,483	96
Cork	2,890	438,432	152
Kerry	1,853	179,136	97
Limerick	1,064	158,912	149
Tipperary	1,659	173,188	104
Waterford	721	98,251	136
Munster	9,481	1,172,402	124
Antrim	1,237	471,179	381
Armagh	512	143,289	280
Cavan	746	111,917	150
Donegal	1,870	185,635	99
Down	957	224,008	234
Fermanagh	715	74,170	104
Londonderry	816	152,009	186
Monaghan	500	86,206	172
Tyrone	1,260	171,701	136
Ulster	8,613	1,619,814	188
Galway	2,452	214,712	87
Leitrim	619	78,618	127
Mayo	2,126	219,034	103
Roscommon	949	114,397	120
Sligo	721	98,013	136
Connaught	6,867	1,724,774	105
All Ireland	32,583	4,704,750	144

The following table shows the towns with more than 20,000 inhabitants, and the movements of their population since 1861:

YEARS.	Dublin.	Belfast.	Cork.	Limerick.	Waterford.	Londonderry
1861	313,437	121,602	80,121	44,476	23,293	20,875
1881	349,688	207,671	78,361	38,600	22,401	28,947
1891	361,891	255,950	75,345	37,155	20,852	33,200

The majority of the inhabitants are of Celtic race, and the earlier English immigrants have completely amalgamated themselves with them. In the northeast, however, there are numerous English and Scotch settlers, who, being Protestant, exhibit a certain amount of antagonism to the remainder of the population. It is among these that Orange lodges recruit their members, and religious animosities, which appeared to be dying out, have revived owing to the agitation in favor of home rule. English is spoken throughout the country, but Irish is still understood by about half a million persons, of whom about 35,000 can speak no other language.

Agriculture.—The climate is more favorable to cattle-breeding than to the cultivation of cereals. Absentee-landlordism has no doubt greatly hindered the development of Ireland, but the excessive subdivision of the land is responsible for much of the backwardness. Emigration, too, is responsible for the country's slow agricultural advancement. Fixity of tenure, fair rents, and free sale have been insured by the various land acts passed since 1870 by the imperial Parliament. They place the Irish cultivator in a far better position than the Scotch and English farmers, for they even facilitate the outright purchase of the land with the help of capital advanced by the state. The number of holdings in 1891 was 572,640, of which only 89,019 were over 50 acres. The following table shows the number of acres under cultivation in the years mentioned, as also the principal crops:

CROPS, ETC.	1861.	1871.	1881.	1892.
Cereals	2,620,339	2,124,079	1,776,877	1,494,816
Green crops	1,467,608	1,511,532	1,268,997	1,174,861
Flax	147,957	156,883	147,085	70,642
Clover and grasses	1,546,216	1,827,733	1,998,402	1,252,979
Fallow	.....	22,323	21,186	26,936
Permanent pasture	.....	10,068,843	10,091,688	11,142,287
Woods	.....	324,990	328,703	328,000

These figures show very distinctly that while there has been a decrease in the area sown with corn and green crops, there has been a corresponding increase in the area devoted to clover, grass, and pastures. The live stock (in thousands) was as follows:

ANIMALS.	1860.	1870.	1880.	1892.
Horses	621	533	557	539
Cattle	3,599	3,800	3,921	4,531
Sheep	3,538	4,337	3,561	4,828
Pigs	1,269	1,461	849	1,116

These figures sufficiently attest the general and increasing prosperity of the country.

Fisheries.—The fisheries were far more important formerly than they are now. In 1861 they employed 12,035 boats, manned by 48,000 men and boys; in 1891 only about 30,000 persons. The decrease is due to emigration and the great demand for seamen. The rivers swarm with salmon, and the surrounding coasts with cod, ling, hake, herrings, pilchards, etc., yet the markets are being supplied with cured fish from Scotland and the Isle of Man. In 1891 611,078 tons of fish and 11,680 cwt. of shellfish, of a total value of £624,000, were landed.

Mining.—The mining industry is of very subordinate importance. The average annual quantity of coal raised is only about 100,000 tons, while more than 2,000,000 tons are imported. The insignificant development of the coal industry is to be regretted, as immense stores of iron of good quality and easily accessible are at hand, but remain unutilized on account of lack of fuel. Ireland was once dotted over with small iron-works, in which the ore was smelted by means of charcoal; but by degrees, as the wood became exhausted, the works were closed. After the discovery of coal in Antrim, however, the production of iron rose from 106 tons in 1860 to 155,833 tons in 1880. Peat is plentiful and much used. Gold and copper also occur.

Manufactures.—Ireland is not a manufacturing country, as may clearly be perceived on referring to the statements given under GREAT BRITAIN. The only manufacture of any extent is that of linen, which has taken the place of the once-flourishing manufactures of coarse woolen goods, and of which Belfast is the center. In 1890 this branch of industry was carried on in 263 factories, employing 1,016,111 spindles, 28,612 power looms, and 71,788 persons.

Commerce.—The direct trade with foreign countries is comparatively trifling, as the greater part of it is carried on through English and Scotch ports. The direct imports of

foreign and colonial merchandise had a value in 1891 of £9,869,000; the direct exports of produce did not exceed £254,000. The principal seaports are Dublin, Cork, Belfast, Waterford, and Limerick. There is no satisfactory record of the trade with England, but the principal exports consist of cattle, sheep, horses, butter, bacon, and other agricultural produce, porter, whisky, and linen goods.

Religion and Provision for its Support.—According to the census of 1891 there were 3,547,307 (75·4 per cent.) Roman Catholics, 600,103 (12·7 per cent.) Protestant Episcopalians, 444,974 (9·4 per cent.) Presbyterians, 55,500 (1·2 per cent.) Methodists, 56,866 (1·2 per cent.) belonging to other denominations, including 1,798 Jews. The bulk of the population is therefore Roman Catholic, and the existence formerly of an established Protestant Church in connection with that of England was looked upon as a grievance. In 1869 this Church was disestablished and disendowed, but of its property, valued at nearly £18,000,000 sterling, £500,000 were paid over to the Church in lieu of its private endowments, £372,332 were paid to the Roman Catholic Maynooth College, and £90,000 to Nonconformist educational institutions; the liabilities (annuities, etc.) are estimated to swallow up £11,560,000, and there will thus remain £5,190,000, which are to be devoted to educational and other purposes. The Roman Catholic Church is governed by 4 archbishops and 27 bishops. It numbers about 1,000 parish priests and more than 1,500 administrative curates. The number of ecclesiastical parishes amounts to 1,084; that of churches and chapels, to about 2,500.

Education.—A system of national education was inaugurated in 1845, but as these national schools are not denominational, they have never been supported so heartily by the ministers of different religious bodies as they ought to have been, and the education of the people has suffered accordingly. In 1891 there were 8,346 of these elementary schools with 544,307 pupils. Among the superior schools, Trinity College at Dublin and the Queen's Colleges at Cork, Galway, and Belfast are the most important. These institutions are open to all alike, without reference to religious creed. There is likewise a Roman Catholic university. Maynooth College is the principal institution for the training of priests. It was founded in 1795, and received originally an annual support of £8,000 from the Government, which after the disestablishment of the Protestant Episcopalian Church was commuted into a consolidated fund of £372,331.

Local Government.—Ireland has formed part of the United Kingdom since 1799, and is represented in Parliament by 28 peers and 103 representatives of the people. The head of the administration is the lord-lieutenant, who represents the crown, draws a salary of £20,000, and keeps court in Dublin Castle. In the cabinet and Parliament the interests of Ireland are looked after by a secretary of state. The administration of the counties is intrusted to grand juries, which include the lieutenants and deputy-lieutenants appointed by the lord-lieutenant, and the justices of the peace appointed by the Irish Lord Chancellor. A paid judge (stipendiary magistrate) presides at the meetings of these juries. The poor laws are administered by guardians, elected by the ratepayers. Eleven towns have full municipal institutions, and 108 are under commissioners elected by the ratepayers. The local revenue in 1890 amounted to £4,383,222, and £1,080,950 was expended upon the poor.

Administration of Justice.—The superior courts are organized in the same manner as in England, and are presided over by a lord chancellor. There are a high court of judicature (a court of appeal), a high court of justice (with a chancery, a queen's bench, an exchequer, and a probate and matrimonial divisions), a high court of admiralty, a court of bankruptcy, and a land commissioners' court, with altogether twenty-three judges in receipt of £2,000 to £8,000 each per annum. One of the common-law judges presides over the assizes, while the quarter sessions of the justices of the peace and recorders' courts in boroughs are presided over by paid judges. Minor offenses are decided by two justices of the peace, one of whom may be a stipendiary magistrate. The civil bill courts correspond to the English county courts. Trial by jury is general. The police force numbers 13,000 men. In 1891 2,112 persons were committed for trial, of whom 1,255 were convicted.

History.—According to tradition, Ireland was inhabited originally by Firbolgs and Danauns, who were eventually subdued by Milesians or Gaels. Next to nothing is known of the country for any period antecedent to the fourth century. At that time the inhabitants were known as Scoti and Picti, and they made descents upon the Roman province of Britannia, and even upon Gaul. Christianity was introduced in the course of the fifth century, when St. Patrick was the chief apostle of the new faith, and in the sixth century missionaries went forth from the monasteries to convert Britain and the nations of Northern Europe. At this early period Ireland appears to have been divided among numerous clans, who owned allegiance to four kings, and to an ardrigh, or monarch, to whom the central district, called Meath, was allotted. The incursions of the Scandinavians, which began in the eighth century and continued for 300 years, checked the progress of civilization. They established themselves on the eastern coast, whence they made predatory incursions into the interior of the country, until they were overthrown at the battle of Clontarf, near Dublin (1014), by Brian Boroimhe, the monarch of Ireland. From the eighth to the twelfth century Irish scholars enjoyed a high reputation for learning. Numerous copies of the writings of the Fathers were made by Irish monks, and the beautiful illustrations which adorn those manuscripts testify to the artistic skill and taste of the copyists. In 1155 Pope Adrian IV. authorized Henry II. of England to take possession of Ireland on condition of paying an annual tribute. In 1172 Henry made his first descent upon Ireland. He received the homage of a number of chiefs, and authorized certain Norman adventurers to take possession of the entire island in his behalf. In the course of the thirteenth century these Norman barons, favored by dissensions among the natives, had succeeded in firmly establishing their power, but in the course of time their descendants identified themselves with the natives, even to the extent of adopting their language. At length the power of England became limited to a few coast-towns and to the districts around Dublin and Drogheda, known as the "Pale." In 1541 Henry VIII. received the title of "king of Ireland" from the Anglo-Irish Parliament, then sitting at Dublin, and several of the native princes acknowledged him as their sovereign. The attempt to introduce the Reformed faith led to repeated revolts, which were suppressed and the lands of the rebellious chiefs parceled out among Protestant Scotch and English settlers. The so-called "plantation of Ulster" took place in this manner under James I. In 1641 the Irish rose in rebellion and massacred the Protestants, but they were most severely punished by Cromwell, who overran the country in 1649. Wholesale confiscations followed the suppression of the revolt, and Ireland received another large accession of English colonists. At the revolution the native Irish generally sided with James II., the English and Scotch colonists with William and Mary, and the war was not terminated until 1692, when the triumph of the Orange party again exposed the Irish to an excessive punishment. Penal statutes were passed against the Catholics, and the general dissatisfaction gave rise to numerous secret societies and to a rebellion in 1798, which was not suppressed till 1800. On Jan. 1 of the following year the Irish Parliament voted the "Final Union" with Great Britain, and from that year dates the existence of a United Kingdom of Great Britain and Ireland; but from that year dates also that antagonistic spirit which perpetually keeps "knocking at the Union." The insurrection of Emmet in 1803 was easily suppressed, but the emancipation of the Roman Catholics had to be granted in 1829, and the "tithe war" ended in 1838 with a compromise. The revolution of 1848 failed, but the formation of the Fenian brotherhood in 1858 was a serious menace. The Irish Church establishment was abolished in 1869, and in 1870 the land question was brought under debate. In 1873 the Home-rule party was founded, comprising members of all classes and denominations, and openly asserting the inalienable right of the Irish people to govern itself. The whole movement was further developed on one side by C. S. Parnell (see PARNELL, CHARLES STEWART) and the Parnellites; on the other it received an impetus from secret societies and other organizations, especially the land league, formed in the interest of the Irish tenant. Mr. Gladstone, who up till 1886 had been a stanch opponent of the somewhat illogical practices of the leaders of the Irish people, became a convert to home rule in that year. A home-rule bill which he introduced in that year was thrown out, but on his return to power in 1893 he introduced a similar measure, which was carried by a majority of forty-three votes in the House of Commons, but rejected by the House of Lords. See HOME RULE, LAND LEAGUE, IRISH LANGUAGE AND LITERATURE, and IRISH PHILOLOGY.

E. J. RAVENSTEIN.

Ireland, William Henry: author; b. in London in 1777. He was apprenticed to a conveyancer, and having accompanied his father upon a visit to Stratford-upon-Avon, he forged a lease, containing the pretended signature of Shakspeare, which he said he had discovered among some old lawpapers. He afterward executed other similar forgeries, and produced *Vortigern*, a tragedy purporting to have been written by Shakspeare, which was acted at Drury Lane theater, Kemble playing the principal part; this, with *Henry II.*, another forgery, was published in 1799. The fraud was soon exposed, and he abandoned his profession, devoting himself to literary pursuits, writing several novels and *The Neglected Genius*, a poem (1812). His *Confessions* (1805) contain a full account of his various forgeries. D. Apr. 17, 1835. Revised by H. A. Beers.

Irenæ'us [= Lat. = Gr. **Εἰρηναῖος**, liter., peaceful, deriv. of **εἰρήνη**, peace]: one of the most distinguished of the early Church Fathers; b. in Asia Minor, perhaps in Smyrna, in the first half of the second century, probably between 115 and 125 A. D. He enjoyed as a young man the instruction of Polycarp, the disciple of John and Bishop of Smyrna. He went afterward to Gaul, and became a presbyter at Lyons. In 177 Photinus, Bishop of Lyons, suffered martyrdom, and Irenæus succeeded him in the episcopal office. His energy and zeal in building up the Christian Church in Gaul are highly praised by his contemporaries, but more particular events of his life are not recorded. Some have supposed that he suffered martyrdom in the persecutions under Septimus Severus—i. e. in 202 or 203—but as neither Tertullian nor Eusebius mentions any such event, it must be considered very doubtful. Schaff (*History of the Christian Church*, ii., 750) calls him "the leading representative of Catholic Christianity in the last quarter of the second century, the champion of orthodoxy against Gnostic heresy, and the mediator between the Eastern and Western Churches. He united a learned Greek education and philosophical penetration with practical wisdom and moderation." Of his writings only the *Adversus Hæreses* has come down to us, and this is entire only in a barbarous Latin translation of the original Greek, but, such as it is, it is of great importance for the understanding of the movements in the early Christian Church. The best editions of the book are that by Stieren (Leipzig, 1853) and that by Harvey (Cambridge, 1857). English translation in the *Ante-Nicene Fathers* (New York, vol. i.). Revised by S. M. Jackson.

Ire'ne [= Gr. **Εἰρήνη**, liter., peace]: 1. In Greek mythology, the goddess of peace. She appears chiefly on coins; is usually clad in the chiton, peplus, and veil, and carries as her attributes an olive or laurel branch, a caduceus, a cornucopia, and ears of corn in her hand or on her head.—2. An empress of Constantinople; b. at Athens about 752; at seventeen became wife of Leo, son and heir of Constantine V., and upon his death, in 780, was named in his testament as ruler during the minority of their son, Constantine VI., then nine years of age. In 786 she called a council at Constantinople to restore the images which had been removed from the churches; but this being interrupted by the soldiery, she in the following year summoned another at Nicæa, in Bithynia, at which the veneration of images was declared to be consonant with Scripture, reason, and the Fathers and councils. Her son was induced by his favorites to throw off the maternal yoke and proclaim himself emperor. Irene was secluded in one of her palaces, but conspiracies were formed for her restoration. In 797 an attempt was made to assassinate Constantine, but he escaped to Phrygia, where he was rejoined by his mother, who persuaded him to return to Constantinople. He was there seized by the emissaries of Irene and his eyes were put out. She then ruled rigorously for five years, but the eunuch Nicephorus, her grand treasurer, having been secretly invested with the purple, arrested Irene, seized all her treasures, and banished her to the island of Lesbos (802), where she gained a scanty livelihood by spinning. D. Aug. 15, 803. It was in her time that the Roman empire was restored in the West by the coronation of Charlemagne (800 A. D.), and one of the influences that contributed to this result was the dislike which the Italians felt for the rule of a woman on the imperial throne.

Revised by J. R. S. Sterrett.

Ireton, īr'tŭn, Henry: soldier; b. at Attenton, Nottinghamshire, England, in 1610; studied law at Oxford and at the Middle Temple, London, and took a conspicuous part in the great civil war, becoming one of Cromwell's generals. In 1646 he married Bridget, daughter of the future Protector. Ireton was taken prisoner at Naseby by Prince Rupert, but rescued the same day; he signed the death-warrant of Charles I., and accompanied Cromwell to Ireland in 1649. On the latter's return to England in 1650 the prosecution of the conquest of Ireland was intrusted to Ireton, and prosecuted with vigor, not unmixed with cruelty. He died of the plague before Limerick in Nov., 1651, and was buried in Westminster Abbey, whence his remains were exhumed at the Restoration and burned at Tyburn.

Iriarte: See Yriarte.

Irida'ceæ: See Iris Family.

Irid'ium [Mod. Lat., from Gr. **Ἶρις, ἴριδος**, rainbow]: one of the rare metals of the platinum group: recognized as a distinct element by Tennant in 1804. It takes its name from the iridescence of its solutions. It has not been found in a pure state, but is usually combined with osmium, forming the mineral species known as Iridosmine (*q. v.*), and with platinum giving the species platiniridium, also in small quantity with palladium and with native platinum. It occurs with these metals in varying, apparently indefinite, proportions. It is regarded as isomorphous with osmium, the percentage varying from 43 to 77, and in the platinum alloy to range from 20 to 77 per cent. It is difficult of separation in a pure state from these metals, and processes for its extraction, especially from osmium, have engaged the attention of many of the most distinguished chemists. Persoz (*Ann. de Chimie et de Physique*, lv., 210) converts the metals into sulphide by ignition in an earthen crucible with carbonate of soda and sulphur. Wöhler recommends (*Pogg Annalen*, xxi., 161) the ignition to redness of the powdered alloy with common salt in a porcelain or glass tube through which a current of dry chlorine gas is passed as long as it is absorbed. The resulting chlorides are dissolved in boiling water; the solution is concentrated and distilled with nitric acid, by which the osmium is removed as osmic acid, leaving the iridium in solution. It is precipitated by chloride of ammonium, and the ignition of this precipitate yields metallic iridium. Fremy roasts the ore in a current of oxygen at a red heat, by which the osmium is partly removed as osmic acid, and the remainder, after fusion with niter, is distilled with nitric acid. (*Comptes Rendus*, xxxviii., 1008.) Claus (*Beiträge zur Chemie der Platin-metalle*, Dorpat, 1854) fuses 1 part of the ore with 1 part of caustic potash and 2 parts of saltpeter. After pouring out and cooling, the fused mass is digested for twenty-four hours in cold water. Osmate and ruthenate of potash are dissolved, and are drawn off by a siphon. The portions of undecomposed ore are subjected to a second fusion after separation by washing from the insoluble black powder, which consists chiefly of the oxides of iridium, rhodium, and platinum. Prof. Wolcott Gibbs, who has made extended investigations of the chemistry of the platinum metals (*Smithsonian Contributions*, xii., and *Am. Jour. Sci.*, xxix., May, 1860; xxxi., 63; xxxiv., 342; xxxvii., 57), employed this method with several essential modifications. He first fuses the ore with three times its weight of dry carbonate of soda, in order to remove the silica and other impurities. He reduces the osmate of potash obtained by the fusion with niter and potash to osmite by boiling it in a mixture of alcohol and water. The ruthenate of potash is completely decomposed. The undissolved portions are well washed with a saturated solution of chloride of potassium. The platinum and iridium exist in the mass in the form of bichlorides, and their separation is effected by the employment of the alkaline nitrates, advantage being taken also of the different degrees of solubility of the double chlorides of the platinum and alkaline metals. For the details of this and of the other methods, reference is made to the memoirs cited. In all these operations great care must be taken to avoid the poisonous vapors of osmium. Deville and Debray have also published an important memoir on this subject. (*Ann. de Chimie et de Physique*, 3d, lvi., 385.)

Iridium may be fused in the flame of the oxyhydrogen blowpipe or by the voltaic current, giving a hard, brittle, silvery-white metal, with a specific gravity of 21·15. When pure it is not acted on by acids or by aqua-regia, but is readily dissolved by the latter when alloyed with platinum. In its powdered state it is the best material for giving a pure black upon porcelain, and is largely used for this purpose. The black powder known as "iridium-black" is obtained by decomposing a solution of iridic sulphate by alcohol. It is similar to platinum-black in its action upon gases, and will ignite alcohol. An artificial alloy is formed by fusing iridium with platinum, which has valuable prop-

erties for many purposes in the arts, but particularly for lasting the vents of heavy ordnance. It is both hard, resisting wear, and indestructible by the gases of the powder. Specimens of this alloy, known as "Matthey's alloy," in ingots 3 inches or more in length, were exhibited at Paris in 1867 by Johnson, Matthey & Co. of London. One vent shown had fired 3,000 rounds from a Whitworth cannon without appreciable wear.

The natural alloy, iridosmine, has long been used for the tips of gold pens, but the necessity arising for larger masses of this useful alloy, John Holland, of Cincinnati, O., in the year 1880 succeeded in fusing iridium in ordinary crucibles by the addition of phosphorus, making a phosphide which is liquid at a white heat and is readily cast into molds. This mixture is harder than the iridium or iridosmine from which it is made. It retains its metallic character, and for any of the uses of iridium it has not yet been found necessary to dephosphorize it, except for electrical purposes.

Iridium is now successfully deposited electrolytically. This was first accomplished by Prof. W. L. Dudley, but perfected, commercially, by Holland, who now iridiumizes any metallic article, especially surgical instruments and mirrors.

Phosphor-iridium is valuable for drawplates, for bearings of scales and balances of precision, watch and clock bearings, drawing and ruling pens, tips of drills, tools, and for various alloys. WILLIAM P. BLAKE.

Iridos'mine [deriv. of *irido-* (compounding form of *iridium*) + *osmo-* (compounding form of *osmium*)]: a native alloy of iridium and osmium, of great hardness and weight. It is usually in irregular flattened grains and scales rarely broader than the head of a pin, and has a tin-white or steel-gray color and metallic luster. But the grains vary in size and form in different localities, and even from the same locality, to such a degree as to indicate a great difference in the chemical composition. It is also obtained as a heavy gray powder, and some samples resemble a fine gray metallic sand. Hexagonal crystals have been observed. It is as hard as quartz, and its gravity ranges from 19·3 to 21·12. It is found generally with native platinum, and with placer-gold, but usually in small quantity compared with the bulk of the gold. Nearly all of the gold-regions have yielded more or less of this mineral, it having been obtained in the Urals, California, Australia, South America, at Choco, in Japan, and elsewhere. In California it is more abundant in the northern counties than in the middle or southern, and it is most abundant in the beach-sand deposits of the northern coast at and near Port Orford, Ore. According to Dr. Torrey, for a year or two after the establishment of the U. S. assay-office in New York the proportion of iridosmine in the gold from California did not exceed half an ounce to $1,000,000. The quantity afterward increased until the average was 7 or 8 oz. to the million of gold, but it afterward fell off, showing great fluctuations, dependent, no doubt, upon the opening of new diggings. In melting large quantities of native gold this heavy mineral settles to the bottoms of the crucibles, and accumulates there. It was the practice at the New York assay-office to separate it from the gold by melting the gold with twice its weight of silver, allowing the iridosmine to settle, and then pouring off the gold alloy. A mass containing nearly all of the mineral remained, and was separated by repeated fusions with silver and a final digestion in nitric and nitro-muriatic acid and washing. It has been found to accumulate similarly in the melting-pots used in California, and it is common to obtain it in the gold recovered from old crucibles and sweepings. It has been announced as occurring in the same way in the sweepings of the Japanese mint. It sometimes, however, eludes the care of mint officers and finds its way into coin. Its presence in gold used by jewelers or in the arts is a great disadvantage, for it can not be cut by a file or steel tools, and so renders the gold unfit for working. Such gold has to be remelted. The superior gravity of the grains of iridosmine carries them to the bottom. Analyses show that the percentage of iridium in samples from different countries varies from 43 to 77, and of the osmium from 17 to 48. Small quantities of platinum, rhodium, ruthenium, and other metals are usually present. A sample of the mixed metals brought from Port Orford, Ore., separated from the fine scale-gold by amalgamation, was found to contain nearly 49 per cent. of iridosmine and 43·54 of platinum.

The value of iridosmine in the arts is chiefly as a source of iridium and for tipping the nibs of gold pens, for which purpose its great hardness, and the fact that it can be attached to the gold by soldering, makes it peculiarly suitable. Grains of the proper form and hardness are much sought for by gold-pen makers. The flat scales are not so suitable as those which are more round and solid and of great hardness. They differ in appearance, as doubtless in composition, from the tabular crystals, and in the California mixtures of this mineral such grains do not usually constitute more than one-tenth of the whole, but sometimes the amount is as great as one-fifth. The pen-makers carefully select such grains. They are so minute that from 10,000 to 15,000 of them do not weigh more than an ounce. A cubic inch would weigh about 11 oz., and at the price of $250 per ounce would be worth $2,750. After these grains have been attached to the tips of the gold pens they are ground into the proper shape upon emery-wheels, and sometimes with great difficulty owing to their extreme hardness. See IRIDIUM.

WILLIAM P. BLAKE.

I'ris [= Gr. Ἶρις, liter., rainbow]: in Greek mythology, the daughter of the sea-god Thaumas and Electra (daughter of Oceanus). She is thus connected by birth with the watery elements. She is the personification of the rainbow, the quick and friendly messenger of peace, and so she is the messenger of the gods to the earth, the sea, and the lower world. She differs from Hermes in that she is a messenger pure and simple, whereas Hermes, besides being a messenger, is also a powerful god capable of bringing affairs to a successful issue. The rainbow is connected with rain, and so it is Iris who draws up the moisture to the clouds. (See the IRIS river.) By order of Zeus she pours upon perjurers some of the Styx water, which she carries in a vase, and puts them into a death-like sleep. There are no statues of Iris, but in vase-paintings and reliefs she is represented as a youthful winged virgin carrying as her attributes a caduceus and a vase. The etymology of the name is not certain.

LITERATURE.—Mayer, in Roscher's *Lexicon* under *Iris*; Tölken, *Berliner Program* (1845); Bergstedt, *Studia Archæologica* (Upsala, 1881). J. R. S. STERRETT.

Iris [= Gr. Ἶρις, rainbow, iris of the eye, so called from its variation in color in different individuals]: in the eye, a thin contractile curtain, nearly circular in outline, suspended in the aqueous humor between the cornea and the lens. It is perforated by an aperture called the pupil, circular in man and most of the mammalia, elongated in the cat, the fox, the owl, and some other vertebrates. Its substance is partly fibrous, partly cellular (pigmentary), and partly muscular. The muscle-fibers are involuntary, some of them circular and sphincteric, and some radiating. The former contract, the latter dilate, the pupil under the varying stimulus of light. Opium and Calabar bean contract, while belladonna powerfully dilates, the pupil. In the fœtal state the pupil is closed by the *membrana pupillaris*, a temporary structure.

Iris [= Gr. Ἶρις, liter., rainbow, also a kind of lily, probably named from its varying colors]: the fleur de lis or flower de luce, the leading genus of the family *Iridaceæ*; consists of numerous species of perennial herbs dispersed over the temperate regions of the northern hemisphere, all with showy flowers, several of them familiar and ornamental in gardens. They spring from root-stocks or tubers, or a few from bulbs. Their leaves are equitant and sword-shaped, and the flower is peculiar in having the three outer divisions recurved, while the three inner are incurved or erect, and the three branches of the style are large and petal-like, overarching the three stamens, which lie hidden underneath them. The violet-scented orris-root, used in perfumery and tooth-powders, is the root-stock of *Iris florentina*, *I. pallida*, and *I. germanica*, common species of flower de luce. All three are cultivated in the neighborhood of Florence for this purpose. There are several indigenous species in the U. S., of which *I. versicolor*, the common blue flag, is abundant from Canada to Florida. See FLEUR DE LIS. Revised by CHARLES E. BESSEY.

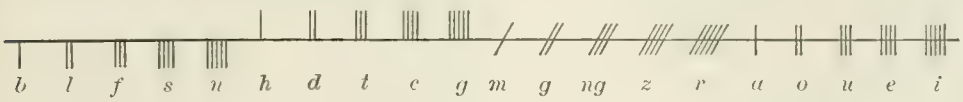
Iris Family: the *Iridaceæ*; perennial herbs with usually radical, two-ranked equitant, linear or sword-shaped entire leaves, and trimerous flowers with an inferior three-celled compound ovary. There are 770 species, natives of all temperate and tropical climates, abounding at the Cape of Good Hope. Many showy-flowered species of *Iris*, *Crocus*, *Gladiolus*, *Ixia*, etc., are common in cultivation.

CHARLES E. BESSEY.

Irish Language and Literature [*Irish* is from M. Eng. *Irish* < O. Eng. *Īrisc*, deriv. of *Īras*, the Irish, whence by

composition *Iraland* > Eng. *Ire'land*]: the language which before the English conquest was spoken over all Ireland. Since then and especially since the seventeenth century it has been gradually yielding place to the English. The present Irish-speaking population is most densely represented in the south and west of the island, but even here the upper classes have abandoned the use of the language, and left it to the peasants and fishermen. Efforts have been made of late, in connection with the national movement, to bring the language again into recognition, though with questionable success. It is also doubtful whether the Irish emigrants to the U. S. will succeed in retaining their language.

The Irish is far removed from the English in character, and is not to be confused with the Irish-English, a dialectal variety of English. It is a Celtic language, and forms with the Gaelic in Scotland and the Manx of the Isle of Man a language-group which is commonly designated as the Gaelic. (See CELTIC LANGUAGES.) Among the Celtic languages the Irish is undoubtedly the most interesting, both on account of the antiquity of its forms and the richness of its mediæval literature. It is divided into many dialects; those of Munster and Connaught differ, as do those of Connaught and Ulster, and even neighboring districts show often important differences. The oldest monuments of the Irish language are tombstones on which the name of the deceased and of his father are recorded in an alphabet known as *Ogum* or *Ogam*. These appear to reach back as far as the fifth century A. D. The Ogam alphabet was known to the later Middle Age; it appears to have been invented on the basis of the Roman alphabet, and not without influence from the Germanic runes, with a view to simplifying the cutting or graving of the letters, and has the following form:



The Ogam-stones are found chiefly in Southern Ireland, and in Wales, which was that time partially under Irish sway. With the spread of Christianity after the fifth century, the Roman alphabet spread itself in Ireland, and in the form which it had received in England. This, with certain later modifications, was the so-called Irish or Anglo-Saxon alphabet, as Irish monks were the teachers of the Anglo-Saxons. It is sometimes employed even yet in Irish prints. The oldest Irish records written in this alphabet are found in manuscripts from the eighth century on. They are mostly glosses or explanations written in between the lines of Latin texts. J. C. Zeuss succeeded in reconstructing from these fragments the entire grammar of the Old Irish language (*Grammatica Celtica*, 2d edit. by Ebel, 1871), which has proved of highest importance for linguistic investigations.

An Irish literature in the proper sense makes its first appearance in the manuscripts of the eleventh and following centuries (a few perhaps earlier). These are very numerous, and are found in the libraries of Dublin, London, Oxford, Edinburgh, and a few other places. They are in the language of what is known as the Middle Irish period. The works contained in them may readily be divided into two main groups or classes: (1) religious or learned; (2) secular.

(1) RELIGIOUS OR LEARNED WORKS.—As is well known, the Irish clergy at an early period became famous for learning and intellectual zeal. Indeed, during the sixth and seventh centuries they were the masters of all Europe in these regards. (See HUMANISM.) Though a variety of causes—e. g. the incursions of the Danes in the eighth and ninth centuries, and the English conquest in the twelfth—prevented this leadership from being permanent, yet the list of Irish scholars throughout the earlier Middle Ages is long and honorable. We find them everywhere in Europe, celebrated as teachers and exercising a powerful influence on scholarship and on thought. It is not surprising, therefore, to find in Ireland itself many evidences of a love of knowledge surviving even the most troublous times. Such evidences in particular are the numerous manuscripts devoted to religious or learned subjects. These either treat of some special matter in prose or in verse, sometimes in both combined, or come under the head of *bibliothecæ*, i. e. miscellaneous compilations of more or less arbitrary nature, some being of great size, and all very closely packed. Among them they exhibit a wide range of subject: annals, astronomy, calendars and computi, ecclesiology, genealogy, glossography, grammar, hagiology, history, homilies, law, legend, liturgies, medicine, "ogam" or occult writing, prosody, scholasticism, theology, topography. These can not here be discussed in detail; suffice it to say that the astronomy and medicine (fifteenth and sixteenth centuries) are those of all the mediæval world, i. e. Arabian, without distinctive Celtic tinge; the genealogies were public records to which, in a tribal community, every man had to look as to the charter of his civil and social status; the glossaries (in prose or rhymed) are of the simplest construction, but of great value; grammar is on the Latin system, but the terminology (as in a great measure is that of medicine also) is homespun, and agrees with that of the glosses on Priscian (see below); hagiology is both native and foreign, the former much older than the latter, which often is rendered or adapted from the *Legenda aurea* of Jacobus de Voragine; the laws are those of the Brehons (Irish *brithemuin*) or native Irish legists, in style and diction most obscure; scholastics are represented by tracts on the stock topics of the Aristotelian predicaments, *materia prima*, etc., important to Celtists for the terminology.

History forms the connecting link between learned and secular literature. The historians and antiquarians (Irish *senchaid*; English *shanaghies*), whose business it was to trace and record the genealogies and annals of noble families, have many points in common with the poets (*fili*). We have historical works of two kinds, native and imported; the former (e. g. the Pursuit of Ceallachan of Cashel, and Magrath's wars of Thomond) deals with purely Irish subjects, the latter treat themes not really historical, such as were popular all over Europe in the Middle Ages (e. g. the Six Ages of the World, the Argonautic expedition, the Trojan war, Alexander the Great, Julius Cæsar, Nennius's history of the Britons, the travels of Marco Polo and Sir John Mandeville).

(2) SECULAR WORKS.—In the field of secular literature the *fili* occupy the most prominent place. They are chiefly concerned with poetic composition. The Middle Irish verse appears to be derived from a union of the native verse structure with the Late Latin rhythm, which came to the Irish through the Latin hymns. The structure of the verse, which is based upon the enumeration of syllables, became steadily more artificial and the rules more complicated. Rhyme and alliteration appear together. A mediæval treatise on the subject claims that the *fili* must study twelve years before he can become a master (*ollam*). Besides these there were also untrained poets known as the *bards*, who were, however, utterly despised by the *fili*. The subject-matter of the poems is greatly inferior to their form. In the entire Middle Irish literature works of true poetical spirit and deep feeling are very rare. The activity of the poets was limited to singing the praises of their lords and the denunciation of enemies and rivals, and this was done in almost stereotyped formulas. Another office of the *fili* is more satisfactory; they were story-tellers, and it was a part of their mission to while away the long evenings with stories. These stories constitute the most valuable part of the Irish literature. They include the Irish legend, in which are reflected all the earlier periods of Irish history, the præ-Christian, the Christian, the period of the Viking invasions. The older stories are in the form of prose interspersed with short passages of verse. The subject-matter is often harsh and brutal, but yet extremely vigorous and spirited. After a time taste underwent a change, and entire stories began to appear in the form of verse. The chief hero, about whom gradually the most of the stories group themselves, is *Finn* (MacPherson's *Fingal*), son of *Cumall*, father of *Ossin* (*Ossian*). The subject-matter of the stories approaches more closely to the modern fairy-tale or legend. This so-called poetry of Ossian long retained its vigor; down into the seventeenth and eighteenth centuries it yielded fresh products and spread itself early in Scotland.

In the seventeenth century, with which the modern Irish period begins, a few eminent names appear, like Michael O'Clery, who in company with others compiled from earlier sources the valuable *Annals of the Four Masters*, and Geoffrey Keating, who wrote a history of Ireland from similar sources. There is also from this time a considerable mass (as yet mainly unpublished) of political verse, epigrams, etc. The political events, however, of the seventeenth century brought to its end the golden age of Irish literature. From this time on the literary language depended for

its standards of orthography and form in the main upon the language of the authors named. The language found, however, but scant literary use, the commonest being in religious writings, translations of the Bible, etc. Its real life is found in the folk-dialect. The folk-songs are, as a rule, more original in the melody than in the matter.

BIBLIOGRAPHY.—(1) Grammars: J. C. Zeuss, *Grammatica Celtica* (2d ed. by Ebel, 1871, for Old Irish); Windisch, *Kurzgefasste Irische Grammatik* (Leipzig, 1879, for Middle Irish); O'Donovan, *Grammar of the Irish Language* (1845, for New Irish). (2) Vocabulary: Windisch, *Irische Texte mit Wörterbuch* (1880). (3) Literary history: O'Curry, *Lectures on the Manuscript Materials of Ancient Irish History* (new ed. 1878; H. d'Arbois de Jubainville, *Essai d'un Catalogue de la Littérature épique de l'Irlande* (1883); *id.*, *Cours de Littérature celtique* (5 vols., 1883–92); H. Zimmer, *The Irish Element in Mediæval Culture* (Eng. trans. New York, 1891). See IRISH PHILOLOGY. R. THURNEYSEN.

Irish Philology: the study of the Irish language and literature. The growing importance of this study, in connection with Celtic philology in general, and, at the same time, the difficulty found by the student in obtaining information in regard to the scattered manuscripts, editions of texts, and articles dealing with the subject, makes desirable a brief review of the materials now available. As was indicated in the article IRISH LANGUAGE AND LITERATURE (*q. v.*), these materials (subdivisions neglected) fall into three broad classes, the Old, the Middle, and the New, representing so many phases of the language in which they are written—that is to say, the Gaelic or Irish member of the Celtic family—and covering (as hereinafter will appear) a period of hard upon 1,200 years.

I. THE OLD IRISH PERIOD is represented by a group of manuscripts, comparatively small in number but astonishingly fertile in material, preserved for the most part on the continent of Europe. The question whether they were written there or executed in Ireland and transported is (as regards some at least) as yet undecided. Neither is their exact date known, but all are of the Carlovingian era. Their contents are chiefly in the form of glosses to Latin texts, not exclusively of theological character; the scribes were of the Irish monks that in those ages went as missionaries to the continent of Europe, and who by these labors sought to facilitate the Latin studies of newcomers from their Western home.

The following is a list of such manuscripts, with the places where they now are, and their approximate dates: (1) St. Gall, Switzerland: Priscian's grammar, laden with Irish glosses, eighth century; (2) Carlsruhe: Priscian, glossed, ninth century; (3) *ibid.*: codex having *inter alia* Bede, *De rerum natura et ratione temporum*, with computistic matter besides, glossed, *circ.* 850; (4) Würzburg: St. Paul's Epistles, glossed, eighth century; (5) University Library, Leyden: Priscian, glossed, ninth century (written in Germany); (6) Palatine library, Vienna: Eutychius, glossed, eighth or ninth century (from Bobbio); (7) *ibid.*: fragment of Bede, *De rerum natura* (later than No. 3); (8) *ibid.*: Pauline codex, glossed, *anno* 1079; (9) Turin: fragment of Jerome on Gospel of St. Mark, glossed, ninth century; (10) Ambrosian Library, Milan: St. Paul's Epistles, glossed, eighth century; (11) Vatican Library: Cod. 5755, Augustine on the Trinity, glossed, eleventh century; (12) Civic Library, Berne: Servius on Vergil, Dioscorides, and rhetorical treatises, glossed, *circ.* 840; (13) Dresden: Pauline *Codex Boernerianus*, Greek with interlinear Latin version, containing two Irish quatrains (written by an Irish hand, probably at St. Gall), *circ.* 840; (14) Convent of Neunburg, near Vienna: codex containing *lorica* or prophylactic charm, eleventh or twelfth century; (15) Convent of St. Paul, Carinthia: fragment containing five short Irish poems, eighth century; (16) St. Gall: folio with formulas of incantation, eighth or ninth century; (17) Cambray: fragment of Irish sermon (in MS. of Irish canons known as *Codex Hibernensis*), between 763 and 790; (18) Nancy: leaf containing six glosses pasted inside Cod. 59 of that library, ninth century; (19) St. John's College, Cambridge: *The Hampton Psalter*, glossed in Irish, age uncertain; (20) Corpus Christi College, Cambridge: codex of Irish canons, glossed, ninth or tenth century; (21) Archiepiscopal Library, Canterbury: MacDurnan's *Gospels*, tenth century *etc.*

The above glosses, with additional matter, may be found printed in the following works: *Goidelica*, etc., with eight hymns from the *Liber Hymnorum*, and the Old Irish notes in the *Book of Armagh*; edited by W[hitley] S[tokes] (Calcutta, 1866); *Goidelica, Old and Early Middle Irish Glosses*, etc. (2d ed. of foregoing, London, 1872); H. Gaidoz, *Note on the Nancy Glosses* (No. 18 above; Proc. Royal Irish Acad. for June 10, 1867); *The Turin Glosses* (No. 9 above; ed. by C. Nigra, Paris, 1869); *Ambrosian Codex* (No. 10 above; ed. and illustr. by G. I. Ascoli, Rome, 1878); H. Zimmer, *Glossæ hibernicæ*, etc. (Berlin, 1881); *Würzburg and Carlsruhe Glosses* (pt. i., ed. by Whitley Stokes, Philol. Soc. of London and Cambridge, 1887).

II. MIDDLE IRISH PERIOD.—A vast literature, of which no more than a small portion can be indicated here, survives in MSS. dating from the ninth to the sixteenth century, and distributed thus: the Royal Irish Academy possesses between 700 and 800, Trinity College, Dublin, not nearly so many, and the British Museum 200 (taking Middle and New together); the Bodleian Library, Oxford, a smaller but most important collection, the University Library, Cambridge, and the Advocates' Library, Edinburgh, a few (these three collections almost exclusively Middle). So also are a few stragglers, e, g. in the Royal Library of Copenhagen, the Bibliothèque Nationale of Paris, and the library of Rennes. The following bibliography will indicate where such of this material as has been printed can be found: Royal Irish Academy's reproductions of leading *bibliothecæ* (see IRISH LANGUAGE AND LITERATURE): *Book of the Dun Cow*, cited as "LU" (library of Royal Irish Academy), written before 1106 (folio, 134 pp., Dublin, 1870); *Speckled Book of the Mac Egans*, cited "LB" (*ibid.*), written *circ.* 1400 (imperial folio, pp. 280, *ibid.*, 1876); *Book of Leinster*, cited "LL" (library of Trinity College, Dublin), written before and after 1130 (imperial folio, pp. 502, *ibid.*, 1880); *Book of Ballymote*, cited "BB" (library Royal Irish Academy), written *circ.* 1400 (imperial folio, pp. 502, *ibid.*, 1888). The first three were facsimilated by Joseph O'Longan and lithographed; BB is photolithographed; the *Yellow Book of Lecan* ("YBL") is in progress, and it is to be hoped that the *Book of Lecan* ("Lec.") will follow.

Irish Archæological Society's publications (texts and translations): *Murtach mac Neill's Circuit*, poem written in 942 by Cormacan Eiges, chief poet of north of Ireland (Dublin, 1841); *Battle of Moira*, etc., from YBL (*ibid*, 1842); *Tribes and Customs of Hy-Many or O'Kelly's Country*, in Galway and Roscommon, from Lec. (*ibid.*, 1843); *Tribes and Customs of Hy-Fiachrach or O'Dowda's Country*, in Mayo, from Lec. (*ibid.*, 1844); poem attributed to St. Columba, Irish charters from *Book of Kells*, etc. (*ibid.*, 1846; all edited and copiously annotated by John O'Donovan); Irish version of Nennius's *Historia Britonum*, from BB and Lec. (*ibid.*, 1847; edited with notes by James Henthorn Todd, D. D.).

Celtic Society's publications (texts and translations): *The Book of Rights*, from BB and Lec. (Dublin, 1847); *Treatise on O'Driscoll's Country*, County Cork, from Lec.; poem on battle of Downpatrick in 1260 (*ibid.*, 1849; all edited by John O'Donovan); battle of Moylena (*ibid.*, 1853; edited by Eugene O'Curry.

Irish Archæological and Celtic Society's publications: *Liber Hymnorum*, book of hymns of the ancient Church of Ireland, from the original MS. in Trinity College, Dublin, with scholia in Irish (edited by J. H. Todd, D. D., Dublin); Irish glosses, from a MS. in Trinity College, Dublin, and from LB (Whitley Stokes, *ibid.*, 1860); three fragments of ancient Irish annals, from a MS. in Burgundian Library, Brussels (John O'Donovan, *ibid.*, 1860); topographical poems of O'Dugan (d. 1372) and O'Heerin (by the same, *ibid.*, 1862); Cormac's *Glossary*, translated by John O'Donovan (edited after his death by Whitley Stokes, Calcutta, 1866).

Academy's Irish Manuscript Series comprises: *Raid for the Kine of Fraech* (edited by J. O'Beirne Crowe) and *Wooing of Becfola* (by Brian O'Looney, Dublin, 1870); *Festology*, attributed [wrongly] to Angus the Culdee, in three versions—from Rawlinson, 505, Laud, 610 (in the Bodleian), and LB, copiously annotated (Whitley Stokes, Calcutta, 1880).

Academy's Todd Lecture Series: *Mesead Ulad* (Intoxication of the Ultonians), an ancient tale from LB (edited by William Maunsell Hennessy, Dublin, 1888) (?); *Passions and Homilies*, from LB (omitting original Latin paragraphs, of which the Irish is a version), with introductory lecture on Irish lexicography (Robert Atkinson, *ibid.*, 1889) (?); the *Codex Palatino-Vaticanus*, No. 830, texts (from LL and LB), translations, and indices (Bartholomew MacCarthy, D. D., *ibid.*, 1892); *Battle of Rosnaree* (two versions), translations, indices (Edmund Hogan, S. J., *ibid.*, 1892).

Brehon Law Commission's publications: Vols. i., ii., iii. contain the *Senchas mór*, or Great Digest, and *The Book of Acaill*; vol. iv., divers law tracts (Dublin, 1865–69–73–79). These texts, transcribed and, for the most part, but roughly translated by Eugene O'Curry and John O'Donovan, were edited after their death by men that never had made the subject (one of enormous difficulty) their special study, or, indeed, studied it at all; hence many imperfections. The bulky prefaces, by others again that knew not a word of Irish, are futile. This and the following series are printed by Government.

The *Atlantis*, register of literature and science, conducted by members of the Catholic University of Ireland (4 vols., Dublin, 1858–63), has Middle Irish tales edited by Eugene O'Curry.

The Master of the Rolls Series: *Chronicon Scotorum*, a chronicle of Irish affairs from the earliest times to A. D. 1150 (edited by W. M. Hennessy, London, 1866); *War of the Gael with the Gall*, i. e. of the Irish and the Scandinavians (edited by J. H. Todd, D. D., *ibid.*, 1867); *Annals of Loch Cé*, chronicle of Irish affairs A. D. 1014–1590 (2 vols., W. M. Hennessy, *ibid.*, 1871); the *Tripartite Life of St. Patrick, etc.* (2 vols., Whitley Stokes, *ibid.*, 1887); *Annals of Ulster*, chronicle of Irish affairs A. D. 431–1540 (vol. i., W. M. Hennessy, Dublin, 1887; vol. ii., Bartholomew MacCarthy, D. D., *ibid.*, 1893).

Anecdota Oxoniensia, mediæval and modern series: *Saltair na rann*, text only (edited by Whitley Stokes, Oxford, 1882); the *Battle of Ventry* (Kuno Meyer, *ibid.*, 1885); lives of saints, from *Book of Lismore* (W. Stokes, *ibid.*, 1890).

La Revue Celtique (which Henri Gaidoz founded in 1870 and ably conducted till 1885, when it changed hands) has numerous Irish-tales, and three rhymed glossaries edited by Whitley Stokes; also minor pieces by Hennessy and by divers continental scholars.

Independent publications: Three Irish glossaries, being Cormac's, Donall O'Davoren's, one on *Festology* of Angus the Culdee (edited, text only, by Whitley Stokes, London, 1862); *Vision of Adamnan*, from LU (by same, Simla, India, 1870); *Three Irish Homilies*, on lives of SS. Patrick, Columba, Bridget (by same, Calcutta, 1877); *Destruction of Troy*, from BL (by same, *ibid.*, 1881); *Book of Fenagh*, otherwise S. Caillin's Book (edited by Denis M. Kelly and W. M. Hennessy, Dublin, 1875); *Irische Texte*, first series, tales (edited texts only, with glossary, by Ernst Windisch, Professor of Sanskrit in University of Leipzig, Leipzig, 1881); second series, in two parts (edited, with translations, English and German, by Stokes and Windisch, *ibid.*, 1884–87); third series, part i. (by same, *ibid.*, 1891), contents being Middle Irish tales treated by Stokes, Windisch, Kuno Meyer, and text only (with notes) of three tracts on prosody, edited by R. Thurneysen; *MacConglinne's Vision*, "a Middle Irish wonder-tale," from LB, notes and glossary (edited by Kuno Meyer, London, 1892); *Silva Gadelica*, a collection of tales in Irish, from LU, BL, LB, BB., etc. (edited by S. H. O'Grady, *ibid.*, 1892).

III. New Irish Period.—This reaches from the later sixteenth century to the middle of the eighteenth. The literature is on paper, whereas the Old and Middle are on vellum. The adoption of the later material greatly influenced handwriting (which in varying degrees became cursive) and multiplied penmen. This branch is represented chiefly in the libraries of the Royal Irish Academy; of Trinity College, Dublin; of the Franciscan convent, Merchants' Quay, Dublin (which possesses some Middle Irish MSS. as well, notably missing folios of BL); of the British Museum; and in the Burgundian Library, Brussels; while a doubtless large number of New-Irish MSS. still lurk in private hands in the U. S. as well as in Great Britain. Perhaps the most important vellum MS. now owned by an individual is the Duke of Devonshire's *Book of Lismore* (so called), rightly the *Book of MacCarthy-Riach*, written before 1500. The Franciscan collection mentioned above was formerly in the Irish College of St. Isidore, in Rome.

The nature of these later remains may be gathered from the following paragraphs:

New Irish Bibliography.—*Annals of Donegal*, otherwise "of the IV. Masters" (i. e. Michael O'Clery, O. S. F., Peregrine and Conary O'Clery, Peregrine O'Clery, the compilers), extending from A. M. 2242 to A. D. 1616, text and translation, with copious notes and indices, by John O'Donovan (Dublin, 1848; 2d ed., on smaller and very poor paper, *ibid.*, 1856); *Martyrology of Donegal*, calendar of Irish saints, compiled by Michael O'Clery in 1629, prepared by John O'Donovan for Archæological and Celtic Society (edited after his death by J. H. Todd and W. Reeves, DD. D., *ibid.*, 1864); *Glossary* of ancient Irish words (explained in Irish), compiled by same (Louvain, 1643; reprint in *La Revue Celtique*, by Arthur K. H. Miller); *Mirror of the Sacrament of Penance*, by Hugh MacCawell, O. S. F., afterward Archbishop of Armagh (Louvain, 1618); *Mirror of Piety*, by Florence O'Mulconary, or "Conry," O. S. F. (*ibid.*, 1626); *Catechism*, Irish and Latin, by Theobald Stapleton, an Irish priest (Brussels, 1639); *Paradise of the Soul*, by Anthony Gernon, O. S. F. (Louvain, 1643); *Essay on Miracles*, by Richard MacGillycuddy, or "Archdekin," S. J. (*ibid.*, 1667); *Lucerna Fidelium*, Christian doctrine (all Irish), by Francis O'Molloy, O. S. F. (Rome, 1676); *Christian Doctrine*, by Bonaventura O'Hosey (*ibid.*, 1707); sermons in Irish, by James O'Gallagher, Bishop of Raphoe (1740); *Catechism*, English and Irish, by Andrew Donlevy, superior of Irish community in Paris (Paris, 1742); *Ossianic Society's Transactions* (6 vols., Dublin, 1854–61) contain a number of texts (prose and verse), some from Middle Irish MSS. (edited by Owen Connellan, Eugene O'Curry, John O'Daly, John O'Donovan, S. H. O'Grady, Nicholas O'Kearney); *Three Sharp-pointed Shafts of Death*, theological treatise, by Geoffrey Keating, D. D. (edited from seventeenth century MSS., by Robert Atkinson for R. I. A. Irish MS. series, *ibid.*, 1890); *Life of Hugh Roe O'Donnell* (1586–1602), by his contemporary, Lughaidh O'Clery (edited, with translation and notes, by Denis Murphy, S. J., *ibid.*, 1893).

Unpublished matter, the quantity of which is immense, consists (1) of historical poetry—e. g. O'Conor Don's MS. (now in Royal Irish Academy) of 10,000 quatrains; poems on Maguires of Fermanagh (1580, *sqq.*), now at Copenhagen, 1,200 quatrains; *Contention of the Bards* written 1600, *sqq.*, 500 quatrains (copies vary); the O'Gara MS. (Royal Irish Academy), many hundreds; (2) of political poetry—e. g. the copious effusions of David O'Bruadar, of Limerick, and of others, on events from 1641–92; (3) of prose, as Geoffrey Keating's *History of Ireland* (a small portion printed by W. Halliday, Dublin, 1811, another by P. Joyce, *ibid.*, 1888); *Key* [and] *Shield of the Mass*, by same (now issuing in *The Irish Echo*, Boston, Mass.); Duald MacFibris's huge genealogical work (compiled 1650); several tales of considerable length and humorous character, written from (say) 1690–1750; (4) of epigrams, of which the seventeenth century is very prolific, and songs of all kinds (many of great merit), which have been poured forth down to our own day. In this last department comparatively little has been done as yet; former zealous laborers were James Hardiman, John O'Daly, Edward Walsh, and the lamp has been trimmed by Douglas Hyde, LL. D., who has printed *Love-songs of Connacht* (Dublin, 1893) as part of a series in progress.

Standish H. O'Grady.

Irish Moss: See Carrageen.

Irish Pale: See English Pale.

Irish Sea, The: a body of water situated between Ireland and Great Britain, and connected with the Atlantic, S. by St. George's Channel, and N. by the North Channel. Its greatest width is 120 miles. It contains the Isle of Man and Anglesey, besides some smaller islands. The principal inlets are the estuaries of the Dee, Mersey, and Ribble in England, Solway Firth in Scotland, and Dundrum, Dundalk, and Dublin Bays in Ireland.

Iris Ornaments: See Barton's Buttons.

Iri'tis [Mod. Lat., deriv. of *iris*, iris of the eye]: a frequent and formidable disease of the eye, characterized by inflammation of the iris and the contiguous serous surfaces, by intolerance of light, by adhesions (*synechia*) to the surrounding parts, and by consequent distortion and immobility of the pupil. The color of the iris also undergoes peculiar changes, so that the skilled diagnostician can usually detect its presence at once. When the iris is at all actively inflamed, it also becomes quite insensible to the action of atropia. Iritis may be traumatic in its origin, or may arise from overuse of the eye or from working in too intense light. It is, however, usually of a rheumatic or syphilitic character. It is often very painful. Local bloodletting, iodide of potassium, mercurials, atropia, and finally tonics, such as iron, quinia, and strychnia, are employed in its treatment.

Revised by William Pepper.

Irkutsk': a government of East Siberia; bordered by the governments of Yeniseisk and Yakutsk, Transbaikal

and Mongolia. Area, 287,061 sq. miles. Pop. (1891) 444,704. It has Lake Baikal on the S. E., and is very mountainous. Large tracts are covered with pine forests; rye and oats are the common crops; rhubarb is much cultivated. Of animals, reindeer, sables, ermines, and foxes abound, and excellent fish, especially sturgeon and cod. Gold, silver, lead, jasper, topaz, emerald, rock-salt, and coal are found. Agriculture and the transit trade between China and Russia are the chief pursuits of the inhabitants.

Revised by M. W. Harrington.

Irkutsk: the largest town of Siberia; the capital of the government of Irkutsk; at the confluence of the Irkut and the Angara, in lat. 52° 17′ N. and lon. 104° 16′ E., 40 miles from Lake Baikal (see map of Asia, ref. 3-G). It is the seat of the governor-general of East Siberia and of an archbishop of the Greek Church, and has many educational institutions. Its houses are mostly built of wood. Its manufactures of linen, leather, glass, and soap are merely local, but it is the principal station of the trading route between China, Siberia, and Russia, and large quantities of tea, silk, porcelain, rhubarb, and furs are here exchanged for European goods. Pop. (1891) 50,274.

Revised by M. W. Harrington.

Irne'rius, Wernerius, or **Garnier**: jurist; b. at Bologna, Italy, in the second half of the eleventh century; became Professor of Roman Law at the university of that city, and in that capacity discovered and expounded the *Institutes* of Justinian and other eminent ancient jurists, thus becoming the restorer of Roman jurisprudence. D. at Bologna, probably, between 1126 and 1128.

Iron, ī'ŭrn [M. Eng. *iren* < O. Eng. *īren*, *īsen*: Goth. *eisarn*: O. H. Germ. *īsarn*, *īsan* > Mod. Germ. *eisen*. The word is of Celtic origin, cf. O. Ir. *iarn*, and was a deriv. of the old word for copper, *īs-*, *ajes-*. The variety of the names for iron among Indo-European peoples is due to its relatively late introduction; cf. Gr. *σίδηρος*, Lat. *ferrum*, Sanskr. *çyāma-*, Armen. *erkath*, Lith. *geležis*]: a metal practically unknown in a pure state in the arts, although some grades of soft basic steel are almost chemically pure. The whole range of iron and steel is a series of alloys, in which carbon is the most important constituent as affecting the physical qualities, although manganese, chrome, nickel, tungsten, and other metals influence their properties in a special manner.

The carbon contents of iron fluctuate between the extremes of 0·05 per cent. and 7 per cent. Some efforts at a scientific classification of these alloys have been made, but have failed of adoption in commercial circles. *Pig iron* is an alloy, produced in the blast furnace, which contains from 1·5 to 7 per cent. of carbon. It is brittle, and melts at relatively low temperature. *Wrought iron*, at the other extreme of the series, is an aggregation of crystals of an alloy of iron with a very small amount of carbon, cemented together with cinder, a silicate produced during the course of manufacture. It fuses at very high temperatures, becomes pasty during a considerable range of heat, and two pieces heated may be united into one by welding. Wrought iron does not harden. *Steel*, in trade classification, is a homogeneous alloy of iron and carbon, produced either in the crucible, the Bessemer converter, or the open-hearth furnace. (See the article Steel.) The fusibility increases with the carbon contents, while the capacity to weld declines. The alloys richer in carbon, when suddenly plunged after heating into some cooling liquid, become very much harder. This temper may be drawn by subsequent heating.

Investigations point to the existence of a series of modifications of carbon in iron and steel. Two forms, that of combined carbon, a constituent of a true chemical compound or carbide, and graphite or free carbon, were recognized by Karsten early in the nineteenth century. In the alloys which constitute the steel series, "temper carbon" and "hardening carbon" are claimed as modifications.

The infinite variety of properties of these carbon alloys, and the incidental series produced by adding other substances, permit of a selection from them of metals particularly suitable for a very wide range of service requirements. It renders a comprehensive statement of physical properties vague. The relation between the latter and chemical composition, while fully understood in a general way, is often obscured through the intervention of a multiplicity of variables. Small quantities of silicon, phosphorus, sulphur, copper, manganese, titanium, etc., affect the tensile strength, ductility, capacity to weld or to harden, of iron and steel, and the temperature at which the alloy has been melted or shaped by hammering or rolling has also much effect upon the value of the iron or steel to resist strains or to perform cutting or abrasive work. An enormous mass of material bearing on these questions has been collected by scientific research, and through commercial and governmental investigation and testing. Pig iron is shaped by casting it, when in a liquid state, into molds. Wrought iron and steel, at a certain range of temperature below the melting-point, is plastic, and can be shaped by hammering or rolling, retaining when cold the form thus imparted.

Physical Properties. *Color.*—Iron is silvery white, with a mild but brilliant luster. Foreign elements modify the luster rather than the color. As the carbon increases the color becomes more gray, till in pig iron with free graphite it is black.

Fracture.—Wrought iron is fibrous. The purer the metal, the more it has been worked, and the more gradual the break, the longer and more silky the fibers. Steel and cast iron are crystalline, the fracture of steel becoming conchoidal when hardened.

Specific Gravity.—Electro-deposited iron, 8·139; worked cast steel, average, 7·823; hammered iron, 7·76 to 7·798; rolled iron, 7·76 to 7·54; puddled bar, average, 7·4; cast-iron castings, average, 7·10.

Conduction of Heat and Electricity.—Silver being 100, wrought iron conducts heat at 11·9, electricity as 12 to 14·8.

Expansion by Heat.—From 32° to 212° cast iron expands 0·0033 in bulk, wrought iron 0·0036, the latter expanding lineally $\frac{1}{5\,8\,8}$ for each degree up to 572° F. Heated cast iron becomes permanently expanded by 1½ to 3 per cent. linear.

Fusibility.—Pure iron is at least as refractory as platinum; cast steel fuses at 4,000° F.; cast iron at 2,780° F.

Ductility.—The ductility of iron is exceeded only by gold, silver, and platinum. Iron wire is made 0·01 inch diameter and 49,000 feet long unbroken.

Hardness.—Hardened steel is the hardest of metals, white cast iron nearly as hard, good cast iron three to five times as hard as copper, while wrought iron and homogeneous iron are often nearly as soft as copper.

Value.—Neither iron nor steel is necessarily good because strong. Steel stretches 5 to 30 and iron 20 to 50 per cent., according to hardness. In these circumstances the elastic limit will be between two-fifths and one-half the tenacity.

Chemical Properties.—Iron forms two classes of compounds known as *ferrous* and *ferric* compounds. *Ferrous chloride*, $FeCl_2$, and *ferric chloride*, $FeCl_3$, are examples. Oxidizing agents convert ferrous into ferric compounds, and reducing agents effect the reverse change. Whenever a ferrous compound is exposed in solution to the air it is gradually converted by the oxygen into the corresponding ferric compound. Some of the more important compounds of iron are mentioned below. Ferric chloride is used in medicine under the name of *liquor ferri sesquichlorati*. *Potassium ferrocyanide* and *potassium ferricyanide*, the former known as *yellow prussiate of potash*, and the latter as *red prussiate of potash*, are described under Potassium (*q. v.*). *Prussian blue* is formed by adding a solution of a ferric salt to a solution of potassium ferrocyanide. Iron forms three compounds with oxygen. These are *ferrous oxide*, FeO; *magnetic oxide of iron*, or *ferroso-ferric oxide*, Fe_3O_4; and *ferric oxide*, Fe_2O_3. The magnetic oxide occurs in nature as the mineral magnetite and loadstone. Ferric oxide is one of the most valuable ores of iron, occurring as the mineral hematite. *Ferrous sulphate*, $FeSO_4$, more commonly known as *green vitriol* or *copperas*, is made by the spontaneous oxidation of pyrite in contact with the air, and by dissolving iron in sulphuric acid. It is used in dyeing, in the manufacture of inks, as a deodorizer, etc.

Ira Remsen.

Iron and Oxygen.—Compact iron rusts or oxidizes slowly in air, owing to the presence of carbonic acid and moisture, but iron sponge burns readily cold, and solid iron at a high heat. Protoxide of iron is a powerful base in metallurgical operations, having great affinity for oxygen and the power of decomposing water. Magnetic oxide of iron, as "scale," is an important product and a powerful agent, as a source of oxygen, in puddling.

Iron and Carbon.—Iron combines readily with carbon up to about 7 per cent., when manganese is present, a small change of carbon producing extraordinary modifications of properties. About 1·5 per cent. carbon is the lowest limit for cast iron; the metal is not malleable or weldable, and graphite will not separate under the slowest cooling. With

1·75 per cent. carbon the metal (steel) can barely be welded, but at 1·5 per cent. the properties of steel develop clearly—viz., fusibility, combined with weldability and capacity to harden. With 0.4 carbon, steel can barely be hardened enough to give sparks on flint, and below 0·25 can not be practically hardened at all. Below 0·2 ingot iron is most decidedly toughened, and, if cold-short, made more ductile by the most powerful attempts to harden it. Below 0·4 the metal is called steely iron, puddled steel, and wrought iron; below 0·25 per cent. carbon it is occasionally called ingot iron, weld iron, or wrought iron. Bessemer rails are usually true steel, but much Bessemer and Martin (ingot) iron is made for wire and boiler-plate. The softest wrought iron rarely contains less than 0·08 per cent. carbon.

Carbon is present in iron as both graphite and combined carbon, the total of both in cast iron being usually 3·2 to 4·7 per cent. With much graphite the iron is called gray iron; with little or none, white iron; with the free and combined carbon about equal, mottled iron. The grades of pig iron in the U. S. are usually 5—No. 1 foundry, No. 2 foundry, No. 3 gray forge, No. 4 mottled, and No. 5 white. White iron containing from 10 to 25 per cent. of manganese is called spiegel iron, and with 30 to 80 per cent. ferro-manganese.

Iron (Carbon) and Manganese.—Manganese is seldom found in wrought (weld) iron. In cast iron it increases combined carbon and diminishes silicon. In steels, from 0·1 to 1 per cent. improves their working.

Iron (Carbon) and Sulphur.—Sulphur diminishes carbon, hinders separation of graphite, and increases strength in cast iron. In steel and iron, 0·1 per cent. causes red-shortness. Copper acts similarly, but less strongly. In Bessemer steel it has been introduced up to 0·75 per cent. without serious trouble in rolling.

Iron (Carbon) and Phosphorus.—Phosphorus is almost always present. In cast iron it increases hardness, also the fluidity when hot, but weakens the cold metal; 0·25 per cent. in iron and 0·1 per cent. in steel cause brittleness—cold-shortness—though the metal works easier when hot, counteracting sulphur.

Iron (Carbon) and Silicon.—White cast iron seldom contains over 1 per cent., while gray has sometimes 8 per cent. Ordinarily it does not injure cast iron, but a small amount renders wrought iron rotten, and 0·1 per cent. is injurious when other impurities are present. Alloys very high in silicon are now made, called ferro-silicon, which are used in foundry practice and in steel-making.

Iron and carbon combine with tungsten, titanium, chromium, and tin; tungsten increases toughness, chromium rendering steel less liable to injury from overheating. Tin, even 0·2 per cent., gravely injures iron.

Iron Alloys.—Few of those with carbon are of practical importance. With zinc in great excess its alloy is used as a coating, to galvanize, as practiced at Rouen in 1786. A similar alloy with tin is used as a coating (tin plates) preventive of rust. An alloy of tin and lead is employed in making terne-plates. As a preventive of rust iron and steel are coated with an adhesive film of magnetic oxide by the Bower-Barff process. The magnetic oxide is produced by exposing the polished or cleaned articles to the action, at a red heat, of air and superheated steam. Revised by Charles Kirchhoff.

Ores of Iron.—These are the oxides of the metal mixed with lime, clayey or siliceous impurities. Commercially over 20 per cent. of iron is necessary.

ORES OF IRON.

NAME.	Composition.	Iron in 100 parts.
1. Magnetic iron ore	Iron and oxygen.	72.41.
2. Red hematite (specular).	Iron and oxygen.	70.
3. Brown hematite.	Iron, oxygen, and water.	61.4; water 12.
4 Spathic iron ore.	Iron, oxygen, and carbonic acid.	48.28.
5. Black-band.	Iron, oxygen, carbonic acid, clay, and carbonaceous matter (coal).	Variable 20 to 35 (10 to 25 coal).

Native iron, meteorites, and minute particles in basaltic rocks—a curiosity.

(1) *Magnetic Iron Ore.*—Sesquioxide 69, protoxide 31 = 100. Iron black in color, leaving black streak; specific gravity, 4·9 to 5·2; often strongly magnetic, sometimes with polarity. Found mostly in primary crystalline rocks, massive (weathered as sand or ocher), and most abundantly in metamorphic rocks in beds. Impurities, titanic acid, apatite, and iron and copper pyrites.

(2) *Specular Iron Ore, or Red Hematite.*—Iron 70, oxygen 30 = 100. Specular variety, dark-steel gray in color, blood red by transmitted light; earthy ore (red hematite) red; each kind leaves a red streak. Not limited to any geological period, without characteristic impurities, and the best iron ore except massive spathic.

(3) *Brown Hematite, or Hydrated Sesquioxide of Iron.*—Sesquioxide 85·6, water 14·4 = 100. Found massive, earthy, ocherous, also containing fossils (one kind of fossiliferous iron ore), and loose or porous as bog ore. Specific gravity, 3·6 to 4, and its streak is yellowish brown. It is the result of alteration of other ores or iron minerals by water, air, etc., and is still being formed as lake ore; for instance, in Sweden and in ponds of Eastern Massachusetts. It is mixed with sand, etc., and its impurities are principally manganese (helpful under certain conditions), organic matter, and phosphates of iron (injurious under some contingencies).

(4) *Spathic Iron Ore.*—Protoxide 62·1, carbonic acid 37·9 = 100. Specific gravity 3·7 to 3·9; color light yellow, turning brown when weathered; before exposure the streak is white. Part of the iron occasionally replaced by manganese (yielding then spiegeleisen), and it is found pure, crystallized in large conformable beds, also in globular masses and earthy with clay or sand, in latter state forming clay ironstone ores.

(5) *Black-band Ore.*—Clay ironstone with coaly matter in excess of 10 per cent.; becomes dark brown or black and often shaly, resembling cannel coal. It occurs in all coal measures more or less, and is valuable, as it roasts or burns itself, thereby increasing the percentage of iron to 50 or more. It carries phosphorus and pyrites.

Franklinite is strictly an ore of zinc, found only in New Jersey, but, owing to its large percentage of manganese, it is used to make spiegel iron after extraction of the zinc.

Roasting improves all ores, but it is necessary for carbonates and any sulphurous ore. It removes water, carbonic acid, and sulphur partly, and in carbonate ores increases the iron, and therefore the furnace yield. It also changes the structure of many ores, so that their reduction in the blast furnace is more readily and more cheaply accomplished. The loss of weight varies from 10 to 35 per cent., and coal-slack required to roast is 5 to 10 per cent. of the ore, except black band.

Distribution of Iron Ores.—In Russia the magnetic ores of the Ural Mountains furnish the most iron, while in Sweden and Norway they are substantially the only ores. Austria has much magnetic ore in Hungary and the Banat, earthy red hematites in Bohemia, and vast deposits of spathic ore in Styria and Carinthia. German empire: in Silesia, brown hematite and spathic clay ironstone with black band; in Prussia, bog ore; in Westphalia, black band and carbonate clay ironstone; in Rhenish Prussia, Siegen, and Nassau, spathic ore proper with some specular; in Saxony, magnetic and specular ores, commonly siliceous, and some bog ore; W. of the Rhine coal measure, carbonates are the principal ores; in the Lorraine and Luxemburg districts the famous "minette," or oölitic hematite, which is the source of supply for a large number of furnaces in Westphalia, the Rhine provinces, Belgium, and Eastern France. With the exception of its share in the territory of the minette district, France is poor in iron ores; mines principally earthy brown hematites with some earthy red hematite, but imports from Elba, Spain, and Algeria. Belgium smelts principally earthy brown and oölitic red hematites, all quite lean, and imports largely. Italy has magnetic ore in the Alps and vast deposits of specular ore at Elba, but exports mostly. Algeria has great deposits of red hematite in Constantine. Spain has deposits of compact red hematite of great purity near Bilbao, and earthy and manganiferous red hematites in the S. very largely support the Bessemer steel trade of England and the Continent. In Great Britain the argillaceous carbonates are by far the most important ores, fully two-thirds of the entire product of the United Kingdom being made from them. They are worked in all coal-fields as clay band or black band (Scotland) and in the Cleveland district. Brown hematite is worked in the Forest of Dean and in Cornwall, where also a spathic deposit occurs at Perran. In Lancashire and Cumberland great deposits of red hematite support a large steel manufacture. In Canada the principal ores worked are magnetic, and in Nova Scotia some red hematite and brown hematite. In Cuba considerable quantities are mined by U. S. mining companies near Santiago, the principal enterprise being the Juragua.

According to the report of the eleventh census, the product of the principal States, the number of employees, their wages, and the cost of production were as follows in the calendar year 1889:

LOCALITIES	Number of mines	Product, gross tons	Value per ton	Number of men employed above ground.	Number of men employed below ground.	Wages expended per ton	Total cost of production, per ton
Total U. S.	592	14,518,041	$2 30	17,999	19,708	$1 06	$1 71
Principal States.							
Michigan	73	5,856,169	2 70	4,081	8 866	1 19	2 07
Wisconsin	16	837,399	3 20	553	1,264	1 09	1 78
Minnesota	4	864,508	2 87	742	1,013	1 10	1 80
New York	35	1,247,537	2 49	1,348	1,784	1 00	1 64
New Jersey	24	415,510	3 24	462	1 080	1 71	2 74
Pennsylvania	180	1,560,234	1 96	3,008	1,332	0 75	1 10
Virginia and West Virginia	38	511,255	1 83	1,006	770	1 09	1 64
Georgia and North Carolina	17	258,145	1 20	675	105	0 71	1 14
Tennessee	16	473,294	1 38	1,313	202	0 76	1 08
Alabama	15	1,570,319	0 96	1,762	1,319	0 69	0 82

The yield of the ores mined in the census year is estimated at an average for the whole country of 51·27 per cent. As an indication of the quality of Southern ores, it is stated that the Alabama furnace material, exclusively local, was 46 per cent. The Illinois furnaces, which use only lake ores, showed an average of 60 per cent., which is considered as fairly representing the shipping ores from that section.

The production of iron ore in the U. S. has been as follows, according to statistics collected by John Birkinbine:

STATES.	1880.	1889.	1890.	1892.
	Long tons.	Long tons.	Long tons.	Long tons.
Michigan	1,640,814	5,856,169	7,141,656	7,544,544
Alabama	171,139	1,570,319	1,897,815	2,312,071
Pennsylvania	1,951,495	1,560,234	1,361,622	1,084,047
New York	1,126,899	1,247,537	1,253,393	801,099
Wisconsin	37,000	837,399	948,965	790,159
Minnesota		864,508	891,910	1,255,465
Virginia	162,791	498,154	543,583	741,027
New Jersey	676,225	415,510	495,808	466,455
Tennessee	93,272	473,294	465,695	406,578
Georgia	81,621	248,020	244,088	185,054
Missouri	344,819	265,718	181,690	118,494
Ohio	488,753	254,294	169,088	95,168
Colorado	....	109,136	114,275	141,769
Montana, Oregon, New Mexico, and Utah	6,225	86,405	81,632	44,875
Kentucky	57,865	77,487	77,685	50,523
Maryland	127,162	29,380	35,657	40,171
Massachusetts	55,926	46,242	32,934	14,941
Connecticut	31,267	29,690	26,058	31,324
West Virginia	54,657	13,101	25,116	6,000
North Carolina	2,963	10,125	22,873	25,379
Texas	3,214	13,000	22,000	22,903
Maine	5,357	12,319	2,500	.....
Indiana and Vermont	958	.....	.....	.....
Totals	7,120,362	14,518,041	16,036,043	16,296,666

Of the total product in 1892, 11,646,619 gross tons were red hematite, 2,485,101 were brown hematite, 1,971,965 tons were magnetite, and 192,981 tons were carbonate ore. The Lake Superior district, in which are included Michigan, Wisconsin, and Minnesota, produced 9,253,750 tons of red, 207,606 tons of brown hematite, and 127,832 tons of magnetite.

In the New England States the greatest part of the moderate ore-supply is drawn from the brown hematite beds of the Salisbury region in Massachusetts, which extend into adjacent parts of Connecticut and New York. It is the foundation for the manufacture of a high-grade charcoal pig, largely used in the manufacture of car-wheels. Magnetite is the predominating ore of New York, large deposits being worked in the northeast corner of the State, on the western shore of Lake Champlain, and southward along the lake; also on the western flank of the Adirondack Mountains and in the southeastern part of the State near Croton. The magnetites of New Jersey, which constitute 98·5 per cent. of the product of the State, start in the northern central portion of the State, entering it from New York, run in a S. S. E. direction, crossing the Delaware river above Easton, into Pennsylvania. The bulk of the magnetites obtained in the latter State come from the Cornwall ore hills near Lebanon, the greatest single ore deposit known in the U. S., which since 1740 has furnished 11,500,000 tons of ore. The brown hematites of Pennsylvania, once an important source of supply for its furnaces, are seemingly divided into two series, starting in the northern section of the State and running S. W. in nearly parallel lines. The same class of ore is mined to some extent in Maryland, and forms the chief source of local supply for the furnaces of Virginia. They extend in a general northeast and southwest line through the State along the Shenandoah valley and the Cripple creek. At one time great hopes were based upon the deposits of "gossan" ores in Southwestern Virginia, the ores being formed by the oxidation of the exposed parts of pyrite and pyrrhotite deposits. These ores have, however, proved too lean to bear long-distance transportation. Brown hematites are found in isolated, though often important, bodies in Georgia, Tennessee, and particularly in Alabama, where large mining operations are carried on at Anniston, Shelby, and other points. The principal reliance of the great and growing smelting industry of Alabama is the "fossil" ore, a red hematite, which finds its greatest development in the vicinity of Birmingham, in close proximity to coking coal.

The ores of Ohio, all of the carbonate variety, once important, are not now largely used because they are too lean. Missouri has declined as an ore-producer, the Iron Mountain now being the only important deposit worked. Texas iron-mining has been limited thus far to brown hematite deposits in the eastern part of the State. Richer ores are found in the southern central part of the State.

By far the more important source of supply of iron ore in the U. S. is that of the districts in Michigan, Wisconsin, and Minnesota embraced in the general term of the Lake Superior region. The oldest is the Marquette range, the iron-ore-bearing series being the Huronian, the rocks having been greatly folded. The next opened was the Menominee range of Michigan and Wisconsin, where there is greater regularity in the position of the rocks. The Gogebic range, at one time the scene of a great mining excitement, lies partly in Michigan and partly in Wisconsin. The ore formation is the most regular in the entire iron region, the product being a soft Bessemer ore. The discovery of the Vermilion range, whose outlet is Two Harbors, carried Minnesota into the list of leading ore-producing States, and more recently the developments in the Mesaba range N. of Duluth promise to add very greatly to its output.

The shipments of iron ore from the Lake Superior districts were for the years mentioned as follows, in gross tons:

DISTRICTS.	1887.	1890.	1893.
Marquette	1,851,717	2,997,927	1,829,053
Menominee	1,199,343	2,289,017	1,466,197
Gogebic	1,285,265	2,845,171	1,329,464
Vermilion	394,252	880,264	820,621
Mesaba	.....	.....	613,620
Totals	4,730,577	9,012,379	6,058,955

The transportation of the lake iron ore to market is a great industry, the ore being brought by local railways to the shipping ports, whose relative importance is shown in the following table:

SHIPPING PORTS.	1889.	1892.	1893.
	Gross tons.	Gross tons.	Gross tons.
Escanaba, Lake Michigan	3,003,632	4,012,197	2,048,981
Ashland, Lake Superior	1,484,802	2,221,241	1,117,520
Marquette, Lake Superior	1,376,335	1,034,700	1,043,988
St. Ignace, Lake Michigan	51,853	.....	.....
Gladstone, Lake Michigan	73,847	115,907	203,343
Two Harbors, Lake Superior	819,639	1,155,498	902,352
Superior, Lake Superior	.....	4,245	80,273
Duluth	.....	.....	440,292

The Escanaba docks receive all the Menominee district ore which requires lake transportation, and took in 1892 1,392,148 tons of Marquette district ore and 512,543 tons of Gogebic ore. All the material coming from Ashland is from the latter district, and the Marquette district occupies a

similar position for the port of Marquette. Two Harbors is the shipping port of the Vermilion range.

Some of the lake ore reaches furnaces in the vicinity, and at certain seasons plants at a distance by rail. All the ore shipped by lake goes to receiving docks at Cleveland, Ashtabula, Fairport, Erie, Buffalo, Toledo, Sandusky, Union, Lorain, Chicago, Milwaukee, Conneaut, and Detroit. About one-third of the ore as it is received is handled directly from the vessels bringing it from the upper lakes into railway cars during the season of lake navigation, and about two-thirds is placed in stock at the docks, from which the furnaces draw their supplies as needed. A very large number of modern vessels are engaged in the traffic, contributing largely toward making the tonnage of the Sault Ste. Marie Canal greater than that of the Suez Canal.

MANUFACTURE OF IRON. — The method of producing wrought iron from ore by robbing the oxide or ore of its oxygen, through the reducing action, at moderate temperatures, of carbon in some form, solid or gaseous, is called the "direct" process. All the primitive methods came within this class, and it still possesses much attraction for inventors and experimenters. It appears simpler because the product is obtained in one operation when contrasted with that now generally prevailing of making from the ore in the blast furnace pig iron, an alloy of iron and carbon, and subsequently converting it into wrought iron by further manipulations based upon the removal of all or the greater part of the carbon introduced during the first operation. Still, economically, the latter procedure has proved so much more advantageous, through ability to employ cheap though inferior materials, through the possibility of working enormous masses at low labor cost, through the avoidance of waste and loss, and through the attainment of a product uniform in quality, that the direct process has practically disappeared as a means of manufacturing wrought iron for direct use. Some hopes are still attached to modified direct processes as the means of producing a raw material for the manufacture of crucible and open-hearth steel. These "sponge" processes, among which those of Chenot, Blair, Siemens, Wilson, Eames, Conley, and Adams have been tested on a large scale, have not thus far proved technically or commercially successful. The old Catalan forge and the bloomery now possess only an historical interest. The refinery-fire, too, has practically lost its place in modern practice in the U. S., and is used only in a few places.

Even puddling or boiling is rapidly losing its importance as a means of converting pig iron into wrought iron, since the rapid cheapening of the steel-making processes is driving wrought iron out of the market, and confining it to the limited range reserved for it by prejudice or by special requirements, and by the desire to produce cheaply a specially pure raw material for open-hearth steel manufacture.

Many efforts have been made to lessen the exhausting labor of puddling by the introduction of mechanical appliances; but none of the many rotary puddling furnaces proposed and tested has retained its hold in the practice of the U. S. and Europe.

The muck bar produced in the puddle-mill is sheared to length and piled. After heating to a welding temperature it is rolled into the different shapes required by the industry. The details of the work in the rolling-mill, since they are identical with those of the manufacture of steel, are described under ROLLING-MILLS.

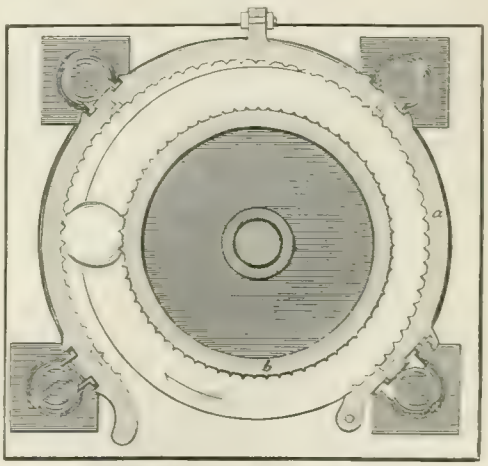
Puddling proper, or *dry puddling*, requires white iron, usually made by refining. It was first effected on a sand-bed by Cort. As the heated iron crumbled into a sandy mass the flame oxidized the carbon, etc., with comparatively little working, but a waste of 7 to 10 per cent., no cinder being tapped and little made. S. B. Rogers designed a cast-iron bed cooled by air, which increased the product from 8 tons to 20 or 24 tons per week.

Boiling, or *wet puddling*, was introduced by Hall. It consists in charging gray-forge pig iron with puddle or roll cinder, which melts into a liquid bath, the protoxide of iron in which becomes the vehicle to transfer oxygen from the flame to the carbon, etc., of the iron. The furnace used, except for rotary puddling, is such as to have a working chamber 60 inches long by 48 inches, by 20 to 24 high, with an area of bed about 20 sq. feet, and a grate area of 7 to 10 sq. feet, according to quality of coal. An arched roof sloping downward from over the grate to the flue "reverberates" the flame upon the bed. The flue lies very low, with an area one-fifth that of the grate, and passes into a stack about 20 inches square in clear and 40 feet high, with a damper. The draught is usually forced by a fan. The bottom of the working chamber is of iron plates 3 inches thick covered by a layer of cinder fused on at a high heat, and the sides, lined with ore, are repaired every day. A door about 20 inches square, at the middle of one side, is made for charging, with a "stopper hole," or notch, for the rabble, on its lower edge. A boiler over the furnace utilizes waste heat.

A charge of 500 to 600 lb. pig iron with 100 lb. cinder is melted at a high heat, then slightly chilled with fresh scale or water, that the iron and cinder may be well mixed, and then the heat raised again with an oxidizing flame. The oxides in the cinder, reacting on the carbon, etc., keep the bath boiling until bright white spots of iron appear and the cinder seems to sink away. The iron sponge thus "brought to nature" is broken up under a reducing-flame, thoroughly worked with the rabble, and finally made into six balls, partially freed from cinder by squeezing with the rabble. These are taken to a squeezer or hammer for thorough consolidation and welding, and usually put at once, without reheating, through a train of rolls, to be rolled into flat muck or puddle bar, $\frac{3}{4}$ to 1 inch thick and 3 to 6 inches wide.

Boiling is preferred for good iron, and in the U. S. puddling is seldom done. With gray-forge pig iron six heats of 480 lb. are boiled in twelve hours, but with one-half refined iron in the charge seven heats of 540 lb. are made in the same time. An average of 2,436 lb. pig and 2,548 lb. refined iron boil into 2,240 lb. of muck-bars, with 4 to 12 per cent. waste and $\frac{3}{4}$ to $1\frac{1}{2}$ tons of coal. In Wales a single furnace makes eight heats daily, or 18 tons per week, and a double furnace 36 tons. Puddling dry requires 2,300 to 2,400 lb. of refined iron to 2,240 lb. of bars. A single furnace averages in Wales about 23 tons per week, with half to three-quarters of a ton of coal.

The Burden squeezer is a rotary machine, the best form of which consists of a serrated wheel, with a vertical axis or shaft placed eccentrically inside a fixed ring, the inner surface of which is also serrated. The wheel is driven by gearing, and its eccentricity is so gauged that the opening at the starting-point is 15 inches, but diminishes gradually through nearly the whole circumference to about 9 inches. The external diameter of the wheel is 5 feet and the internal diameter of the ring is 7 feet. The puddle-ball is put into the



Rotary squeezer, horizontal section: *a*, strong cylindrical cast-iron frame; *b*, strong cast-iron wheel.

squeezer in a roughly round shape, and is seized, rotated, forcibly compressed, formed into a cylinder, and delivered at the point of entrance still hot enough for rolling.

IRON, HISTORY OF.—The Scriptures ascribe the discovery of the process of working iron to Tubal Cain, while Egyptian tradition credits it to Hephæstus, the king preceding Osiris, possibly identical with Tubal Cain. The Egyptians made iron in the district between the Nile and the Red Sea, but mostly imported it from Assyria, where it was very freely used. The Chalybes of Pontus hardened iron for tools and used coal. Aristotle said (322 B. C.) their iron was made from iron-sand put into the furnace with coal. The Romans got iron from Great Britain (A. D. 25, Strabo), but mostly from *Noricum*, now Styria.

In 55 B. C. the Britons exported iron to the Continent in their own ships. The Romans, A. D. 120, had a great forge

at Bath, supplied from the Forest of Dean. In 1355 the export of iron was stopped, and in 1483 the export of forms made in England was forbidden. Before 1756 the scarcity of wood became so great that iron was sought in North America. In 1616 Dud Dudley succeeded in producing both cast iron and malleable iron by the aid of coke; but was obliged to abandon the process on account of the opposition from the charcoal smelters. Darby used it regularly in 1735. Cort's rolls in 1784 made 15 tons of bars in twelve hours, in which time the hammers made 1 ton of ¾-inch square bars. His puddling furnaces made 5 tons a week. By using hot blast Neilson made 2·65 tons raw coal replace 8·5 tons coked coal to 1 ton of iron. At Ynescedwin, by hot blast, anthracite could be used alone for short intervals.

Steel has been made in bloomeries from time immemorial, and in finery forges as German or natural steel; afterward iron converted into "blister steel" was welded up into "shear steel." Huntsman in 1740 melted blister steel, in pots, into best cast steel. Heath used poorer material in 1836 by introducing not more than 3 per cent. carburet of manganese. By the use of manganese puddled steel was made by Riepe in 1850. In 1856 the process known as Bessemer's was perfected by Mushet, Kelley (U. S., 1856) having approximated it in the blast furnace making pig blooms. The Siemens regenerative furnaces melted steel, and even iron, and in 1866 Martin introduced mild steel so made. The successful removal of phosphorus by using basic linings of lime, etc., affords the prospect of cheaper, as well as perhaps better, steel from ordinary pig iron formerly inapplicable.

The first iron produced in North America was made in Virginia in 1622, on the James river. In 1724 Spotswood, Washington, and others built charcoal blast furnaces and exported pig iron to Bristol, England, at a cost of £3 to £4, selling at £6 per ton. In Maryland much bar iron was made, beginning at Principio 1717, to be sold in England at £10 to £16 per ton. In Massachusetts there was an iron-mill at Lynn in 1631, a blast furnace at Hammersmith in 1644, a forge at Braintree in 1646, and bar iron was sold at about £20 per ton. Jenks cast iron pots at Raynham in 1646, and made saws in 1652. Bar iron cost in 1727 about £12 10*s.* per ton. In 1702 the first charcoal furnace was built in Plymouth to work 25 per cent. bog ore into hollow-ware, at a cost of $49.77 per ton. In Connecticut a furnace at New Haven used English ore in 1657, and G. Eliot made blister steel before 1750. In New York the first works were at Stirling, in 1751, where the 186-ton chain to bar the Hudson was made in 1778. In New Jersey, Col. Morris built a bloomery in Monmouth County in 1685, but Hasenclever and his London company did most for the trade, beginning at Ringwood in 1762. In Pennsylvania the first forges were those of Hall, Nutt, and Rutter, on the Schuylkill, in 1717, and the first furnace was built on the Christina river in 1726 by Sir W. Keith. The Pennsylvania trade was distinguished by the use of finery forges; nine of them and ten furnaces were built before 1750. The forges made 60 tons yearly, the furnaces 20 to 25 tons a week, stopping in summer. Between 1717 and 1770 the colonies exported about 150,000 tons pig and bar iron to England, most of it before 1750, when the making of bar iron and steel was absolutely prohibited by Parliament as a common nuisance.

Coke was first used in the U. S. in the blast furnace by Oliphant at Fayette, Pa., in 1836; anthracite at Mauch Chunk in 1838, by Baughman, Giteau & Co.; and raw coal by Wilkeson & Co. at Mahoning in 1846. Before 1840 the forges in the U. S. had almost ceased to make bar iron, and had been superseded for common grades by the puddling furnace, which in its turn has been superseded for rails by the Bessemer converter.

Wrought iron has been largely displaced in nearly the whole line of finished products by steel. This is true of nails, wire, plates and sheets, bars, beams, angles, tees and structural iron generally, hoops, and cotton ties.

The modern history of the iron trade thus resolves itself into various epochs: (1) The perfection of mechanical art to enable blast furnaces to be used, 1580 to 1621. (2) The general use of coke as fuel 1735–50, and the use of cast iron blast-cylinders, 1760. (3) Application of steam-engine in iron-works first to blowing-engines, 1769. (4) Inventions of rolling and puddling by Cort, 1783–84. (5) Use of hot blast and application of waste gases, 1828–36. (6) Economy of fuel by improved apparatus and processes, and perfection of works, engineering, 1856 to present time; extended use of steel.

SUMMARY OF U. S. STATISTICS FOR 1892.

Pig iron	9,157,000	gross tons.
Spiegeleisen, included in above	159,131	"
Bar, rod, hoop, skelp, and shaped iron and steel	3,661,268	"
Iron and steel wire rods, included in above	627,529	"
Plate and sheet iron and steel, except nail plate	751,160	"
Structural shapes	153,957	"
Cut nails, kegs of 100 lb	4,506,819	kegs.
Wire nails, kegs of 100 lb	4,719,524	"
All rolled iron and steel, including nails but excluding rails	4,613,970	gross tons.
Bessemer steel rails	1,537,588	"
Open-hearth steel rails	3,819	"
Iron rails	10,437	"
Total rails	1,551,844	"
Street rails, included in above	111,580	"
Bessemer steel ingots	4,168,435	"
Open-hearth steel ingots	669,889	"
Crucible steel ingots	84,709	"
Blister and "patented" steel	4,548	"
All kinds crude steel	4,927,581	"
Ore, pig, and scrap blooms	9,104	"

Revised by CHARLES KIRCHHOFF.

MEDICINAL USES OF IRON.—Iron is an important ingredient of the substance of the red-blood corpuscles, and its administration in some unknown way directly induces an increased formation of these bodies. In health this effect takes place only to a limited extent, but in the morbid condition known as *anæmia*, where from any cause the blood is unnaturally poor in red corpuscles, this action of iron is far more striking, and the normal proportion of these elements is often rapidly restored by its influence. On account of this peculiar property, iron is commonly called a blood-tonic, and its preparations thus have a unique medicinal use in curing anæmia. To a full-blooded individual, on the other hand, they are injurious. Locally, the preparations of iron differ greatly in action. Some are powerfully astringent and styptic, and have thus special uses by virtue of this property; others are nearly destitute of this action. The astringent group are also exciters of the digestive faculty, and for some unknown reason also cure anæmia, in some cases more promptly than the bland preparations. Almost all chalybeates tend to cause constipation, and the astringents again more than the others. The muriated tincture, the most used of the astringent group, has, moreover, a great reputation in some special diseases, notably in erysipelas and diphtheria. The preparations of iron used in medicine are very numerous—indeed, unnecessarily so. They embrace both soluble and insoluble forms, but as the latter are readily dissolved by the aid of the gastric juice, they are as active as the former. The non-astringent preparations are reduced iron (*ferrum redactum*), known also as iron by hydrogen or Quevenne's iron, consisting of the pure metal in a state of fine powder; pills of the carbonate (Vallet's ferruginous pills); the so-called sub-carbonate or saffron of Mars, consisting of the hydrated sesquioxide with a little undecomposed carbonate; and numerous salts, embracing the phosphate, pyrophosphate, oxalate, citrate, ammonio-citrate, citrate of iron and quinine, and of iron and strychnine, and the ammonio and potassio tartrates. The astringent preparations are ferric chloride, principally used in alcoholic solution under the name of muriated tincture of iron, ferrous sulphate or green vitriol, ferric nitrate in solution; lactate, a feebly astringent salt, and the so-called solution of the subsulphate, or Monsel's solution, chiefly used as a powerful styptic to stop bleeding. Ferrous iodide is used to combine the medicinal effects of iron and iodine; the hypophosphite, to combine those of iron and hypophosphorous acid; iron alum, as a simple astringent; and the hydrated sesquioxide, in the moist state, when freshly precipitated, as an antidote in arsenical poisoning.

Revised by H. A. HARE.

Ironclads: See SHIPS OF WAR.

Iron Crown: the ancient diadem of the Lombard kings. It is a jeweled circlet of gold, containing a fillet of iron, said to have been made of one of the nails of the true cross, presented by Pope Gregory I. to Theodelinda, wife of King Antharic, in 590. In 591 the crown was used at the coronation of Agilulphus; in 774, at that of Charlemagne; and by thirty-four other sovereigns. Henry VII. of Germany was crowned with it in 1312; Frederick IV. in 1452; Charles V. in 1530; Napoleon I. in 1805. In 1866 it was given by the Emperor of Austria to the King of Italy, Victor Emmanuel.

Iron Mask, THE MAN WITH THE: a mysterious prisoner of state who was in 1679 confined by the French Government at Pignerol in Savoy; was removed in 1681 to Exilles; in 1687, to the island Ste.-Marguerite in the Mediterranean;

in 1698, to the Bastile, in which he died, Nov. 19, 1703. He always wore a mask of black velvet. Much has been written with a view of determining this unfortunate man's identity. He has been in turn held to have been the Duke of Vermandois, the Duke of Beaufort, the Duke of Monmouth, Fouquet, the minister of Louis XIV., an illegitimate son of Anne of Austria, and a twin-brother of Louis XIV.; it was for many years generally held that he was in reality the Count Matthioli, minister plenipotentiary of the Duke of Mantua to France, unlawfully held a prisoner by the French court, or perhaps a Chevalier de Kiffenbach, confined for plotting against the king's life. The first who drew attention to this singular story was Voltaire in his *Age of Louis XIV.*, but he who has done the most to unravel the mystery is M. Jung, a French staff-officer, who has attempted to establish the identity of the prisoner with one Marchiel, of Lorraine. See *La Vérité sur le Masque de Fer d'après des Documents inédits des Archives de la Guerre et autres dépôts publics, 1664–1703* (1873).

Iron Mountain: city (organized in 1888 from part of Breitung township); capital of Dickinson co., Mich. (for location of county, see map of Michigan, ref. 3–F); on the Menominee river and the Chi. and N. W. and the Chi., Mil. and St. P. railways; 208 miles N. of Milwaukee. It has large iron-mining interests, public school property valued at more than $25,000, and two weekly newspapers. Pop. (1890) 8,599; (1894) 7,638. EDITOR OF "TRIBUNE."

Iron Mountain, or **Iron Mount**: a famous iron mountain in St. François co., Mo.; 81 miles S. W. of St. Louis. It is 228 feet high, covers 500 acres, is of mammillary shape, and consists chiefly of an iron ore which yields 55 or 60 per cent. of excellent iron. The ore is softer and less siliceous than that of PILOT KNOB (*q. v.*). It is very rich and uniform, nearly free from sulphur, and carrying only 0·12 per cent. of phosphorus. It is magnetic, with distinct polarity, and acting in several parts very strongly on the needle. The amount of ore in Iron Mountain seems to be immense, the main body having a thickness of 50 feet, and continuing indefinitely in depth.

Ironton: city; capital of Lawrence co., O. (for location of county, see map of Ohio, ref. 8–E); on the Ohio river, and the Cin., Day. and Iron., the Iron, and the Norfolk and West. railways; 50 miles S. W. of Pomeroy; 145 miles S. by E. of Cincinnati. It is in an iron and bituminous coal region, the center of the Hanging Rock iron district, and is engaged in lumbering, iron and coal mining, manufacturing, and shipping. The principal manufactures are machinery, boilers, foundry products, rolled iron, nails, stoves, firebrick, and furniture. In 1892 the assessed valuation of taxable property was $3,554,020, and the city debt $294,267; and in 1893 there were 3 national banks with a combined capital of $650,000, and a monthly, 2 daily, and 4 weekly periodicals. Pop. (1880) 8,857; (1890) 10,939; (1894) including suburbs, estimated, 16,000. EDITOR OF "IRONTONIAN."

Iron-wood: a name given in the U. S. to the two species of HORNBEAM (*q. v.*). The iron-wood of commerce is from *Metrosideros vera*, a myrtle of Eastern Asia. The wood is extremely hard, dark colored, and so dense and heavy that it sinks in water. It is often used for anchors in China and the Malayan islands. *Mesua ferrea* and *speciosa* of India (*Guttiferæ*), *Vepris undulata* (*Diosmaceæ*), and *Olea laurifolia* (*Oleaceæ*), the last two from South Africa, and *Siderodendrum triflorum* (*Cinchonaceæ*), are all called iron-woods, and are exceedingly hard timber. *Sideroxylon* (*Sapotaceæ*), of which the U. S. have one species, *S. pallida*, is a native of Florida. *S. inerme*, of the Cape of Good Hope, is a valuable timber-tree. Revised by CHARLES E. BESSEY.

Ironwood: city; Gogebic co. (organized from part of Ontonagon County in 1887), Mich. (for location of county, see map of Michigan, ref. 2–D); on the Mil., Lake S. and W. and the Wis. Cent. railways; 39 miles E. by S. of Ashland, Wis., 150 miles W. of Marquette. It is in the celebrated Gogebic iron-mining region, and has four newspapers. Pop. (1890) 7,745; (1894) 9,324.

Iroquoian Indians: the collective name of a number of Indian tribes of North America speaking tongues of a common lineage. Iroquoian is derived from the proper name *Iroquois*, given by Champlain to five tribes of this stock which had formed a league, and which were in his time living in the lake region of Central New York. These five tribes will be called here the Iroquois. The etymology and meaning of the word *Iroquois* are still undetermined. A probable etymology of the word (Iro-kho-ois) is as follows: *irin* or *inin*, true, genuine, natural, *akho*, snake, serpent, with the French ethnic terminative *ois*, making *Irin-akho-ois* (in which the *n* is a vanishing nasal sound), signifying "real, natural snakes," which is by no means an unreasonable explanation of a name for mortal enemies by Algonquian tribes.

Tribes.—The chief and best-known tribal subdivisions of this linguistic stock are the following: The Attignawantan, the Attigneenongnahac or Attignenonhac, the Arendahronon, the Tohontaenrat, the Ataronchronon (to these five tribes collectively the names Hurons, Wendats, and latterly Wyandots have commonly been applied); the Mohawks or Caniengas, the Cayugas, the Oneidas, the Onondagas, and the Senecas (these five tribes were collectively called the Iroquois); the Tionontates or Tobacco Nation, the Attiwendaronk or Neuter Nation, the Eries or Cat (Raccoon) Nation (also called Erigas, Riquerhonon, or Rhiierhonon), the Canastogas or Susquehannocks, the Tceroki (Cherokees), the Tuskaroras, the Nottoways, and other kindred but less important tribes.

Habitat.—The earliest known domain of the tribes of this stock consisted of at least three isolated areas. The first and largest of these included the region bounded on the N. by a line extending from Matchedash Bay in Georgian Bay, Ontario, nearly to Quebec; on the E. by one along Lake Champlain and the Delaware river; on the S. by one cutting the watersheds of the Susquehanna river and Chesapeake Bay; and on the W. by one crossing the upper valley of the Ohio, and extending along Lakes Erie, St. Clair, and Huron to Matchedash Bay. This region thus covered a large part of the provinces of Ontario and Quebec and of the States of New York and Pennsylvania. The Huron or Wendat tribes dwelt about Lake Simcoe and the St. Lawrence; the Tionontates or Tobacco Nation W. of Lake Ontario and S. of the Hurons; the Attiwendaronk or Neuter Nation S. of the Tionontates and in New York; the Eries or Cat (Raccoon) Nation S. of Lake Erie; the Wenrohronon (Awenrehronon or Awenrochronon) S. E. of the Eries in Pennsylvania; the Canastogas or Susquehannocks and allies along the Susquehanna; and the Iroquois or Five Nations (the Mohawks, Oneidas, Onondagas, Cayugas, and the Senecas) in the lake region of Central New York.

The second area lay in the mountain region of Northern Georgia, Northeastern Alabama, Eastern Tennessee and Kentucky, Southern West Virginia, Western Virginia, North and South Carolina, and it was occupied by the Tceroki, who spoke several dialects.

The third lay directly eastward, but isolated from the Cherokee domain, and it was occupied by the Tuskaroras, the Nottoways, and other kindred but unimportant tribes. This territory lay on the Tar, Neuse, Chowan, Nottoway, and Pamlico rivers, and on the head-waters of the Roanoke and Cape Fear rivers.

General Characteristics.—The marriage tie was not a bond of strength, being broken for the good or convenience of the persons or families concerned, and to be chaste after, rather than before, marriage was considered one of the duties of a woman. The line of descent was in the female, and the children were virtually the property of the clan rather than of the family, which was only a subdivision of the clan or gens.

In the Iroquoian pantheon the gods of the sky, the sun, the moon, and earth, the stars, thunder and lightning, storm and wind, fire, and of dreams (the mouthpiece of the sky-god), were the chief and most influential. The treatment of disease and wounds was in the hands of the shamans mainly.

Long-houses of bark and saplings for dwellings, and caches of riven pieces of timber for the storage of their vegetables, roots, squashes, and gourds, were built by these people. They constructed palisades around their chief towns and villages. The tillage of their lands was carried on mainly by the women and girls, but labor was not considered degrading. They raised tobacco and many kinds of vegetables, including a kind of potato. They also manufactured sugar and sirup from the sap of the maple-tree, and it was from them that the white people learned the process of this manufacture. Their chief dependence for food was upon the produce of the soil.

Their government was in the hands of chiefs divided into two classes, one of each class belonging to every clan. These chiefs were nominated by the suffrages of the women of the clan to which they belonged by birth or adoption, but such nomination had to be passed upon by the tribal,

and among the Iroquois by the federal council, as well. The chiefs held office for life unless deposed for cause. In statecraft the Iroquois were politic and crafty, but magnanimous to captives; their cunning and caution were proverbial even among their Indian neighbors. The adoption of captives into full citizenship with the free Iroquois to replace those who had been lost in battle or by capture was a marked policy of the Iroquois league; and it was by means of these adopted aliens, under the discipline of Iroquoian institutions and under the guidance of Iroquoian commanders, that the confederacy was able to recruit its war-parties, depleted by almost incessant warfare, and to hold high its name and power for so long a period. During the long period of their intercourse with the Dutch and English colonists before the Revolution these Indians were remarkably noted for their regard for treaties and for their good faith when once their pledge was given.

Notwithstanding all their wars, which were chiefly undertaken to maintain national independence, there is to be found among the nobler traits of the character of the Iroquois a strong love of peace, a great regard for law and custom, a reverent homage paid to ancestral greatness, a lively sentiment of the brotherhood of man, and strong social and domestic affections.

History.—The first mention of people of this stock is perhaps that of Jacques Cartier, in 1534, in his account describing the people he met on the shores of what is now the Bay of Gaspé. The few words he gives of the language of this people prove that they were Huron-Iroquoian.

Before the dawn of the seventeenth century the Five Nations—the Mohawks, the Oneidas, the Onondagas, the Cayugas, and the Senecas—had formed the league for defense and offense which is known to history. The league was originally designed to be a permanent central government rather than a temporary union of peoples and common interests. Local matters concerning individual tribes were to be determined as formerly by the local council, but after that the council was to be guided by the principles of the federal constitution. The federal government was lodged in the hands of fifty (originally forty-eight) chiefs of the highest order unequally divided among the tribes, who were also members of the tribal council of the tribe to which they belonged. The tenure of office of these chiefs was for life unless deposed for cause, and their official acts in all things were acknowledged throughout the entire confederacy. One of the distinctive features of this league was the avowed purpose of its founders to abolish war and murder by the peaceful expansion of the confederacy so as to induce all the tribes of men to adopt the principles and to agree to live under its institutions; notwithstanding this, the history of the league is one of almost incessant warfare and bloodshed. The first known act of the league was the expulsion of the Huron tribes from the valley of the St. Lawrence, the direct result of which was to embroil the confederates with the Huron tribes living about Lake Simcoe, to whom the fugitives from the St. Lawrence had fled for protection, and the insolence of the victors engaged them in wars with all the Algonquian tribes whose lands were conterminous with those from which the Hurons had been expelled. In 1622 this struggle was at its height.

In the year 1609, Champlain, espousing this quarrel of the Hurons and Algonquians, marched with them and several Frenchmen against the Iroquois, and succeeded in defeating a party of these on the banks of Lake Champlain. The confederacy never forgave the French, and the Iroquois opposition thus aroused eventually cost France her North American possessions.

This war of the Iroquois to maintain independence continued with a few short intervals until 1649, when the Iroquois drove from their Simcoe country the remnants of the Huron tribes whom they had not killed or taken into captivity. The victorious Iroquois then began a war with the Neuter Nation, which culminated in 1651 in the utter dispersion of this people by death or capture; in the meantime the Tobacco Nation had been compelled to flee to the regions about Lake Superior to seek an asylum among Algonquian tribes. The Eries or Cat (Raccoon) Nation also were almost annihilated and the survivors were forced to abandon their country in 1655. In 1657 a long and bloody war broke out between the Iroquois and the Canastogas, and, with short cessations, lasted until the year 1676, when the Iroquois succeeded in dispersing the remnants of this brave and warlike people. In the south the Iroquois were at times engaged in war with the Tceroki, their hereditary enemies, and a people of their own lineage. The Iroquois, again, were almost constantly at war with their Algonquian and other neighbors E., S., N., and W. of them. The Abenakis, Mohegans, Ojibwas, Etchemins, Montagnais, Delawares, Illinois, Miamis, Nanticokes, Shawnees, as well as the Tuteloes, Saponys, Catabas, and various other tribes, at one time and another felt the displeasure of the Iroquois. In these wars the Iroquois carried out their policy of adopting their captives, by tribes, clans, and by individuals; but it is also true that they burned at the stake many of their prisoners to intimidate their enemies, but mainly as a sacrifice to the god of war. Notwithstanding the fact that the successful career of the Iroquois places them, intellectually and physically, among the highest developed people on the continent, it is equally true that other causes contributed materially to give them the vast power and influence they acquired among their neighbors during the century and a half ending with their defeat in 1779 by Gen. Sullivan. The chief of these is the fact that the Dutch, finding that the Iroquois preferred guns and powder to other merchandise, began selling firearms and ammunition to the Iroquois.

The Tuskaroras were originally from North Carolina. They were compelled to abandon their homes in 1713 after an unsuccessful war, which lasted three years, with the colonists. The war had its origin in the exasperation of the Tuskaroras against the colonists for encroaching upon their lands without even the pretense of a purchase, and especially for a systematic stealing of Tuskaroras by the colonists for the purpose of selling them into slavery. After their overthrow the Tuskaroras sought and found an asylum among the Five Nations, who allowed them to settle on lands lying on the affluents of the Susquehanna, and a few perhaps may directly have joined themselves at this time to particular tribes of the Five Nations. It was not until Sept., 1722, that the first mention is made of them as taking part publicly in the management of the affairs of the Five Nations, who after this were called the Six Nations. This is strong evidence that they had not until then, or at most but recently, been adopted by the league; for at the conferences held at Albany Sept. 20, 1714, Aug. 27, 1715, June 13, 1717, Sept. 7, 1721, and Aug. 27, 1722, and at other councils with the Five Nations, no mention is made of the Tuskaroras. The Six Nations, with the exception of the Oneidas and a portion of the Tuskaroras, sided with Great Britain in the revolutionary war.

The tribes and portions of tribes that sided with Great Britain are now situated on the Grand river, Canada, on lands granted them by the crown. These consist of Cayugas, Mohawks, Oneidas, Onondagas, Senecas, and Tuskaroras, who maintain nearly unchanged their ancient form of government under the protection of the British Government. They hold their lands by patents, individually. Their farms are well cultivated, and their industry is markedly in contrast with that of some of their brethren in New York State. They have a flourishing agricultural society which holds semi-annual sessions, and their exhibits of produce and stock fully equal, and in some instances surpass, those of the towns surrounding them. The fostering care of the Canadian Government is directed wisely for their advancement. Nearly one-half of the Wyandots now living are in the Indian Territory on the Quapaw reserve, and the remainder live in Canada, at Lorette, and at Anderdon. Many Wyandot mixed-bloods—crosses of Wyandot blood with that of the other Iroquois tribes—are living on the various reserves of the Iroquois, but how many such there are it is difficult to determine.

A portion of the Oneidas occupy a large reserve at Green Bay, Wis., and another lands lying S. of Oneida, N. Y. Both these people hold their lands in severalty, and, excepting the Cherokees, are the most prosperous of the Iroquois tribes, being mainly dependent on the produce and increase of the stock of their farms for subsistence. A part of the Onondagas live on a reserve lying S. of Syracuse, N. Y. They are the least progressive and thriftless of the Iroquois tribes. Portions of the Senecas live on reserves in New York, at Cattaraugus, Allegany, Tonawanda, and at two or three unimportant places. Of these, those living on the Tonawanda reserve have profited least from the arts and institutions of civilization. On the Allegany reserve there are at most a score of fairly good farms; a larger number, however, would be found on the Cattaraugus reserve. On these reserves there is a much larger proportion of untilled lands than there is on any other Iroquois reserve. A portion of the Tuskaroras live on a reserve in Niagara County,

N. Y. As a whole they are more enlightened and better educated than any other tribe in the State, and are self-supporting. Their farms are fairly well tilled, and they have many fine orchards.

The Cherokees live in the eastern part of the Indian Territory, having emigrated thither early in the nineteenth century. They constitute one of the "five civilized" tribes, and like the others have a constitutional government, based on that of the U. S., in so far as circumstances would permit, which is divided into three departments—executive, legislative, judicial—and an officer or officers of any one of these departments may not exercise any of the powers appertaining to either of the others, except when expressly directed or permitted by the constitution. Their laws are printed both in English and in Cherokee. Their school system is elaborate, and provides seminaries for youths of both sexes. They have an orphan asylum, where the Cherokee government provides everything. They receive about $150,000 in interest from the Government of the U. S. on deposited moneys arising from the sale of their lands, and the sale of what is called the Cherokee Strip will make them the richest tribe of people in the world. They have been farmers for a long time, and have kept the U. S. Government in debt to them, instead of its supporting them. Their income from the Government enables them to defray all their expenses as a nation, and to aid their young men to acquire a liberal education. They are the most highly developed and enlightened North American Indians.

Population.—According to the U. S. census bulletin for 1890, No. 25, and the *Canadian Indian Report for 1888*, the number of Iroquoian Indians is as follows:

Cherokees	28,448
Cayugas	1,301
Mohawks (including those living at Caughnawaga, Lake of Two Mountains, Quebec, Gibson, and Grand River, Ontario, and the Mohawk, Oneida, and Huron mixed-bloods living at St. Regis, with those living on other reserves)	6,656
Oneidas	3,129
Onondagas	890
Senecas	3,055
Tuskaroras	733
Wyandots	689
Total	44,901

Authorities.—Lawson, *History of Carolina* (London, 1718); Pierre François Xavier de Charlevoix, *Histoire et description générale de la Nouvelle France* (Paris, 1744); *Relations des Jésuites* (3 vols., Quebec, 1858); *Voyage de Jacques Cartier au Canada en 1534* (Paris, 1865; translated in *Hakluyt's Principal Navigations*, vol. iii., London, 1810); Samuel de Champlain, *Œuvres de Champlain* (5 vols., Quebec, 1870); Guss, *History of Juniata and Other Counties of Pennsylvania*, chapter ii., and *Early Indian History on the Susquehanna* (Harrisburg, 1883); Hale, *Iroquois Book of Rites* (Philadelphia, 1883); Capt. John Smith, *English Scholar's Library*, No. 16, being John Smith's works, edited by Edward Arber (Birmingham, 1884); the histories of New York, Pennsylvania, and Maryland, and many other works, cited in the foregoing authorities and in James C. Pilling's *Bibliography of the Iroquoian Languages* (Washington, Government Printing Office, 1888), as well as in Fields' *Indian Bibliography* (New York, 1873). J. N. B. Hewitt.

Iroquois: port of entry of Dundas co., Ontario, Canada (see map of Ontario, ref. 2–I); on the north shore of the St. Lawrence, 99 miles above Montreal, on the Grand Trunk Railway, and at the foot of the Iroquois Canal. It has large factories and mills. Pop. 1,200.

Irrawad'dy: common spelling of Irawadi (*q. v.*).

Irrigation (Lat. *irrigatio*): in the broadest sense of the term, all artificial methods of using water for agricultural purposes. The immediate effect of irrigation upon the consistence of the soil is to soften it and render it more easily penetrable by the plow and by the roots of plants. Hence in dry climates water is frequently applied, before plowing, at the rate of about 400 or 500 cubic yards to the acre, or barely enough to loosen the earth to the depth of a foot without drenching it. But it is most important to observe that the ultimate effect of long-continued irrigation is to condense and harden the surface to a very inconvenient degree. Irrigation affects the quality of the soil by introducing into it air and other gases, and vegetable and mineral matter held in suspension or solution by the water. In most cases the substances so introduced are beneficial to vegetation, but in some they are highly noxious. Even the water of large rivers sometimes, as has been observed in India, deposits on the surface or introduces into the texture of the soil salts which in the course of time render it wholly sterile. Irrigation also acts upon arable soil by facilitating the decomposition of soluble organic and inorganic matter contained in it, and carrying off such matter from it. The extent of this latter action is disputed, but it must be considerable, for constituents of vegetable growth have been found in underdrain water from cultivated fields, and large tracts of ground, impregnated with salts to such a degree as to make them incapable of cultivation, have been rendered fertile by washing with fresh water. (See Duponchel, *Hydraulique Agricole.*) Irrigation often injuriously affects the subsoil by charging it with water which stagnates in it and renders it cold and sour to the roots of plants which descend into it. In countries where irrigation has been immemorially practiced this effect has not attracted much attention, but in the British Indian provinces, watered by the new canals constructed by the Government, and elsewhere when irrigation is first introduced, it is very observable. Irrigation also exercises an important influence on the water-supply of lands lying at a lower level, by diverting from their natural channels streams which originally flowed through such lands, and, on the other hand, by discharging upon their surface surplus water from irrigated fields, or by saturating them with water conveyed to them from such fields by subterranean infiltration. These effects are seen not only in the soil itself, but in the diminished or augmented volume of spring and well water. Irrigation modifies the temperature of the soil beneficially or injuriously by communicating or abstracting heat, and by promoting evaporation from the surface, which is necessarily attended with some cooling of the ground. Irrigation also has a decided influence upon the adjacent atmospheric conditions, and it is therefore concerned in the sanitary features as well as in the agricultural conditions of the region where it is practiced. Its effects upon vegetation are also marked, aside from the mere growth or bulk.

Purposes and Extent.—Irrigation is used for two general purposes—to aid in the production of crops in regions which are naturally supplied with rain, and to reclaim desert or arid countries. As an adjunct to the natural rainfall of summer, irrigation is little used in the U. S., where land is not yet of sufficient value to make its practice profitable, except in special highly cultivated garden areas. As a means of reclaiming arid wastes, irrigation in some form has been used to advantage from the earliest times. In North America the subject is becoming one of importance in the efforts to make fertile parts of the great American desert region. (See Arid Region.) The U. S. Congress has instituted investigations into the subject, and the eleventh census made a detailed inquiry into it in the Western States. Several valuable reports and bulletins have resulted. The total number of acres under irrigation in Colorado in 1890 was 4,068,409, or 6,336·89 sq. miles; in Arizona the irrigated lands under crop were 65,821 acres; in New Mexico, 91,745 acres; in Wyoming, 229,676 acres; in Montana, 350,582 acres. In California the irrigated area probably exceeds any of these figures, and it is also large in Idaho, Oregon, and Washington. Spanish America has also given great attention to irrigation, although too often the appliances are primitive and crude. Italy and Spain, Egypt and India, present extensive operations of this nature. The British have extended irrigating facilities in India on a grand scale. The arrangements of the native inhabitants, which have existed for centuries, are also extensive.* They practiced irrigation by natural flow of water, but they supplemented their supply of water by raising it from wells by means of various appliances. They made extensive use of reservoirs to collect the water when abundant, and to hold it until the season for its application to the land. The Madras provinces are dotted over with reservoirs. Each inequality of the ground which afforded any facility for storage was utilized, and it was surrounded by an earthen embankment. The water-supply was afforded from the natural drainage of the little basin, or, if this was insufficient, a channel was cut to conduct the flood-waters of the

* For brief account of which see *Engineering*, vol. xvii., and Van Nostrand's *Eng. Mag.*, July, 1874.

rivers to the storehouses. In the northern provinces the reservoirs are the fields of snow on the Himalayas.

Quantity of Water and Method of Applying it.—In Europe the quantity of water supplied during the season to ordinary plowed or hoed field crops varies from 20 to 40 inches, though in the rice-fields, the *mareite* or water-meadows of Lombardy, and many other grass-grounds, this amount is vastly exceeded. In the U. S. experience alone can determine the proper quantity and seasons. The modes of application are by flowing with running, and flooding with partially stagnant, water; by infiltration from superficial ditches or furrows, and, more rarely, from underground conduits; and by sprinkling with scoops or other light hand-implements. The evening hours are considered the most favorable time, but this rule is by no means universally observed.

Irrigating canals are usually derived from rivers. The water is raised to the required level by a weir or dam thrown across the river, and the head of the canal is placed above the dam. In the deltas of rivers, where the ground to be irrigated is little if at all above the level of the water in adjacent portions of the rivers, the problem is solved much more simply and at a much lessened expense than in the general case where the river flows along the lowest line of the valley, and where the adjacent lands rise from the river-banks on either side. In this latter case it is necessary to fix the head of the canal at a considerable distance above the land to be irrigated, and consequently a line of canal often many miles in length must be made to bring the water out on the level of the ground. For illustration, let us suppose that the water in the river at the head of the canal is raised by a dam to a level 10 feet below the banks. Give a slope to the bed of the canal of a foot per mile, and assume that the country slopes along the line at a rate of 5 feet per mile; then for each mile the canal-water will gain a relative elevation of 4 feet, and it follows that the water-level in the canal will emerge from the excavation at a distance of 2½ miles from the head. On the other hand, in deltas the ground falls from the banks on either side, and a command of the land is quickly gained. If this upper and, so to speak, unprofitable section of the canal passes through a broken country, the difficulty and expense of construction are largely increased. In India there are illustrations of both systems. In the Madras provinces the deltas of the Cauvery, Godavery, and Kistna rivers afford instances of the most successful irrigation at a small outlay, while the Ganges and other large canals in the uplands of Northern India abundantly prove the greater difficulties in their several cases.

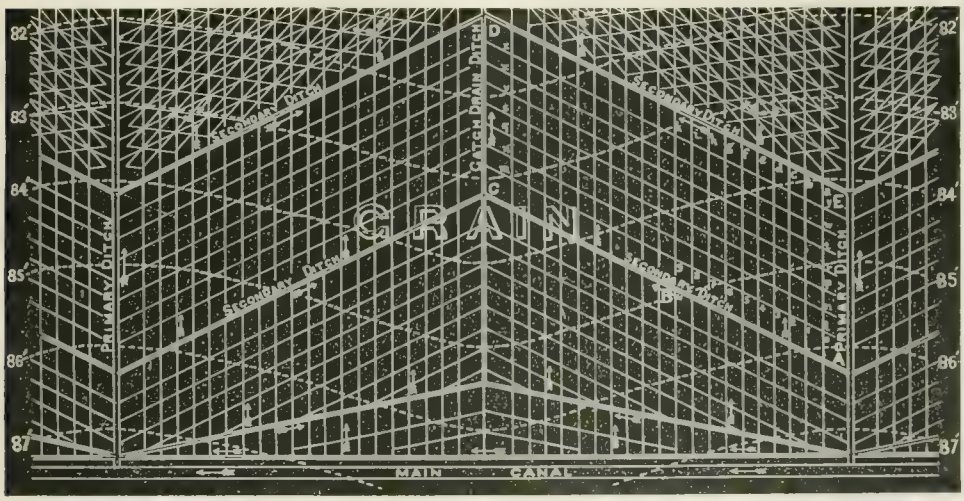
In the projection of an irrigating canal intended to water a given area, the first question which presents itself is this—namely, How much water will be required per acre? The answer to this question results from a consideration of a number of circumstances. It will depend upon the amount of rainfall in the irrigated district, and upon its distribution, both as to quantity and as to time; upon the temperature in the growing season; the kind of cultivation, whether of rice, cotton, sugar, cereals, or of vegetables; and, finally, upon the character of the soil, whether retentive of moisture or sandy and easily drained. Again, if the climate permits cultivation throughout the year, and the water-supply is perennial, irrigation may be continuous, and a part of the land may be devoted to one kind of cultivation in the winter, and the remainder to a different cultivation in the summer. One cubic foot of water supplied each second for twenty-four hours will cover 4 acres with a trifle less than 6 inches of water, and supplied for 100 days it will cover 400 acres with 6 inches, or 200 acres with 12 inches, of water. A cubic foot of water per second throughout the season is sufficient to mature rice in quantities varying from 30 acres to as much as 90 acres—this last case existing in districts of India exposed to heavy falls of rain. In Northern India, where the rivers are fed from the snow-reservoirs, and where there is a heavy fall of rain, with a winter and a summer cultivation, the average area irrigated in some cases rises to 400 acres per cubic foot a second. In most cases, however, it does not much exceed 200 acres per foot. This is for other cultivation than rice, and principally relates to cereals. In California 12 inches of rain, with timely application, suffice to insure a crop of cereals.

In proportioning the water-supply to the irrigable area, it is usual to make a large allowance for the ground which in a particular season will lie fallow, and for that which will be taken up by roads, fences, forests, and buildings. Having determined, after full consideration, the capacity of the canal, which should exceed by 15 or 20 per cent. the estimate for irrigation, in order to make up for loss by absorption, evaporation, and waste, we may proceed to determine its dimensions and the slope of its bed. Many irrigating canals are arranged for navigation. New conditions, more or less incompatible with those pertaining to mere irrigating canals, are thereby introduced. The ideal canal for irrigation transports the water at the highest velocity which is admissible, for the reason that its section is thereby reduced. The mere navigation canal should have no velocity, as by absence thereof transportation is facilitated. The canal which shall subserve both ends must carry its water at a low velocity to permit navigation, and it must have an increased section to enable it to transport the required volume of water for irrigation. There are cases where the slope of the country compels a low grade for the bed of the canal, and there are soils which will not maintain themselves under any but a very low velocity. In such particular cases the conflicting conditions of irrigation and of navigation are measurably harmonized. The relations existing between the slope of the bed, the mean velocity, and the section are conveniently expressed in this formula, which is sufficiently accurate for the purposes to which it is applied: $v = \frac{92}{100}\sqrt{2ds}$, in which v is the mean velocity in feet per second; s is the slope of the bed in feet per mile; d is variously termed the "hydraulic radius" or "the hydraulic mean depth," and it is obtained by dividing the area of the section of the waterway, expressed in square feet, by the wetted perimeter expressed in linear feet. The velocity of the water ought not to be so great as to cause erosion of the bed and banks of the canal, and it ought to be great enough to prevent the growth of water-plants, which interfere with the service of the canal. A stiff clay soil will stand under a mean velocity of as much as 4 feet per second, and where the bed is of shingle a higher velocity may be permitted with safety. In a light sandy soil 3 feet per second is a maximum velocity, and in some particular soils disturbance of the bed and banks takes place with a considerably lower velocity. In a hot climate a velocity of 2 feet per second is necessary to prevent the growth of plants in the waterway. If the water derived from the river is laden with earthy particles in suspension, as is often the case, deposits will occur unless the initial velocity is maintained. If the silt is of a fertilizing character, it is desirable that it be transported to the cultivated fields in order to sustain their productiveness. When it is deposited along the line of the canal, periodical closures become necessary to effect clearance, which is attended in many cases with great expense. In order to carry the silt to the fields, it will be necessary to increase the fall of the ditches as their section is diminished. Something is gained by transporting the matter beyond the main channel to the minor ditches, where its clearance will not require the canal to be closed, and whence it can be removed at a lessened expense. In some cases the velocity near the head is slackened by diminishing the slope or by enlarging the section, so that the deposits may be encouraged at this particular section, where the clearance can be more conveniently effected than it would be if the silt is deposited along a larger line.

The British engineers in India have adopted a rule which governs the proportion of width and depth of the canals, the width being made to vary from thirteen to fifteen times the depth. The slope of the bed is variable, depending on the fall of the country and on the character of the soil. The ruling gradient on the Ganges Canal is 15 inches to the mile; in many canals it is less. For illustration, it may be stated that by the formula a fall of a foot per mile will give in a canal 90 feet wide at bottom, 6 feet deep, with side-slopes of 2 base to 1 altitude, a mean velocity of 3 feet per second. If the slope of the bed is less than the fall of the country, it will be necessary to provide a series of falls, which may be arranged with dams giving a direct fall, or by rapids. The slope of the bed and the dimensions of the canal will generally be determined, so as to conform to the fall and character of the land traversed, by assuming the quantities which enter the formula in a succession of trial cases. In this way a close approximation may be made. The alignment of the canal will be most favorable when it can be placed on the water-shed or divide. Such a position gives command of the land on either side, and avoids the passage of the drainage-lines of the country. This advantage, however, is one which can

seldom be fully secured. It is generally necessary to cross some of these lines, and certain arrangements result which vary with the circumstances of the case. If the level of the canal at the point of crossing is higher than the stream, an aqueduct will be required to carry the canal-water, and in special cases of low lands adjoining the stream the canal must be embanked at one or at both ends of the aqueduct. Where the canal-level is below that of the stream, the latter may be carried over by an aqueduct, or the canal may be carried under the stream through a tunnel or a siphon. If a small stream crosses the line of the canal at a suitable level, it may be admitted into the canal; but if the stream is torrential in character, it may not be safe to admit its water into the canal. Regulating sluices will be necessary in this case to exclude the torrent from the canal, and a dam will be required to maintain the proper level at times when the stream is not full.

There are two general types of devices to record the amount of water taken off at given points from the main ditch or canal—the *dividing-box*, which apportions to each consumer some definite part of the water passing in the main ditch; the *measuring-box*, designed to give the patron a stated quantity of water, as a cubic foot per second. The latter device is the most satisfactory, especially where water is somewhat scarce, and it is the system mostly used in Italy, where it is known as the *module*.



Irrigating system for grain, as laid out by the San Joaquin and King's River Irrigation Company, California.

Specific Example.—The accompanying sketch illustrates the principles which must govern in the projection and construction of an irrigating canal. The diagram exhibits the system pursued in irrigating the plains of the San Joaquin valley in California. It will be seen that the water passes from the main canal into primary ditches, from which it is delivered into secondary ditches, which in turn pass it into irrigating furrows, which are its immediate dispensers to the land; and finally, having done its duty, it is conveyed away by a drain to irrigate again below, or else it escapes into the natural drainage-lines. The main canal has a fall of a foot to the mile, while the fall of the primary ditches is 8 feet, and of the secondary ditches from 3 to 5 feet to the mile. The contour-lines of a foot difference of level are shown, and they indicate a surface nearly plane and extremely favorable for irrigation. The primary ditches in this case are a mile apart, and the secondary ditches are a quarter of a mile apart. The irrigating furrows in the grain-field are parallel to the primary ditches, and the "checks" are represented by lines parallel to the secondary ditches. These checks are 50 yards apart, measured parallel to the primary ditches. The irrigating furrows are 40 yards apart. The primary ditches, when full, will carry 50 feet per second, and one primary ditch will supply three secondary ditches. The water passes from the secondary ditches to the furrows by boxes 6 by 10 inches, which pass through the bank. Each box will deliver 1½ cubic feet per second, and each secondary will supply 10 boxes. Each secondary ditch waters 80 acres, within which area there are about 5 miles of furrows and 4 miles of checks. There is a gate at the junction of each primary with the main canal, and one in each primary for every three secondaries, and one in the middle of each secondary; and each box is fitted with its little gate.

A C D E contains 80 acres, sown in grain. The gate in the secondary ditch at B being closed, and that at A being open, the first half of the secondary ditch will begin to fill with water, which will run into the irrigating furrows 0 to 9, inclusive, and will flow until it encounters the dam made by the check *l m*, when it will rise and overflow the strip of land lying between the secondary ditch and the check *l m*. When this strip is sufficiently watered, the cultivator opens with a hoe a passage through the checks *l m* for each furrow, and permits the water to flow in parallel courses until it is again checked at the line *n n* for a time sufficient to water the strip lying between the check *l m* and *n n*; and this process is continued until the 40 acres lying next the primary ditch are completely irrigated. This done, the little gates 0 to 9 are closed, the gate at B is opened, and the same steps are pursued in irrigating the other half of the tract. In the alfalfa field the furrows are multiplied, to insure a more equal diffusion of the water. In this case the ground falls 8 feet to the mile, and as the checks are 50 yards apart, the fall for this distance is $2\frac{7}{10}$th inches. When the water is just even with the upper line of one of these strips between two consecutive checks, it will be $2\frac{7}{10}$th inches in depth along the lowest line of the strip. In this way a secondary ditch with a fall of 5 feet to the mile, and running full, will spread more than 4 inches of water over 80 acres in twenty-four hours.

The increase of production which results from irrigation in warm climates, where the rainfall is insufficient to produce a crop, is quite sufficient to justify the large expenditure required to put the system into operation. It is estimated that the canals and primary ditches, including dams, head-works, and all necessary arrangements, excepting the secondary and other minor ditches, can be constructed on the plains of California at an expenditure which may vary from $10 to $20 per acre. It must be borne in mind, however, that the features of the country are in general extremely favorable, and that the gates, head-works, and other constructions are made of wood, and that they must be replaced from time to time. The minor ditches, it is estimated, may cost from $5 to $10 per acre, which makes the total probable outlay to vary between $15 and $30 per acre. The simplicity of the irrigating system which is practicable on the plains of California is in strong contrast to the intricacies which have been developed in Italy; but its practical value in the U. S. is doubtful.

Legislative Action.—The legal aspects of irrigation are largely concerned with the interrelations of irrigators and owners of prior rights. There are various evils, also, which demand legislative action in the American States. We have space here to indicate but one which is of urgent necessity in all those parts of the U. S. where irrigation is necessary or probably highly advantageous; and another which is of even greater general importance. The first is the assumption by the Government of the absolute title to all natural waters of sufficient volume to possess any real importance as sources of supply, and the enactment of codes or the creation of special boards to control the construction of all hydraulic works and the distribution of water from them, including, of course, proper arrangements for disposing of the surplus water from irrigated lands. The second is the adoption of systems of forest economy which shall secure the permanence, and, where necessary, extension, of the woods around the sources and along the upper basins of the rivers.

LITERATURE.—The best account of irrigation in the U. S. is Deakin's *Irrigation in Western America, so far as it is re-*

Land to the Circumstances of Victoria (Melbourne, 1885). Other important works are Hinton's *Irrigation in the United States* (Washington, Dept. of Agriculture, 1887); *Report of the Special Committee of the United States Senate on the Irrigation and Reclamation of Arid Lands* (Washington, 1890); *Bulletins* of the eleventh census and of the experiment stations of Colorado, New Mexico, and Arizona. A complete study of irrigation in its various phases is Remaury's *Les Irrigations* (Paris, 1890). Cossigny's *Hydraulique Agricole* (2d ed. Paris, 1889) is the best work of its class. Other notable works on irrigation are the following: Romagnosi, *Trattato della Ragion Civile delle Acque* (Florence, 1834, 8vo); Romagnosi, *Della Condotta delle Acque* (Florence, 1833, 2 vols. 8vo); Calandra, *Manuale Idraulico legale* (Savigliano, 1870, 12mo); Negri, *Idée Elementari per una Legge in Materia delle Acque* (Turin, 1864, pamphlet); Niel, *L'Agriculture des États Sardes* (Turin, 1856, 8vo); Vigan, *Étude sur les Irrigations des Pyrénées Orientales* (Paris, 1867, pamphlet); Cuppari, *Manuale dell' Agricoltore* (Florence, 1870, 12mo); Boussingault, *Économie Rurale* (Paris, 1851, 2 vols. 8vo); Hervé-Mangon, *Expériences sur l'Emploi des Eaux dans les Irrigations* (Paris, 1869, 8vo); Cosimo Ridolfi, *Lezioni Orali di Agraria* (Florence, 1869, 2 vols. 8vo); Baird-Smith, *Italian Irrigation* (London, 1855, 2 vols. 8vo, and atlas); A. Vignotti, *Des Irrigations du Piémont et de la Lombardie* (Paris, 1863, pamphlet); G. Taglisecchi, *Canali dell' Alta Lombardia* (Milan, 1872, 8vo); Dupuytchel, *Traité d'Hydraulique et de Géologie Agricoles* (Paris, 1868, 8vo); Millet, *Les Merveilles des Fleuves et des Ruisseaux* (Paris, 1871, 12mo); Denton, *Water-supply for Farms* (London, 1865, pamphlet); Dumas, *La Science des Fontaines* (Paris, 1857, 8vo); Marsh, *The Earth as Modified by Human Action* (3d ed. New York, 1884, 8vo), and *Letter to Commissioner of Agriculture on Irrigation* (Washington, 1873, pamphlet); Beardmore, *Manual of Hydrology* (London, 1862, 8vo); Dumont, *Des Travaux Publics dans leurs Rapports avec l'Agriculture* (Paris, 1848, 8vo); Passy, *Étude sur le Service Hydraulique* (Paris, 1868, 8vo); Jaubert de Passy, *Voyage en Espagne* (Paris, 1819); Aymard, *Irrigations du Midi de l'Espagne* (Paris, 1864, 8vo, and atlas); C. R. Markham, *On Spanish Irrigation* (London, 8vo), and works there cited; Keelhof, *Traité Pratique de l'Irrigation des Prairies* (Paris, 1888); Deakin, *Irrigation in Egypt and Italy*; Roth, *Continental Irrigation* (London, 1882); also reports of the State and Territorial engineers in the Western U. S. The works of Nadault de Buffon on irrigation and general agriculture are all of great value, and the numerous papers on this subject by the eminent Italian engineer Lombardini, chiefly published in scientific periodicals, are indispensable to a knowledge of the hydraulic system of Upper Italy, which is unrivaled in scientific merit and practical value. The only well-known work upon irrigation for the Eastern States is Stewart, *Irrigation for the Farm, Garden, and Orchard.* The reader should also consult A. N. Cole, *The New Agriculture, or the Waters Led Captive* (New York, 1885), which explains a system of subterranean storage of water. See also article SUB-IRRIGATION.

Revised by L. H. BAILEY.

Irritability [from Lat. *irritare*]: the property of organic or living matter whereby it contracts in response to stimulations from its environment, such as touches, changes of temperature, etc. Its simplest form is seen in unicellular organisms which react to mechanical and chemical agents in the way of contraction and expansion, and its highest form is found in the reactions of the nervous system in man and the higher animals. The responses of the sensitive plant show the same property in the vegetable world. See PHYSIOLOGY (*Vegetable*).

J. M. B.

Irritants [from Lat. *irritans, irritantis*, pres. partic. of *irrita're*, irritate]: in medicine all such agents as by contact with the animal tissues cause one or more of the following effects: pain, increased flow of blood to the part, inflammation, or active excitation of function, as increase of secretion by a gland, involuntary muscular contraction, etc. Such are, in general, mineral astringents (except nitrate of silver, subnitrate of bismuth, and subacetate of lead); all substances chemically disorganizing to the tissues, as strong acids, alkalies, and caustic salts, like corrosive sublimate or silver nitrate, and certain vegetable substances, generally containing either an acrid resin or volatile oil, such as mustard, jalap, croton oil, oil of turpentine, squills, etc. Agents which excite the "irritability" of nerve-centers, like strychnine, are also sometimes called irritant. Irritants do not thus form a natural group of medicines, but the word "irritant" expresses a certain general property belonging in different modes to many distinct classes of medicinal agents.

Revised by H. A. HARE.

Ir'tish: a river of Northern Asia. It rises in the Altai Mountains, in lat. 47° N., lon. 89 E., in Northern Mongolia, flows N. W. through the Russian governments of Semipalatinsk and Tobolsk, till it joins the Obi, after a course of about 1,700 miles, 180 N. of the city of Tobolsk. Its upper course flows through the best agricultural districts of Siberia, but its navigation is much impeded by shoals and shifting sand-bars. It abounds in fish, both salmon and sturgeon. The ferry of the Irtish was called the "ferry of death," because it took the Russian exile to political and often to physical death. To "cross the ferry of the Irtish" is to be "laid on the shelf."

Revised by M. W. HARRINGTON.

Ir'vine: town; in Ayrshire, Scotland; on both sides of the Irvine, near its entrance in the Firth of Clyde; 29 miles by rail S. W. of Glasgow (see map of Scotland, ref. 12–G). It has several educational institutions of high reputation, large ship-building docks, and some manufactures. Notable relics of antiquity are the square tower of Stonecastle and the ancient Seagate Castle, which has good examples of Norman architecture. Pop. (1891) 9,037.

Irvine, WILLIAM: soldier; b. near Enniskillen, Fermanagh, Ireland, Nov. 3, 1741; studied at Dublin University, and became surgeon of a British ship of war during the French war, after which he emigrated to North America, and settled at Carlisle, Pa. He was a member of the provincial convention of Pennsylvania in 1774; was appointed colonel of the sixth battalion of the Pennsylvania line in Jan., 1776; was taken prisoner at Three Rivers, Canada, in June of that year, and paroled, but not exchanged, until May, 1778. He was a member of the court martial for the trial of Gen. Charles Lee in July, 1778; was appointed brigadier-general in May, 1779; served in New Jersey and at the battle of Bull's Ferry under Wayne. In 1781 he took command of the defenses of the northwest frontier, with headquarters at Fort Pitt; was State commissioner for the distribution of public lands to the soldiers 1785; he suggested the purchase of the "triangle," which gave the State an outlet on Lake Erie; was a member of old Congress 1786–88, and of Federal Congress 1793–95. He was a commissioner for settling the accounts of the U. S. with the several States, and a member of the convention for revising the constitution of Pennsylvania; took part in the campaign against the insurgents in the "Whisky Insurrection" in 1794; was superintendent of military stores at Philadelphia 1801, and president of the State Society of the Cincinnati at the time of his death, which occurred at Philadelphia, July 29, 1804.

Irving, EDWARD: religious leader; b. at Annan, Dumfriesshire, Scotland, Aug. 4, 1792. He graduated M. A. from the University of Edinburgh in 1809, then was a teacher for some years, meanwhile studying for the Presbyterian ministry, and receiving licensure in 1815. In 1819 he became assistant to the celebrated Dr. Chalmers, and three years later he accepted a call from a Presbyterian congregation in London, where his eloquence, modeled on the writings of Hooker, Bacon, and Jeremy Taylor, attracted crowds of hearers. At that time there was a general religious revival, a remarkable reaction from the religious apathy into which Christendom had gradually fallen after the excitement of the Reformation had died out. Most of the great missionary societies were then founded; ministers of all sects spoke with new earnestness; the Bible was more eagerly read, special attention being given to its prophetical passages. Among students of prophecy Edward Irving was distinguished. In 1825 he published *Babylon and Infidelity Foredoomed*, and in the following year his translation from the Spanish of *The Coming of the Messiah in Glory and Majesty*, written by Manuel Lacunza under the pseudonym of *Juan Josafat Ben Ezra*. In 1828 Irving began to preach the entire humanity of Christ. Our Lord, he declared, took upon himself the body of man as it became after the fall—mortal, corruptible, capable of sin, from which he was kept only by the power of the Holy Spirit dwelling in him. This doctrine Irving himself regarded as not a new thing, but as the ancient and natural belief of all Christians; but it caused a stir in the Presbyterian Church. In 1830 there appeared in his congregation phenomena which Irving and others regarded as the revival of the miraculous gifts of the

early church—the gifts of "prophesying" and of "tongues." These manifestations attracted much attention and sharp disapproval, but no one questions the sincerity or the purity of character of many of those who were engaged in them. That year Irving was prosecuted for heresy before the Presbytery of London for his teachings concerning the nature of Christ, and was condemned. He appealed, and after various stages the case was finally referred to the Scottish Presbytery at Annan, by which Irving was deposed in 1833, and was excluded from the Presbyterian Church. Meanwhile, in 1832, he had removed, with those of his congregation who adhered to him, to a chapel fitted up for the purpose on Newman Street. The apostles of the Newman Street congregation reordained him as angel or pastor of that church, and there he officiated until a little while before his death at Glasgow, Dec. 8, 1834. He was buried in Glasgow Cathedral.

The new community continued to prosper. In London alone it soon numbered seven congregations, among which were many persons of wealth and position, and in 1853 the magnificent church in Gordon Square was opened with much religious ceremony. The followers of Irving became popularly known as Irvingites, but this appellation is rejected by the body of Christians holding the views of which he was an exponent. (See CATHOLIC APOSTOLIC CHURCH.) See the works of Edward Irving (5 vols., London, 1864–65); Mrs. Oliphant, *The Life of Edward Irving* (2 vols., London, 1862); the biography by Wilkes (1854); Carlyle, *Miscellaneous Essays and Reminiscences*; Davenport, *Edward Irving and the Catholic Apostolic Church* (New York, 1853); Seesemann, *Die Lehre der Irvingianer* (Milan, 1881).

Revised by WILLIS J. BEECHER.

Irving, HENRY: actor; b. at Keinton, near Glastonbury, Somersetshire, England, Feb. 6, 1838. His name was JOHN HENRY BRODRIBB, originally, but was changed to HENRY IRVING by letters patent. He was educated at a private school in London, was originally intended for mercantile life, and passed a few months in the office of an East India merchant. He forsook commerce for the stage, and made his first appearance at the Lyceum theater, Sunderland, in 1856, in the small part of Orleans in Lytton's play of *Richelieu*. Afterward, at the same theater, he undertook the part of Cleomenes in *The Winter's Tale*. In both performances he was subjected to unfavorable criticism in the local press. Henceforward he earnestly devoted himself to the study of dramatic art. In the first three years of his dramatic career he played a great number of characters. He appeared in Edinburgh, Glasgow, Manchester, and Liverpool, with traveling companies, and in 1866 he made his appearance as an actor of recognized merit at the St. James's theater, London, winning particular applause as Doricourt in *The Belle's Stratagem*. He played in *Hunted Down*, *Taming of the Shrew*, and the villain in Henry J. Byron's *Lancashire Lass*, also in *Not Guilty*. All these impersonations were highly praised by the press. In 1870 Irving performed the part of Digby Grant in Albery's play, *Two Roses*, which ran for 300 nights. His impersonation was so original as to entitle him to take rank as one of the best actors on the London stage. In 1871, at the Lyceum theater, he made his first success in a serious part as Mathias in *The Bells*, and was now looked upon by many as the foremost actor in England. He played Hamlet, Othello, Richard III., and a number of other characters. In 1878 he became manager of the Lyceum theater, and in that position and by the magnificent setting of his productions and his attention to detail gave his theater a national reputation. Most of the plays produced had long runs. *Hamlet* was performed for 200 and afterward for 150 nights, *The Merchant of Venice* for 250 nights, and *Romeo and Juliet* for 150 nights. In Feb., 1893, he produced *Becket*, by Tennyson, which ran until the close of the season. In May and June, 1881, Edwin Booth and Irving played in *Othello* together, each taking the parts of Othello and Iago alternately. In 1883 he visited the U. S. with Miss Ellen Terry and his Lyceum company. The tour was a highly successful one. He made a second visit in 1884–85, and a third in 1887–88, and produced the tragedy of *Faust*, taking the part of Mephistopheles, and in 1893 made a fourth visit. Judgment and taste differ in defining Irving's talent and estimating his rank. His oddities help to make him unique. His versatility in a wide range of important *rôles* is remarkable. In characters so different from each other as Robert Macaire, Bill Sikes, Harry Dornton, Captain Absolute, Jingle, Charles I., Shylock, Louis XI., the differentiation is perfect. His Louis XI. and his dual character of Lesurques and Dubosc in *The Lyons Mail* are remarkable impersonations. He is the most earnest of actors, and unexcelled in eccentric comedy and character parts. In July, 1892, Trinity College, Dublin, conferred on Irving the honorary degree of D. Lit. He was knighted May 24, 1895. He is the author of a number of magazine articles, and of *Impressions of America* (1884). He has given lectures on the drama at Oxford and Harvard Universities. B. B. VALLENTINE.

Irving, WASHINGTON: author; b. in New York city, Apr. 3, 1783. His school education ended when he was sixteen years of age, when he began to study law, but his literary training was acquired by the diligent perusal at home of the older English writers. In 1802 he made his first literary venture by printing in the columns of *The Morning Chronicle*, then edited by his brother, Dr. Peter Irving, a series of local sketches under the pseudonym of *Jonathan Oldstyle*. In 1804, being threatened with consumption, he traveled through Europe. Returning to New York in Mar., 1806, he quickly completed his legal studies and was admitted to the bar, but never practiced the profession. Early in 1807 he began, in connection with his brother William and James K. Paulding, the amusing serial *Salmagundi*, which had an immediate success. In 1808, with some assistance from his brother Peter, he wrote *Knickerbocker's History of New York*. His attention was much absorbed at this time by the interests of a mercantile business in which he engaged with two of his brothers. Early in 1815, upon the conclusion of the war with Great Britain, he went to Europe and remained abroad for seventeen years. For two or three years he was engaged in rambling through the United Kingdom, without other object than pleasure, making, however, many literary friends, and accumulating a minute acquaintance with English life. About the close of 1817 the commercial house in which Irving was a partner failed, and he was compelled to devote himself to literature for a subsistence. He sent the essays composing the *Sketch-book* to New York, where they were printed in pamphlets in 1818, over the signature of *Geoffrey Crayon*. The *Sketch-book* laid the foundation of the fortune and the permanent fame of Irving; the legends of *Sleepy Hollow* and *Rip Van Winkle* at once took rank as modern classics, while the pictures of English life and customs were so genial, artistic, and withal so faithful that they took the reading world fairly by storm. *Bracebridge Hall* was published in 1822; though rapidly written, and decidedly unequal to the standard of the *Sketch-book*, it was well received. The *Tales of a Traveler* were published in 1824. Irving had spent three winters on the Continent, chiefly at Paris and Dresden, when in 1825 his attention was called to Navarrete's collection of documents upon Columbus and the early explorers of America, then appearing at Madrid. He proceeded to that capital, intending to make a translation of the work of Navarrete, but finding it to be a rich mine of materials rather than a readable book, he fortunately changed his plan and produced his *History of the Life and Voyages of Christopher Columbus* (1828), to which was added (1831) its continuation, the *Companions of Columbus*. In 1828–29 Irving traveled through the south of Spain. In the latter year he published the *Conquest of Granada*, and in 1832 *The Alhambra*, neither of which was quite as successful as his former works. He returned in July, 1829, to London, having received the appointment of secretary of legation in England. In 1831 the University of Oxford conferred upon him the degree of LL. D. In 1832 he returned to his native land. The same year he accompanied Commissioner Ellsworth in his journey for removing the Indian tribes to the W. of the Mississippi, and narrated his observations in his *Tour on the Prairies* (1835), to which were added in another volume *Abbotsford* and *Newstead Abbey*. In 1836 he published *Astoria*, a narrative of the exploration of Oregon by American fur-traders; in 1837, the *Adventures of Captain Bonneville*; and in 1839–41 contributed to *The Knickerbocker Magazine* a series of articles afterward published (1855) in the volume entitled *Wolfert's Roost*. In 1842 Irving received the appointment of minister to Spain, a post which he filled for four years, during which he discontinued authorship, and it was not until 1849 that he reprinted with large additions a biography of Oliver Goldsmith, furnished some years before to a Paris edition of that author's writings. In 1850 he published *Mahomet and his Successors* (2 vols.). He was thenceforth occupied throughout his life in his *magnum opus*, the *Life of Washington*, of which the first volume ap-

peared in 1855, and the fifth, concluding the work, in Aug., 1859. Irving resided during the closing years of his life at Sunnyside, a quaint pre-Revolutionary edifice at Tarrytown on the Hudson. D. Nov. 28, 1859.

Revised by H. A. Beers.

Irving, William: author; b. in New York city, Aug. 15, 1766; brother of Washington Irving. He became an Indian trader, residing at Johnstown and Caughnawaga on the Mohawk from 1787 to 1794. In 1793 he married a sister of James K. Paulding, and settled in New York as a merchant. His poetical and other contributions to *Salmagundi* would, if separately published, have given him a distinct place among humorous writers in the U. S., but he seemed entirely unambitious of literary fame. He became a member of Congress in 1813, but resigned in 1819 on account of ill-health. D. in New York city, Nov. 9, 1821.

Irvingites: the name by which the adherents of the Catholic Apostolic Church are usually known from Edward Irving (*q. v.*) the founder of the body. See Catholic Apostolic Church.

Irvington: village; Westchester co., N. Y. (for location of county, see map of New York, ref. 8–J); on the Hudson river and the N. Y. C. and H. R. Railroad; 23 miles N. of New York city. It is beautifully situated on the east bank of the river, has connection with the west bank by ferry at Tarrytown, 2 miles N., and contains the costly summer residences of many New York business men. Pop. (1880) 1,904; (1890) 2,299.

Irwin: borough; Westmoreland co., Pa. (for location of county, see map of Pennsylvania, ref. 5–B); on the Pennsylvania and the Youghiogheny railways; 22 miles S. E. of Pittsburg. It is engaged in coal-mining, manufactures mining supplies and plate-glass, and has three newspapers. Pop. (1880) 1,444; (1890) 2,428.

Irwin, Jared: Governor of Georgia; b. in Mecklenburg co., N. C., in 1750; moved with his parents when a boy to Burke co., Ga.; took an active part in the cause of independence during the Revolutionary war; was a member of the first Legislature of Georgia after independence was achieved; was a member of the State convention which ratified the Constitution of the U. S. of 1787; was Governor of the State 1796–98, and again 1806–09. He was a member of the State constitutional conventions of 1789, 1795, and president of the State convention that formed the constitution of 1798. As Governor in 1796 he signed the act abrogating the famous Yazoo fraud, perpetrated by a previous corrupt Legislature. D. at Union Hill, Georgia, Mar. 1, 1818.

Is [=Gr. Ἶς, modern *Hit*]: an important city of ancient Babylon, eight days' journey N. of Babylon, on the west bank of the Euphrates. The name signifies *bitumen*, which was carried thence to Babylon for building purposes. The site has been identified by cuneiform inscriptions.

Isaac [=Heb. *Yitschaq*, sporting, laughing]: the only son of the Hebrew patriarch Abraham by Sarah his wife; b. in the extreme old age of both his parents, in fulfillment of the divine promise. For his sake Ishmael, his half-brother, was thrust out into the wilderness, with Hagar, his mother, a bondwoman or slave. Later, the lad Isaac was brought by his father as a sacrifice to Mt. Moriah, in obedience to the divine command, but Isaac's life was spared in consequence of a heavenly interposition. When forty years of age Isaac married Rebekah, his kinswoman, who bore him twin sons, Esau (or Edom) and Jacob (afterward called Israel). The former was the first-born and the favorite of his father, but Jacob, the favorite of his mother, obtained the birthright. Isaac died at Hebron, aged 180 years. Ussher dates Isaac's birth 1898 B. C., but all dates for it are mere conjectures. Revised by Willis J. Beecher.

Isaac I., Comnenus: a Byzantine emperor, descended from the family of Comnenus. He was educated by the Emperor Basil II., and raised to the throne in 1057 by a conspiracy. Being prostrated by a violent fever, he abdicated in 1059, retired to a monastery, and died there in 1061. He was an excellent man, firm, fearless, prudent, and with the noblest intentions. For the purpose of bringing order into the finances, he revoked a great number of pensions and grants bestowed upon idle courtiers, and resumed a part of the revenues of the monasteries.

Isaac II., Angelus: a Byzantine emperor, descended from the family of Comnenus, and raised to the throne by a revolution in 1185. He is described by Gibbon as indolent, extravagant, and bent solely upon the gratification of his appetites. In 1195 his brother, Alexis III., compelled him to abdicate and deprived him of his sight, but in 1203 the crusaders again placed him on the imperial throne, whence he was driven in 1204 by Alexis Ducas, who put him to death.

Isabella, or **Isabela**: the first city founded by Europeans in the New World. So called in honor of the Queen of Spain. It was founded by Columbus in Dec., 1493, on a small bay of the northern shore of Santo Domingo island, about 25 miles W. of the present town of Puerto Plata. The site was low and unhealthful. Later, in 1497, Santo Domingo city was founded and became the capital of the colony; gradually Isabella was abandoned, and only a few ruins, overgrown with tropical vegetation, remain to mark its site. H. H. S.

Isabella I., The Catholic [Sp. *Isabel*]: Queen of Castile; b. at Madrigal, Old Castile, Apr. 22, 1451; daughter of John II., King of Castile, by his second queen, Isabella of Portugal, and sister to Henry IV., who succeeded to the throne in 1454. She was brought up by her mother in the obscure village of Arévalo, receiving an education largely tinged with the ascetic bigotry of the age. The insurrection which broke out in 1464 against Henry, alleging the illegitimacy of his infant daughter Juana (called "la Beltraneja," from the name of her supposed father), and raising to the throne (1465) his brother Alfonso, first gave political importance to the person of Isabella as a not improbable heir to both her rival brothers. On the death of Alfonso in 1468, Henry regained the throne, but encountered armed resistance from the former partisans of Alfonso, who offered to proclaim Isabella queen. She refused the proposal, but consented to allege her claims to the succession against those of the infant princess, and the civil war was terminated, with the sanction of the Cortes, by Henry's promise to repudiate his queen and her offspring, and his recognition of Isabella as immediate heir. During this troubled interval intrigues had been rife for the disposal of Isabella's hand, which had first of all been unsuccessfully sought for Ferdinand of Aragon, her destined husband. At the age of eleven she had been betrothed to Prince Carlos of Aragon (brother of Ferdinand), who soon died by poison, and two years later Henry had promised her hand to Alfonso of Portugal. Isabella having energetically refused to sanction this agreement, Henry next endeavored to compel her to marry the Marquis of Villena, but this was prevented by the latter's death, and after the peace of 1468 Henry returned to his earlier project in behalf of the Portuguese prince. While these intrigues were going on overtures had been made directly to Isabella herself by her cousin Ferdinand of Aragon, which she accepted in spite of her brother's threats of imprisonment. Early in the year 1469, the articles of settlement were signed at Cervera, guaranteeing to Isabella the exercise of her sovereign rights in Castile. Henry endeavored to seize upon his sister's person, but she took refuge in Valladolid, under the protection of her stanch and powerful partisans, the Admiral of Castile and the Archbishop of Toledo, Primate of Castile. This prelate, in order to hasten the union, produced a papal dispensation from the impediment of consanguinity (which ultimately proved to have been fabricated by him), and Ferdinand, traversing Northern Castile in disguise, was married to Isabella at Valladolid in Oct., 1469. Henry, enraged at this resistance to his mandates, declared that by marrying against his consent Isabella had forfeited her rights, and again proclaimed his infant daughter heir to the throne, taking, along with the queen, an oath to her legitimacy, and betrothed the *infanta* to a French prince, the Duke of Guienne, brother of Louis XI. The partisans of Isabella in Northern Castile stoutly maintained her claims, and in 1473, Henry again found himself obliged, for his own security, to negotiate with his sister. They were publicly reconciled at Segovia amid great rejoicings, and Henry dying soon after, Isabella was proclaimed Queen of Castile Dec. 13, 1474. Most of the nobility at once recognized her, but a few, aided by Alfonso of Portugal, asserted by arms the claims of the *infanta* Juana, now betrothed to that prince. Isabella took an active part in this war, encouraging her troops by her presence and by an unwearied attention to their needs; it was not until 1479 that this source of disquietude was removed by a treaty of peace, in accordance with which Juana, then seventeen years of age, who had retired to Portugal, took the veil at Coimbra, where she survived until 1530. Meanwhile the prince consort, who had received the honorary

title of King of Castile, succeeded to the throne of Aragon as Ferdinand V. in Jan., 1479, thus effecting a virtual union between the two principal states of the Iberian Peninsula, which was consolidated in the succeeding reign of Charles V., and laid the foundation of the modern Spanish state. In 1482 began that final warfare with the Moors of Granada which only ended ten years later by the extinction of their sovereignty in 1492. On this occasion Ferdinand and Isabella received from the pope the title of "Catholic sovereigns," by which they are distinctively known in history. The honors of the Moorish war belonged of right chiefly to Isabella, who had personally directed the operations, submitting for years to all the inconveniences of campaign life. Isabella's chief title to fame rests upon the well-known part she took in promoting the great project of Columbus, and in the New World, at least, her memory will be immortal. She was beautiful in person, of pleasing manners and kindly heart, though of inflexible will; ambitious and proud, though devout; had considerable learning and political ability; was a loving wife, and is justly revered by Spaniards as the purest glory of their royal annals. She died Nov. 26, 1504, at Medina del Campo, and at her own desire was buried in the Franciscan monastery at Granada. She had five children—Isabella, who married Prince Emanuel of Portugal; John (Juan), who died in 1497, aged twenty; Juana, afterward called *La Loca*, or "The Mad," who married Philip of Austria and was the mother of Charles V.; Maria, who married Emanuel of Portugal after her sister's death; and Catharine (Catalina), known in English history as the unfortunate queen of Henry VIII. and mother of Mary Tudor. For the literature relating to the reign of Isabella, see Prescott's *History of the Reign of Ferdinand and Isabella the Catholic*, in which copious bibliographical references may be found. See also the article FERDINAND V.

Revised by F. M. COLBY.

Isabella II.: Queen of Spain; b. at Madrid, Oct. 10, 1830. She succeeded her father Ferdinand VII. in 1833, under the guardianship of her mother, but war at once broke out, the followers of Don Carlos asserting that the Salic law, which had been the rule of succession in the Bourbon family in France, also held good for Spain, notwithstanding the Pragmatic Sanction of the old Castilian law of female succession published by Ferdinand in 1830. The first Carlist war lasted till 1840 with varying fortunes. In 1843 she was declared of age; married her cousin, Don Francisco, in 1846—a purely political marriage arranged through the influence of Louis Philippe—and after a reign disturbed by many violent revolutions she was deposed in 1868, and in 1870 abdicated in favor of her son, who in 1875 succeeded as Alfonso XII., the short reign of Amadeus and the attempted republic having intervened.

Isabey, ēē'zăă'bā', EUGÈNE LOUIS GABRIEL: genre, landscape, and marine painter; b. in Paris, July 22, 1804. He was a pupil of his father, Jean Baptiste Isabey, miniature-painter (1767–1855); was awarded first-class medals at the Salons of 1824 and 1827, and at the Paris Exposition 1855; was made an officer of the Legion of Honor 1852. D. at Langres, Apr. 26, 1886. Pictures by him are in all the principal museums in France, including four in the Luxembourg Gallery, Paris. They are notable for brilliant color schemes and dramatic composition. *French Hospitality* is in the collection of Mrs. W. H. Vanderbilt, New York; three marines are in that of W. T. Walters, Baltimore.

WILLIAM A. COFFIN.

Isabey, JEAN BAPTISTE: painter and draughtsman; b. at Nancy, France, Apr. 11, 1767. He removed to Paris in 1785 and painted miniatures for snuff-boxes and the like; obtained admittance to the atelier of David, and was employed to paint the portraits of the sons of the Comte d'Artois who was afterward Charles X. The leaders of the Revolution sat to him; he became still better known under the directory and the consulate, and the empire was still more favorable to him. At the time of the coronation of Napoleon, in 1804, he had much to do with the arrangement of the ceremony, and had charge of the great folio work in which it was recorded. The Restoration was also favorable to him; he was at the Congress of Vienna in 1814, and made the portraits of princes and dignitaries there; during the reign of Louis XVIII. he was constantly employed; under Charles X. he had a court position, and his success continued under Louis Philippe. He was made a member of the Legion of Honor at its first foundation by Napoleon and an officer of the Legion under Charles X. The last annual Salon at which he exhibited was that of 1841, and he died in Paris, Apr. 18, 1855. He painted on ivory and on porcelain, and in enamel, and very many of his portraits are water-colors, or sepia-drawings with slight touches of color. Some of his sepia-drawings are very large and contain many figures, but are still very delicately finished. He was a successful lithographer as well. Among his important works are, at the Louvre, the large water-color of *The Staircase of the Louvre Museum*, painted in 1817, and two portraits; at the Museum of Versailles, *Napoleon Visiting a Factory at Rouen* and *Napoleon Visiting a Factory at Jouy*: at Windsor Castle, *The Congress of Vienna*; and in England, in private hands, the large painting on ivory of Napoleon and his marshals generally called *La Table des Maréchaux*.

RUSSELL STURGIS.

Isæus (in Gr. 'Ισαῖος): one of the ten Attic orators; a native of Chalcis in Eubœa; flourished in the first half of the fourth century B. C. A pupil of Isocrates, he seems to have felt the influence of Lysias also, with whom he is often compared and contrasted. As a foreigner, he could not appear in court or in the assembly, and was restricted to the preparation of speeches for others, a profession in which he showed consummate mastery of Attic law, vigor of style, and astuteness in argument. He was the first great forensic orator and the very trainer for Demosthenes, who is said to have sought his aid and studied his methods. Of his many speeches (some fifty or sixty) only eleven have come down to us, all dealing with questions of inheritance; but though his domain is narrow, Isæus affords many interesting glimpses of Attic interiors. The extant orations have been edited in the *Oratores Attici* (translated into English by Sir William Jones, 1794) of Reiske (1773), Bekker (1823–28), Dobson (1828), Baiter and Sauppe (1839–43). Separate editions by Schömann (1831) with notes, by Bürmann (1883), and by Scheibe in the Teubner Series (2d ed., pp. 486–577). Compare Blass, *Attische Beredsamkeit*, vol. ii.; Jebb, *Attic Orators*, vol. ii., pp. 261–368; and May, *Les Plaidoyers d'Isée* (Paris, 1876).

B. L. GILDERSLEEVE.

Isaiah, ī-zā'ya, or ĕĕ-zī'ăă [= Heb. *Yĕshayāhû*, salvation of Jehovah]: the greatest of the Hebrew prophets in mental gifts, in literary culture, and in deep spirituality. He began his ministry about 740 B. C. in the time of Tiglath Pileser III., under Uzziah, who is also called Azariah (2 Kings xiv. 21), and who was a contemporary of Jeroboam II. At this time Judah was in an exceedingly prosperous condition, so that Isaiah could say: "Their land also is full of silver and gold, neither is there any end of their treasures; their land is also full of horses, neither is there any end of their chariots" (ii. 7). Isaiah witnessed the fall of Samaria (722 B. C.), and the campaign of Sennacherib against Hezekiah (701 B. C.). Jewish tradition affirms that he was sawn asunder in the time of Manasseh, but of this there is no proof.

CONTENTS OF THE BOOK.—His prophecies are not arranged in chronological order, but according to the subject-matter. The book, which bears his name, consists of two main parts: chaps. i.–xxxix. belong mainly to the Assyrian, chaps. xl.–lxvi. to the Babylonian period. The first part may be subdivided as follows: (1) Chaps. i.–vi. is directed against the idolatrous, luxurious, and unrepentant people, beginning with the "great arraignment" (chap. i.), followed by a picture of millennial glory, with which is contrasted the worldliness of the people, and the judgment which is to befall men and women (chaps. ii.–iv.). Then we have the parable of the vineyard (chap. v.), and Isaiah's vision of Jehovah (chap. vi.), which really belongs at the beginning of his prophecies. In (chaps. vii.–xii. there is a triad of Messianic prophecies. An attack of Samaria and Syria on Ahaz and his appeal to Tiglath Pileser III. furnished the occasion of Isaiah's prediction of the one to be born of a maiden whose name should be called Immanuel (chap. vii.). Despair because of the rejection of the prophetic word (chap. viii.) stands in marked contrast to the rejoicing at the birth of him who is called "Wonderful," etc. (chap. ix.). Assyria is the rod of God's anger for the punishment of his people, nevertheless a remnant is to return (chap. x.). This is followed by the third Messianic prophecy which ushers in the reign of millennial peace (chaps. xi.–xii.).

Chaps. xiii.–xxiii. deal mostly with the enemies of Israel, who are to be subdued. Babylon, Assyria, Philistia, Moab (chaps. xiii.–xvi.), Syria, and even Ephraim pass in review (chap. xvii.). The Ethiopians are to bring a present to Jehovah (chap. xviii.). The Assyrians and the Egyptians are to be converted (chap. xix.). The fall of Egypt and Ethi-

opia is set forth in symbol (chap. xx.), that of Babylon is described (chap. xxi.), and the epicureanism of Jerusalem under siege (chap. xxii.). The series closes with a prediction against Tyre (chap. xxiii.).

Chaps. xxiv.–xxvii. present the visitation of judgment on the whole earth. The Apocalypse is foreshadowed. The new Jerusalem is founded on the Rock of Ages. The pious dead are to be raised. God's people are to hide themselves for a little, while God overcomes the powers of evil, represented by the world empires under the form of mythical monsters. Chaps. xxviii.–xxxiii. are especially directed against foreign alliances. They open with an invective against Ephraim's drunkenness (chap. xxviii.). God's revelation becomes a sealed book, their wise men void of understanding (chap. xxix.). Having forsaken God they summon Egypt against Assyria, and rely on statecraft and horses in vain (chap. xxx.). But God promises to deliver his people from their enemies in Zion as well as from Assyria (chap. xxxi.). Last of all we have the picture of an ideal king (chaps. xxxii.–xxxiii.).

Chaps. xxxiv.–xxxv. describe the destruction which befalls Edom and the favor which God shows his ancient people. A transformation of the natural world is to accompany that of the spiritual. Chaps. xxxvi.–xxxix. are historical and serve to unite the first part of Isaiah with the second.

In the second part of Isaiah there are three main divisions marked by the refrain, although with variations: "There is no peace, saith the Lord, unto the wicked" (xlviii. 22, lvii. 21, lxvi. 24, by implication).

One of the most distinctive characteristics of these chapters in Isaiah is the teaching regarding the Servant of Jehovah. It is clear from some passages that an individual is not indicated, but that the reference is to the entire people of Israel. In others the application is limited to the faithful in Israel, who were compelled to suffer on account of their belief.

Chaps. xl.–xlviii. open with a message of comfort. Jehovah, as king, is represented as making a triumphal journey through the wilderness on his way to Jerusalem. Man, the fading flower, is contrasted with the word of God which abides forever. Jehovah is the Good Shepherd. (Cf. Isa. xl. 11; Ps. xxiii. 1, lxxx. 1; Ez. xxxiv. 12, etc.) The folly and inconsistency of idolatry are set forth with biting sarcasm. (Isa. xl. 19, 20, xli. 6, 7, xliv. 9–17, xlvi. 1–7).

Cyrus is recognized as one anointed by God to do a special work for his people (xli. 2, 25, xliv. 28, xlv. 1); the Servant of Jehovah is first introduced as the entire people of Israel (xli. 8, xliv. 1, 21, xlv. 4), then as an individual in terms which our Lord applied to himself (xlii. 1–4; cf. Matt. xii. 17–21).

In chaps. xlix.–lvi. the conception of the Servant of Jehovah is limited to the pious congregation in Israel. This idea easily passes over into that of a person (xlix. 1–6). The mission of the Servant is enlarged; he becomes an apostle to the Gentiles (verse 6).

It is in this division that we have a remarkable description of the vicarious sufferings of the Servant (liii.), to which no other complete parallel exists except in the New Testament account of our Lord's passion on the cross.

The fifty-fourth chapter of Isaiah represents that Israel, so long forsaken of God, like an unfaithful wife, is to be restored to her former place in God's favor. This is accompanied with the gracious invitation in the fifty-fifth chapter, and with promises to eunuchs, and to faithful proselytes in the following chapter. These chapters close with a description of the corrupt condition of the people, which is compared to that of adultery.

At the beginning of chaps. lvii.–lxvi. the Jews are rebuked for their formalism, and are exhorted to keep the Sabbath day. The picture of the depravity of the people is adopted by Paul in his Epistle to the Romans (Isa. lix. 7–9; cf. Rom. iii. 15–18). Out of this darkness, and the punishment which God visits upon his adversaries, rises the dawn of the millennial morning (lx.), followed by the message of the Servant of Jehovah to God's chosen people (chaps. lxi.–lxii.). Through an historical retrospect these chapters which are so full of promise are brought into connection with the actual waste condition of the land in the time of the Babylonian captivity (lxiv. 10–11), and the shameful iniquities of the majority of the people (lxv. 1–7, lxvi. 3–5, 17).

The prophecy closes with the promise of new heavens and a new earth, a new Jerusalem (lxv. 17–18), and of the return of God's people to their own land (lxvi. 20), and with the assurance of the everlasting punishment of those who have transgressed against God (verse 24).

Critical Opinions.—The modern school of critics, on historical, literary, and other grounds, regards the book of Isaiah as a collection of prophecies by various authors, including those of Isaiah. The oracle xiii.–xiv. 23 is attributed to a prophet of the Babylonian exile, on account of the historical situation. For the same reason Delitzsch and others refer xxi. 1–10 to the same period. Chaps. xxiv.–xxvii. and chaps. xxxiv.–xxxv. are also referred to the exile. Chaps. xxxvi.–xxxix. are thought to have been taken from the Book of Kings (2 Kings xviii. 13–xx. 19) by the editor of the Isaianic collection.

Whatever discussion there may be among the critics of the modern school as to the authorship of these oracles, they are essentially unanimous in the view that chaps. xl.–lxvi. were written by one or more prophets living among the Babylonian exiles to inspire them to return to their own land. The theory naturally follows from the view that the prophets were primarily preachers, and that their discourses grew out of a historical situation. Predictions are suggested by the condition of the prophet's contemporaries.

It must be admitted that the author of the last twenty-seven chapters of Isaiah, which form a separate book, is clearly among the exiles in spirit, if not in body. He speaks as an eye-witness when he says (Isa. lxiv. 10–11): "Thy holy cities are become a wilderness, Zion is become a wilderness, Jerusalem a desolation. Our holy and our beautiful house where our fathers praised thee is burned up with fire: and all our pleasant things are laid waste." (Cf. Isa. lviii. 12.) He threatens the Chaldeans for their cruel treatment of God's people at the conquest of Jerusalem, which he mentions as something which has already taken place (Isa. xlvii. 5, 6). He names Cyrus as the instrument of their punishment; he beholds him in his triumphal march (Isa. xli. 2, 3); he predicts his conquest of Babylon (Isa. xlv. 1–4), and that he will rebuild Jerusalem (xliv. 28, xlv. 13).

Delitzsch in the earlier editions of his commentary maintained that Isaiah was transported over the chasm of a century and a half, so that he saw the condition of Palestine and of the exiles in Babylon, and from this remote standpoint could preach to the exiles as if he were living among them. In such a case we must conceive of a book that could have been as little understood by Isaiah's contemporaries as a volume of sermons by the parishioners of Jonathan Edwards at Northampton, in which he should have sought to comfort the Negroes, in view of the emancipation proclamation by Abraham Lincoln. Such a volume would have been entirely foreign to the needs of his Northampton congregation or to those of any congregation existing at that time.

The theory that Isaiah is the author of the entire book bearing his name can only be urged on doctrinal grounds. It is readily conceded that at a late period of life he might have written in a style differing as widely as that of the last part of the prophecy from the first, and that God's Spirit had power to show him the ruins of Palestine, the oppressors of the exiles, and to reveal their deliverance from them; but such a theory is contrary to the analogy of the other prophetical books. If we understand the popular and uncritical language of the New Testament writers in the quotations made from Isaiah as the declaration of the Spirit of God regarding the authorship of these chapters, then we must maintain that Isaiah was the author of the entire book. (Matt. iii. 3, viii. 17, xii. 17, etc.)

The tendency of such a theory leads to a hopeless confusion regarding the historical allusions in the book, and tends to destroy all intelligent interest in prophecy. Alexander furnishes an example of this method when he says regarding Isa. lxiv. 10, 11, after remarking that some apply it to the time of the Babylonian conquest, and others to the time after the overthrow of Jerusalem under Titus, that it refers to "the desolations of the church itself expressed by figures borrowed from the old economy, and from the ancient history of Israel."

Literature.—Cheyne, *The Prophecies of Isaiah* (London, 1880); Driver, *Isaiah, his Life and Times* (London, 1888); George Adam Smith, *The Book of Isaiah* (2 vols., New York, 1888–90); Delitzsch, *Biblical Commentary on the Prophecies of Isaiah* (Edinburgh, 1890); Driver, *An Introduction to the Literature of the Old Testament* (New York, 1891).

Samuel Ives Curtiss.

Isalco: same as Izalco (*q. v.*).

Isambert, ĕē'zäN'bār', François André: jurist; b. at Aunay, France, Nov. 30, 1792. After brilliant classical and legal studies at the Collège de France he became one of the king's counsel in 1818, and gained a great reputation at the bar as the chief defender of the rights of the free Negroes of the French West Indies; was a member of the Chamber of Deputies 1830–48; was one of the founders of the French Geographical Society and of the Society for the Abolition of Slavery, of which he was long the secretary; edited (1820–27) the annual volume of modern laws; published, with other writers, the vast collection of ancient French legislation (1822, *seq.*, 29 vols.); a *Manual for the Publicist and Statesman* (4 vols., 1826); *The Religious Condition of France and Europe* (1844); a *History of Justinian* (1856); translated the complete works of Flavius Josephus and the *Ecclesiastical History* of Eusebius, and wrote a large work on the *History of the Origin of Christianity*, besides contributing to many periodicals, and writing numerous articles for Didot's *Nouvelle Biographie Générale*. D. in Paris, Apr. 13, 1857.

Isar, ĕē'zär: a river of Germany. It rises in Tyrol, enters Bavaria, and flows, after a course of 200 miles, into the Danube. Munich and Landshut are situated on its banks.

Isau'ria (in Gr. ἡ Ἰσαυρία): a district of Asia Minor; situated between Phrygia, Lycaonia, Cilicia, and Pisidia. It was in ancient times in ill repute for the fierceness and daring rapacity of its inhabitants. In 78 B. C. it was conquered by the Romans, but when, in the fourth century A. D., the Isaurians united with the Cilicians, they became a formidable enemy of the Byzantine empire, and two of their race occupied the Byzantine throne—Zeno, from 474–491, and Leo III. from 717–741. Its capital was Isaura (now Zengibar Kalesi), situated on a high hill not far from the deep cañon of the Calycadnus. The elevated site commands a view of almost the entire Isauria. It is not known when the seat of government was transferred to Nea Isaura, which was the city besieged by Servilius, as is proven by the Sallust fragments discovered in Orleans in 1886. Isauria was explored by Sterrett in 1885. See his *Wolfe Expedition to Asia Minor*, pp. 21–142 (Boston, 1888), for geographical detail and Isaurian inscriptions.

Revised by J. R. S. Sterrett.

Iscanderoon', **Scanderoon**, or **Alexandret'ta**: the most northern seaport of Syria; on the east coast of the Gulf of Alexandretta, the ancient Gulf of Issus (see map of Turkey, ref. 6–G). It has the best harbor on the Syrian coast, and is the sea outlet of the Syrian Gates, hence of Aleppo and the West Euphrates basin. Sometimes more than 1,000 loaded camels enter the town in one day. Several hundred steamers, besides other vessels, touch here annually. Its situation is picturesque, but extremely unhealthful, despite spasmodic attempts at drainage. Pop. (1890) 3,728.

Edwin A. Grosvenor.

Ischia, is'ki-a [Gr. Πιθηκοῦσσα, ape-island (deriv. of πίθηξ, πίθηκος, ape): Lat. *Æna'ria*]: a mountainous island of igneous origin; in the Mediterranean, at the entrance of the Bay of Naples; 7 miles W. S. W. from Cape Miseno, the nearest point on the mainland. It is rudely circular, about 18 miles in circumference, not reckoning the indentations of its bays. Its highest point is Monte Epomeo, 2,617 feet high. It was early peopled by Greeks from Asia Minor. Its mild climate, exquisite scenery, and fertile soil (producing abundant fruits), have made it throughout the year a favorite resort of strangers in all ages. Nothing more beautiful can be conceived than the varied landscapes it presents. The largest animals are goats and donkeys, the latter the sole means of conveyance. Hot springs abound—their principal source the Gurgitello—with a mean temperature of 130° F.; these are utilized in admirably arranged baths. The inhabitants speak a distinct dialect, and are remarked for their peculiar personal appearance and quaint costume. Their chief occupation is fishing and tillage. The famous Italian dance, the tarantella, is better performed here than anywhere else. Ischia has frequently suffered from volcanic eruptions and earthquakes. One eruption (474 B. C.) drove away many of the Greek colonists; another (1302) almost depopulated the island. In 1883 the cities of Casamicciola, Ischia, and Forio were almost utterly destroyed. Prior to 1883 the population was over 25,000, Ischia having 6,500, Forio 6,100, and Casamicciola 4,500 inhabitants; the rest were mainly in the small towns of Lacco, Panza, and Barano. All these towns have in great part been rebuilt.

Edwin A. Grosvenor.

Ischl, ish'l: town; in the province of Upper Austria; at the confluence of the Ischl and the Traun; 33 miles E. by S. of Salzburg (see map of Austria-Hungary, ref. 5–C). Its charming situation, its saline and sulphur springs, and the presence during several weeks each summer of the Austrian court and a great number of the Austrian nobility, have made it one of the most popular bathing-places in Europe. Salt-works were established here in 1571, and are very productive. Pop. (1890) 2,272.

Ise, ee'sā: the headquarters of the Shinto priesthood of Japan (see Shinto); a province in Central Japan, adjoining Yamato (*q. v.*), the center of its historic unity. The province of Ise lies along the western side of the Bay of Owari, and the temples which give the province its fame are found close to the town of Yamada. These are plain edifices constructed of white pine, with thatched roofs; they are decorated with no paintings, images, or carvings; every twenty years they are renewed, with devout and elaborate ceremonies, their unbroken historic continuity being thus maintained. The last occasion on which this renewal took place was in Oct., 1889, when, as is usual, the fragments of the old temples were distributed all over the empire, to be preserved as relics. Few Japanese fail to make a pilgrimage to the Ryo-dai-shin-gu (two great divine palaces), to invoke the protection of Daishingu-Sama, bringing back some of these charms wrapped in oil-paper. In every Japanese house will be found a shelf on which is placed a miniature Shinto temple, containing paper packets inscribed with the names of the various gods. Twice a year, in the sixth and twelfth months, there are festivals at Ise, which are supposed to effect the purification of the nation from sin; and the wooden chips (*oharahi*) inside these paper packets are pieces of the wands used by the priests on these occasions. For a full account of these temples, the architecture of which is that of the primitive Japanese hut, see *Transactions of the Asiatic Society of Japan*, vol. ii.; *The Shinto Temples of Ise*, by Ernest Satow.

J. M. Dixon.

Iser, ĕē'zer: a river of Bohemia; an affluent of the Elbe. It rises in Prussian Silesia and flows S. W., passing through one of the most picturesque and busy valleys of Bohemia. Length, 135 miles.

Isère, ee'zär': a French river which rises in Mt. Iseran in Savoy, flows W. and S. W. past Grenoble and Romans, and joins the Rhône 4 miles from Valence. Length, 150 miles.

Isère: department of Southeastern France; on the Rhône and its affluent, the Isère. Area, 3,201 sq. miles. The northern and western parts are level, but the southern and eastern parts contain majestic mountains, one of which, Mt. Olan, is 12,664 feet high. The department is rich in minerals. Copper, lead, iron, and coal are mined; gold and silver are found. The wine of Isère is superior. Capital, Grenoble. Pop. (1896) 568,933.

Iserlohn, ee'zer-lōn: town; in Westphalia, Prussia, on the Kalle; 14 miles S. E. of Dortmund (see map of German Empire, ref. 4–C). It has large manufactures, especially of iron and bronze ware. Pop. (1890) 22,117.

Ish'im: a river, territory, and town of Western Siberia. The river is an affluent of the Irtish, an affluent of the Obi. It rises in the government of Akmolinsk, E. of the town of that name, and flows first W., then N. E., and passing Petropaulovsk, Ishim, and Vilkulovsk. Its length is 1,100 miles. The region on each side of the river is called the steppe of the Ishim. Numerous lakes and marshes which formerly poured their waters into the Ishim are now dry, showing a general desiccation. The steppe is less naked and monotonous than those of Southern Russia. It has many ravines, some trees, and its pastures are good. The town of Ishim is 150 miles S. of Tobolsk. Pop. 6,000. An important fair is held here in December, calling together 20,000 people, and giving rise to business transactions amounting to $4,000,000. The town was founded in 1630, and is one of the oldest in Siberia.

Mark W. Harrington.

Ish'mael [יִשְׁמָעֵאל, *Ishmāël*, whom God hears]: the son of Abraham and Hagar, the Egyptian handmaid of Sarah; was expelled, together with his mother, from his home when Sarah gave birth to Isaac. The Bedouin tribes of Northern Arabia, occupying the region between the peninsula of Sinai and the Persian Gulf, are said to descend from Ishmael, and possess many Ishmaelitic traditions.

Ish'peming: city; Marquette co., Mich. (for location of county, see map of Michigan, ref. 2–F); on the Chi. and

N. W., and the Duluth, S. Shore and Atlantic railways; 15 miles W. S. W. of Marquette. It is the center of the great Lake Superior iron-ore region, and is on the Marquette range, the most productive of the four iron ranges. There are fourteen mines in the Ishpeming district, which, from their opening till 1888, yielded 13,759,936 tons of ore, or nearly one-third of the total product of all the ranges, and in 1891 had an output of 1,360,000 gross tons. Gold and silver were discovered here in 1877; were first worked in 1881. The first stamp-mill was erected in 1884, and forty-five were in operation in 1889. Marble is also found. The city has a public library (founded in 1875), public-school property valued at $110,000, and two banks. There are several foundries, blast furnaces, and machine-shops, and a daily and five weekly newspapers. Pop. (1880) 6,039; (1890) 11,197; (1894) 11,687. EDITOR OF "IRON ORE."

Is'idore of Charax [*Isidore* is from Gr. Ἰσίδωρος, liter., gift of Isis; Ἶσις, the Egyptian goddess *Isis* + δῶρον, gift]: a native of Charax on the Tigris, near the Persian Gulf, and a distinguished geographer of the first century A. D. His *Parthian Itinerary*, portions of which are extant, is an important source of information upon Asiatic geography; it was printed by Höschel (1600), Hudson (1703), and Miller (Paris, 1839) in their collections of the minor Greek geographers.

Isidore of Seville, or **Isido'rus Hispalen'sis**: ecclesiastic; b. at Carthagena between 560 and 570; was appointed Bishop of Seville about 600; and died Apr. 4, 636. By establishing schools, and by harmonizing the moral and doctrinal system of Christianity with the habits and institutions of the various races which at that time composed the Hispano-Gothic kingdom, he became one of the brightest ornaments of the Church of Spain, and his fame and authority were not confined to Spain. He presided over the second Council of Seville (619), and over the Council of Toledo (633). His works, which form an encyclopædia of the knowledge of his time, were collected and edited by Perez and Grial (Madrid, 1778), by Arevalo (Rome, 1797–1803), and by the Abbé Migne (Paris, 1850, 4 vols.). A separate edition of the *Etymologiarum libri XX.*, sometimes called *Origines*, which is extremely valuable on account of the use made of earlier writings now lost, was made by F. w. Otto in 1833, forming the third volume of Lindemann's *Corpus Grammaticorum Lat.* Revised by M. WARREN.

Isido'rian Decretals: See DECRETALS, FALSE.

Isinglass [by analogy of Eng. *glass* from Dutch *huizenblas* (cf Germ. *hausenblase*), liter., sturgeon-bladder; *huizen*, sturgeon + *blas*, bladder]: a gelatin prepared from the air-bladder of various sturgeons (*Acipenser*) and other fish, such as the cod, the weak-fish (*Otolithus regalis*), and the hake (*Gadus merluccius*). It is used in preparing jellies, confections, blanc-mange, gum-drops, etc.; in fining wines and liquors; as a test for tannic acid; as an ingredient in court-plaster; as a size for delicate fabrics, etc. The coarser kinds (fish-glues) are used in various cements. "Japanese isinglass" is prepared from a seaweed. Commercial isinglass is made in Russia, Brazil, the U. S., and other countries.

I'sis [= Lat. = Gr. Ἶσις, from Egypt. *Hes-t* or *As-t*; meaning unknown]: an Egyptian goddess, sister and wife of Osiris, and mother of Horus, Set (Typhon), and Nephthys. She was worshiped with Osiris at numerous places, but especially at Abydos and Busiris. At a later period she was a special object of veneration at Philæ, where her temple is one of the most beautiful of all Egyptian remains. This cult continued down to 453 A. D., seventy years after the edict of Theodosius forbidding heathen worship. Isis is represented as a woman with a throne upon her head, or wearing the horns of a cow, an animal sacred to her, in whose form also she sometimes appears. Many representations have been preserved showing her seated with the youthful Horus at her left breast. Her emblems were the life-sign and the lotus, which she carried in her hands. As late as the fourth century she is painted at the foot of sarcophagi with Osiris and Nephthys, mourning the dead, and her image is found in tombs of all periods. The red amulet placed at the neck of mummies represented the blood of Isis, and was believed to have the power of opening the gates of the nether world, and of giving the deceased landed possessions there. CHARLES R. GILLETT.

Isis: the classical Latin name for the river Thames in England (Tham-*esis* = "the broad Isis"), still often employed in the same sense in English poetry and *belles-lettres*. The principal tributary of the Thames, which passes by Oxford, is also called Isis.

Isla, José FRANCISCO, Padre de: author; b. near Valderas, in León, Spain, Apr. 24, 1703. He early showed talents, and an inclination to the kind of cultivated religious life led by the Jesuits. In 1719 he was received into this order, and throughout his life he remained true to it, sharing cheerfully the sufferings and privations due to the expulsion of the Jesuits from Spain in 1767 and the dissolution of the order in 1773. The last years of his life were spent in exile —one of them in Corsica, and most of the rest in Bologna or its vicinity. In Bologna he died, Nov. 2, 1781. Though few persons suffered in their private fortunes more than the Padre Isla from the liberalizing movements of the reign of Carlos III., yet he really belonged to them. Within the Church he was the most dangerous enemy that appeared of the unenlightened and gross practices of the preceding generation. His attacks, however, were generally not direct, but in the form of veiled satire. Himself a famous preacher, and the first for a hundred years to make his sermons simple, direct, and to the point, he succeeded, in his satirical *Historia del famoso predicador Fray Gerundio de Campazas*, in giving a deathblow to the mountebank preaching that had become common all over Spain. The first part of this famous book appeared in 1758, but was prohibited by the Inquisition in 1760. The second part was surreptitiously printed in 1770; and a little later the whole work appeared without authorization in Bayonne, and was followed by unlicensed editions in Madrid and other places in Spain. The book has been well said to be for Spanish pulpit oratory what *Don Quixote* was for imaginative literature. It is, furthermore, highly entertaining. The only other work of the author to approach this in fame was his translation of Le Sage's famous *Gil Blas*. Made late in Isla's life, and as a translation highly inaccurate and untrue to the original, this work has yet such qualities of vigor and style that it has remained to this day one of the most popular books in Spain. Besides these two books, the following, in all of which something of the writer's satiric power may be found, may be mentioned: *La Juventud triunfante* (1727); *Cartas de Juan de la Encina* (1732); *El Dia Grande de Navarra* (1746); *Cartas familiares* (4 vols., 1786). Eighty-seven of his sermons, running from 1729 to 1754, were published after his death (Madrid, 1792). The original manuscript of an unpublished satirical poem, entitled *Vida de Cicerón*, is now in the Boston Athenæum, Boston, Mass. A good selection from the original works of the Padre Isla, with biography by Monlau, is in vol. XV. of the *Biblioteca de Autores Españoles* (Madrid, 1876). The *Gil Blas* has been printed many times (e. g. Paris, 1883). A. R. MARSH.

Islam: the religious system of Mohammed. See MOHAMMED and MOHAMMEDANISM.

Islamabad' (i. e. Dwelling of the Faith), or **Chittagong Port**: town; in Bengal, India; the capital of the district of Chittagong; in lat. 22° 20′ N., lon. 91° 54′ E., on the Karnaphuli, 7 miles from its mouth (see map of N. India, ref. 8–K). It has important ship-building and other manufactures, and a large trade in rice, salt, cocoanuts, and tortoise-shell. Pop. 21,000.

Islamabad: city of Kashmir, India; on the Jhilum, 30 miles S. E. of Srinagar (see map of Northern India, ref. 3–D). The city is on a small eminence at the foot of which is a reservoir, held sacred by the Brahmans as the work of Vishnu. This is strongly sulphurous, but contains many fish. The city has 300 places where Kashmir shawls are made. Near it are the celebrated ruins of Martand.

Islands: relatively small bodies of land surrounded by water. Islands are produced in various ways. They may be cut off from the mainland by the action of waves and currents; thus England was presumably separated from France. They may be produced by the partial submergence of a rugged or mountainous land; by far the greater number of islands near the continents have been thus formed. Innumerable small islands of this kind lie along the coasts of Finland and Norway. Many islands are formed by the rise of lake waters in warped or obstructed valleys, as in Lake Huron and Georgian Bay and the Lake of the Woods (see LAKES); larger islands of this class fringe the various fiord coasts (see FIORD), as in Scotland, Maine, British Columbia, and Southern Chili; still larger islands of the same kind form the Malayan and Australian archipelagos; the sea bottom from which many of these islands rise being

relatively shallow. (See OCEAN.) The classic archipelago of the Ægean Sea belongs in the same class. The Santa Barbara islands, off the southern coast of California, are remarkable in being separated by very deep water from the mainland and from each other. The geological structure of islands of this class corresponds to that of the adjacent continent. Sand-bars are built along shallow shores, forming low linear islands, as along the New Jersey coast and farther south.

Volcanic islands are built up from the sea bottom, not only along continental shores, as in the Lipari and other islands of the Mediterranean, various islands of the Lesser Antilles, and the looped island chains E. of Asia, but also alone in mid-ocean, as the Azores, Ascension, St. Helena, and others in the Atlantic, the Hawaiian, Fiji, and other groups in the Pacific. Conical eminences rising from the ocean bottom but not reaching the surface have been found by soundings in various parts of the ocean; they probably mark submarine volcanoes not high enough to form islands. (See VOLCANOES.) CORAL ISLANDS are described in a special article. Mid-ocean islands are volcanic or coral, with few exceptions. Madagascar is associated with Africa, although separated by water over 1,000 fathoms deep; New Zealand and New Caledonia may be classed as outlying parts of Australia.

Island Changes.—On taking a definite attitude with respect to the sea-level islands suffer various changes. Like the mainland coast, they may be consumed by the waves; thus Heligoland in the North Sea has been greatly reduced in the historic period; Rockall, a lone rocky summit on the continental shelf W. of Scotland, is but a remnant of a once larger island. Submarine shoals often mark the foundations of consumed islands, as, presumably, the George's Bank, in the Gulf of Maine. When favorably situated islands may be tied to the mainland by sand-bars, as Gibraltar is tied to Spain, the peninsula of Table Mountain and Cape Town to South Africa, and, less completely, Ceylon to India by "Adam's Bridge." They may be welded to continents by the outward growth of deltas, as the ancient island, now the promontory of Shantung is united to the mainland of China by the broad delta lowland of the Hwang-Ho; and in a smaller way islands are united to the mainland of Greece by the delta of the Aspropotamos.

Climate, Fauna and Flora.—With respect to temperature, islands are tempered by the waters that surround them. They are generally well watered, but may have a rainy slope to windward and a dry slope to leeward, as on the Hawaiian islands. With respect to fauna and flora, islands may be divided into continental and oceanic groups (the common statement that oceanic islands are either volcanic or coral and the implication that continental islands are only of other kinds is an error, as both volcanic and coral islands occur close along continental shores). The former generally possess animals and plants derived from the adjoining mainland at a time when the two were connected, as in the case of the wolves once common in Great Britain. The islands of the Malayan and Australian archipelagoes are separated by relatively deep water between Java and Celebes; an Asiatic fauna is restricted to Sumatra, Java, Borneo, and their neighbors; and an Australian fauna to New Guinea and its fellows. In such cases the animals and plants on the islands resemble those on the neighboring continent; but their similarity decreases with distance and depth of separation, thus indicating variation of species with time. In the case of oceanic islands remote from continents, the scanty fauna and flora are restricted to such forms as may have crossed from other lands by air or water. Thus the occupants of the Azores in the Eastern Atlantic, and of the Galapagos in the eastern equatorial Pacific, are related to, but different from, those of the continents nearest to them. On the islands of the mid-Pacific both fauna and flora are extremely limited, being restricted to such forms as may have reached their shores by drifting over the surrounding waters; both the human savages and the cocoanut-palms of the Pacific coral islands have spread there from other lands at some time previous to their discovery by Europeans. The modern relations of islands to travel and commerce, in which they serve as stations and posts of supply on long voyages, have relieved them from a state of isolation. Animals and plants are thus artificially distributed far and wide, beyond their natural areas. Small islands, whose own resources are so narrowly limited that they can not alone develop any higher stage of human life than savagery, may witness a considerable advancement when aided by frequent communication with some larger country. W. M. DAVIS.

Islay, ī'lā: an island of the Inner Hebrides, belonging to the county of Argyle, Scotland. Area, 246 sq. miles. It is the richest and most productive of the whole group of islands, and for this reason is called the "Queen of the Hebrides." Pop. (1890) 7,559.

Isle of France: See MAURITIUS.

Isle of Man: See MAN, ISLE OF.

Isle of Pines: See PINES, ISLE OF.

Isle of Wight: See WIGHT, ISLE OF.

Isle Royal: a large island in the northwest part of Lake Superior, belonging to Michigan, and about 20 miles from the coast; 40 miles long by 8 to 12 broad. It is a very rocky island, with many bays, often of the form of fiords, covered with low spruce and fir. It consists of series of rocky hills, running parallel to those of Keweenaw point. It possesses rich copper mines, and its shores afford fine fishing-ground. The large bay on the south side is called Siskawit, and a fish of the same name is taken here in large numbers. It is a large salmon trout, sometimes weighing 40 lb. Brook trout weighing 8 and 10 lb. have been caught in Rock Harbor at the eastern end. Washington Harbor at the western end is an excellent port. There is no permanent population. In Apr., 1897, it was annexed to Keweenaw County. M. W. H.

Isles of Shoals: a group of eight small islands in the Atlantic: about 10 miles S. E. of Portsmouth, N. H. They are barren and almost without vegetation. The few inhabitants live mostly by fishing. On White island is a lighthouse; on Appledore and on Star island there are large hotels for summer tourists.

Isle Verte (i. e. green isle): a town of Quebec, Canada; 140 miles N. E. of the city of Quebec; capital of Temiscouata co. (see map of Quebec, ref. 2–E); on the right bank of the St. Lawrence and opposite the island, and in the mouth of the river, both of the same name; station of the International Railway. Pop. 1,134, nearly all French-Canadians. M. W. H.

Iskimid: See ISMID.

Ismail, ĕes-măă-eel': city of Bessarabia, Southwest Russia; 125 miles S. of Kishinef; on the Kilia, the northern mouth of the Danube (see map of Russia, ref. 10–B). It was given to Moldavia in 1856, but has belonged to Russia since 1878. It has been an important place in history, and has been taken by assault and sacked three different times—1770, 1790, and 1791. The fortifications were destroyed on the evacuation of 1856. Pop. about 16,000. M. W. H.

Ismaïl Pasha, ĕes-măă-eel' păă-shaa': fifth Viceroy and first Khedive of Egypt; b. in Cairo, 1830; the son of Ibrahim Pasha and a Circassian lady. He was educated in Paris. On the death of his father (1848) he courageously opposed the new viceroy, his cousin Abbas Pasha, who died the following year. A favorite of the next viceroy, his uncle Saïd Pasha, he was intrusted with the government during Saïd's pilgrimage to the holy places of Arabia and during his visit to Europe. Then he was appointed general-in-chief of the Egyptian armies, and subdued the insurgent tribes on the frontier of the Sudan. Saïd died in 1863, and Ismaïl succeeded. First he opposed, then favored, the completion of the Suez Canal. This was opened in 1869. By two firmans from the sultan (1867) he obtained the semi-independent title of khedive (master), with almost every attribute of sovereignty. He secured a third firman (Aug. 4, 1868) which set aside the customary Mussulman order of succession (among the Mussulmans not from father to son, but to the oldest male member of the family), and declared the investiture of Egypt hereditary among his descendants in direct line. Soon, by raising heavy foreign loans, buying breechloaders and ironclads, and increasing his army, he roused the suspicions of the sultan, who, pressed by Great Britain, ordered the khedive to surrender his fleet, reduce his effective force to 30,000 men, and negotiate no further foreign loans without special authorization. Unable to resist, he submitted. Then he directed his restless energies to magnificent schemes for the forcible "Europeanization" of Egypt. Practically the whole industry of the country was under his despotic control. During the civil war in the U. S. he had given an immense impulse to the cultivation of cotton. He now introduced many manufacturing enterprises, constructed immense works of public utility, largely improved Alexandria, and almost rebuilt Cairo; but these undertakings brought no speedy financial returns. The debt of Egypt exceeded £80,000,000, and the khedive, him-

self seriously embarrassed, sold his shares in the Suez Canal to the British Government for $3,976,582. He had obtained additional concessions from the Sublime Porte in 1873, and in 1874 had gained a brilliant victory over the Sultan of Darfur. The imminent bankruptcy of Egypt and the dissatisfaction of a part of the Egyptians with his government served as a pretext, and Sultan Abdul Hamid II., largely influenced, it is said, by the arguments of the British ambassador, deposed him in 1879, and appointed Mohammed Tewfik Pasha, the eldest son of the khedive, in his stead. The deposed ruler withdrew to Italy. In 1888 he removed to Constantinople, where he died Mar. 1, 1895.

Ismaïl was a master of Oriental diplomacy, able and willing to play off one European power against another, and he exercised extraordinary influence on his sovereign, Sultan Abdul Aziz. His projects were always on a magnificent scale; he admired Western civilization, the form perhaps more than the reality, and he and his entire reign present one of the most striking anomalies in modern history.

EDWIN A. GROSVENOR.

Ismail'ia: town of Lower Egypt; on the north shore of Lake Timsah, on the railway leading from Alexandria and Cairo to Suez, and on the Suez Canal. It was founded in 1863 to serve as the central point for the construction of the canal, and was named after the khedive, Ismaïl Pasha. Its situation gave promise of considerable commercial importance, which has not been fulfilled, and infiltration from the canal has made it unhealthful. Pop. 1,850.

Ismailia, or **Ismaihya**: See GONDOKORO.

Ismaïlis, ĕes-mă-ee'lĕez: an almost extinct sect of Mussulman heretics. They first came into prominence in the ninth century under Babek, in Aderbidjan, whence their doctrines spread throughout the Mussulman world. During four years they were able to resist all the power of the Caliph Motassem. There is hardly a crime or heresy of which they were not accused. Their outward practice was very devout, but it was charged that their private life was of the worst, and that they were materialists and atheists. There seems no doubt that their doctrines, pure at the origin, speedily became perverted and corrupt. They paid special honor to the imam Mohammed ben Ismaïl, whence their name.

EDWIN A. GROSVENOR.

Ismid, or **Isnikmid** (anc. *Nicomedia*): town in Asia Minor, occupying an advantageous situation on the northeast extremity of the Gulf of Nicomedia (see map of Turkey, ref. 4–E). Here the Emperor Diocletian began his frightful persecution of the Christians (303), and here he abdicated the throne. The city contains few Roman or Byzantine ruins. As episcopal see of the Orthodox (Greek) Church, it, with Nice, or Nicæa, also in Asia Minor, ranks second to Constantinople. Its present (1894) bishop, Philotheos Bryennios, discoverer of *The Teaching of the Twelve Apostles*, is a distinguished theologian. On the main highway between Constantinople and the East, it has always been an important and prosperous city. The Anatolian Railway passes through it. Its population consists of 20,000 Mussulmans, 6,000 Armenians, 5,000 Greeks, and 2,000 Jews.

EDWIN A. GROSVENOR.

Isnard, ĕes'naar', MAXIMIN: politician and orator: b. at Grasse, Provence, France, Feb. 16, 1751; entered the National Assembly in Sept., 1791, as a deputy for the department of Var. He joined the Girondists, though his ideas were more advanced than theirs, and became noted for his eloquence. He was president of the Convention for a few days in May, 1793. He was arrested in June, 1793, but escaped, and concealed himself until the fall of Robespierre. He was a member of the Council of Five Hundred, but exercised no influence, and during the Empire and the Restoration he lived in retirement, occupied with literary pursuits. D. at Grasse, 1830. Revised by C. H. THURBER.

Isné: See ESNEH.

Isobar: See CLIMATE.

Isocheimal Lines: See METEOROLOGY.

Isnik (anc. *Nicæa*): town in Asia Minor; beautifully situated at the east end of the Lake of Isnik (anc. *Ascanius*). The first Œcumenical Council (325) was held here. The mediæval double walls with towers and gates are still in good preservation; so, too, is Yeshil Djami (the green mosque), the finest existing monument of Seljuk art. Carved fragments of marble and stone from ancient buildings everywhere dot the ground, and are built profusely and indiscriminately into the modern houses. The present town, comprising about 150 Mussulman and Greek families, occupies only a part of the former site. EDWIN A. GROSVENOR.

Isoc'rates [=Gr. *Ἰσοκράτης*]: Greek orator; one of the chief masters of the Attic canon; b. in the Attic deme Erchia 436 B. C. He was educated in the schools of the fashionable sophists and rhetoricians, and was at one time so much in the circle of Socrates and Plato that when he devoted himself to rhetoric he was considered a manner of renegade to philosophy. His native timidity and his weak voice prevented his speaking in public, and after serving his apprenticeship as a writer of speeches for court, he became a teacher of rhetoric and what we should call a pamphleteer. His school, which he is said to have opened first at Chios and then at Athens, was brilliantly successful. He professed not only rhetoric but culture, and undertook to prepare young men for the conduct of public and private life. The list of his graduates was long and full of shining names, princes, statesmen, orators, historians, and Isocrates became rich in his professorial calling. The orations which he prepared for publication, his holiday speeches, his addresses, his political pamphlets, were intended to serve a double purpose —as models for his pupils and as manifestoes to the Greek people. The Panhellenism of Isocrates was the ideal of a *doctrinaire*, and the victory of Philip at Chæronea in 338 revealed to the vain veteran the futility of what he deemed the great work of his life, and in Milton's phrase, "killed with report that old man eloquent." The more sober statement is that he refused to take food, and died at the great age of ninety-eight. No more painstaking artist in words than Isocrates is known to literature. He spent three years in elaborating one speech and ten, it is said, on another; and though there is a lack of freshness and vigor, the perfection of form can not be denied. He was a master of periodology and rhythm, and the example which he set of a strict avoidance of hiatus became a law for later stylists. The thoughts that he arrayed in this faultless dress seem to us the baldest commonplaces, and the perpetual reiteration of them is wearisome in the extreme; but we must remember that he helped to make those thoughts commonplace, and though he is slack and nerveless and superficial, he is an indispensable element in the study of his times. In his art he is inevitable, for his influence is still felt. Cicero learned of Isocrates and we of Cicero. Editions of the text are those in the *Oratores Attici* of Bekker (1823), and of Baiter and Sauppe (1839), and separately by Benseler-Blass in the Teubner series (1882); select orations, with German notes, by Rauchenstein-Reinhart in the Weidmann collection, and by Schneider (Teubner). The *Panegyricus*, his greatest oration, has been edited by Felton in America (3d ed. 1866) and by Sandys in England (1868). See Blass, *Attische Beredsamkeit*, vol. ii.; Jebb, *Attic Orators*, vol. ii., pp. 1–34. B. L. GILDERSLEEVE.

Isogeotherms [from Gr. *ἴσος*, equal + *γῆ*, earth + *θέρμη*, heat]: imaginary surfaces of equal temperature within the earth. Consider a temperature somewhat higher than those observed at the surface of the earth, for example, 200° F. If we descend in the earth, we find the temperature of the rock gradually increasing until at a certain point it is 200°, and beyond that point it is more than 200°. The point is part of an indefinitely thin sheet or zone which in a general way extends horizontally through the rock and everywhere has the same temperature, the rock above it being cooler and that beneath warmer. Such a zone or imaginary surface of equal temperature is an isogeotherm. An isogeotherm may correspond to any assignable temperature represented in the earth. A system of isogeotherms corresponds to temperatures separated by equal intervals, as, for example, 1° or 100°. Roughly speaking, the isogeotherms are parallel to the earth's surface, but to this description of their form there are important qualifications. At the surface of the earth the isogeotherm corresponds to the mean temperature of the air, and as that varies from place to place there is a corresponding variation of the isogeotherm. The upper isogeotherms of polar regions do not envelop the globe, but terminate at the surface in the corresponding isotherms; and any given isogeotherm is nearer the surface under equatorial lands than it is under polar lands, the extreme difference amounting to nearly a mile. In tropical regions each isogeotherm lies deeper under the land than under the ocean, and in polar regions this relation is reversed. A second qualification is related to minor irregularities of the earth's surface. The isogeotherms close to

the surface follow the surface configuration, but those at greater depth are less influenced by it and approach more nearly a spherical form. A third qualification is related to the heterogeneity of the earth's crust. The gradation of temperature from the surface downward is due to the fact that heat is passing from the earth's interior to the earth's surface, whence it is radiated. Where the rock has a high coefficient of diffusivity the isogeotherms are relatively far apart; where the diffusivity is low they lie close together. The isogeothermal surfaces are therefore locally inflected by every mass of rock which differs in diffusivity from the surrounding rock. A fourth qualifying condition is dynamic. The geologic processes by which the earth's crust is continually transformed involve the local production of heat through rock crushing, the local production and local consumption of heat through chemical reaction, and the local transfer of heat through the circulation of lavas and of waters; and every such change produces a local deformation of the isogeotherms. See REFRIGERATION OF THE EARTH.

G. K. GILBERT.

Isola Bella: See BORROMEAN ISLANDS.

Isola del Liri, ee'sō-lăă-del-lee'rĕe [Ital., Liri island]: town; in the province of Caserta, Southern Italy. The immense water-power furnished by the Liri and the Fibreno is here utilized for manufacturing paper, linen, woolens, chemical products, etc., on a large scale, and also for working metals. The town is charmingly situated, and the trout of the Liri are as famous as in the days of Martial and Appian. Pop. (1881) 4,569.

Isolation: a technical term of modern historical grammar, used to characterize the condition of words or expressions which stand outside the usual association-groups. Thus the old plural *brethren* has been isolated from the influence of the group *tree* : *trees*, *sister* : *sisters*, *brother* : *brothers* by its peculiar use; so *forlorn* has become isolated from the group *lose*, *lost*, etc. See Strong, Logeman, Wheeler, *History of Language*, chap. x. B. I. W.

Isom'erism [*iso-*, from Gr. *ἴσος*, equal, like + Gr. *μέρος*, part]: in chemistry, the relation between two or more substances having the same composition, but different properties. It was at first assumed that substances having the same chemical composition necessarily are identical, but in 1823 Mitscherlich showed that the element sulphur crystallizes in two forms, one of which can be easily transformed into the other, and that calcspar and arragonite, two distinct substances, have the same composition. Later Wöhler and Liebig showed that cyanic acid and fulminic acid, though differing markedly in their properties, contain the same elements in the same proportion by weight, and to-day isomerism is one of the most common, as well as one of the most interesting and important, facts of chemistry, and for many years much of the work of investigators has had for its object the explanation of cases of isomerism. Under the general head of isomerism three kinds of relations are included. These are called (1) *Allotropism*; (2) *Polymerism*; (3) *Metamerism*. (1) By allotropism or allotropy is meant the relation existing between two or more forms of one and the same element. Cases of this kind are referred to under the proper heads, and they need only be mentioned here for the sake of illustration. Carbon presents itself to us in three very distinct forms, the diamond, graphite, and charcoal. Notwithstanding the marked differences between these substances, it has been shown that each is made up of only one form of matter, that which we call carbon. At present we have no explanation for this remarkable fact, though, judging by analogy, it seems probable that the cause of the difference is to be found in the different arrangement of the smallest particles (atoms or molecules) of which the mass of each substance consists. Oxygen exists in two allotropic forms, ordinary oxygen and ozone. One can be transformed into the other without loss or gain in weight. In this case it has been made very probable that the difference is due to the fact that the molecule of ordinary oxygen is made up of two atoms of the element, while the molecule of ozone is made up of three atoms. This explanation is reached through a study of the specific gravity of the two gases and an application of Avogadro's law. (See CHEMISTRY.) Phosphorus appears in at least three forms, yellow, red, and black; and many other examples of allotropism might be given. (2) *Polymerism* is that kind of isomerism in which the substances have the same percentage composition, but different molecular weights. This is well illustrated by the three hydrocarbons, acetylene, C_2H_2, benzene, C_6H_6, and styrene, C_8H_8. Each of these compounds contains the same elements in the same proportion by weight—i. e. carbon 92·31 per cent. and hydrogen 7·69 per cent.—but their molecular weights, as shown by their specific gravity in the form of vapor, differ. That of acetylene is 26, that of benzene 78, and that of styrene 104. By this is meant that in the smallest particle of acetylene, i. e. its molecule, there are two atoms of carbon and two of hydrogen, while in the molecule of benzene there are six atoms of each constituent, and in that of styrene eight. This kind of relation is very common, especially among the compounds of carbon. (3) *Metamerism* is the most common kind of isomerism, and indeed substances that are metameric are generally spoken of as being isomeric. Substances that have not only the same percentage composition but the same molecular weight are said to be metameric. An interesting example of metamerism is that afforded by urea and ammonium cyanate. Both of these substances have the composition and molecular weight represented by the formula CON_2H_4, but their properties are markedly different. So also both dimethyl ether and ordinary alcohol have the composition C_2H_6O, and butyric acid, propyl formate, ethyl acetate, and methyl propionate have the composition $C_4H_8O_2$. A thorough study of such cases as those cited has led to the prevalent views regarding chemical structure and constitution. (See CHEMISTRY.) Metameric compounds contain groups or atoms arranged in different ways with reference to one another. Thus ammonium cyanate has been shown to be made up as indicated in the formula $N \equiv C–O–NH_4$. It contains the ammonium group NH_4 in combination with oxygen, which is in turn in combination with carbon, and this with nitrogen. On the other hand, urea has the constitution expressed by the formula $O = C \langle \begin{smallmatrix} NH_2 \\ NH_2 \end{smallmatrix}$. It does not contain the ammonium group NH_4, but two quite different groups of the composition NH_2, each of which is in combination with carbon, which is also in combination with oxygen. The difference between dimethyl, ether, and alcohol is shown by the formulas $CH_3 — O–CH_3$ and $CH_3–CH_2–O–H$, etc. A new kind of metamerism has come into great prominence. It is believed to be due to a different arrangement in space of the same atoms or groups. This is well illustrated by the lactic and tartaric acids, sugars, etc. It is treated under STEREOCHEMISTRY (*q. v.*).

IRA REMSEN.

Isomorphism: See MINERALOGY.

Isoperim'etry [from Gr. *ἴσος*, equal + *περίμετρον*, circumference (*περί*, around + *μέτρον*, measure)]: a branch of mathematics that treats of the properties and relations of isoperimetrical figures—that is, of surfaces having equal perimeters and volumes bounded by equal surfaces. It may be shown by elementary geometry that the greatest plane area having a given perimeter is a circle, and that the greatest volume bounded by a given surface is a sphere. Of all triangles having a given perimeter, the equilateral triangle has the greatest area; and, in general, of all polygons with a given number of sides and a given perimeter, that has the greatest area whose sides are equal. The principles of isoperimetry are best developed by means of the calculus of variations.

Isopleura [from Gr. *ἴσος*, equal + *πλευρά*, side]: the class of mollusks called Amphineura in MOLLUSCA (*q. v.*), in allusion to their retention of the primitive bilateral symmetry.

Isop'oda [from Gr. *ἴσος*, equal + *πούς*, *ποδός*, foot]: an order of Crustacea, including the sow-bugs, pill-bugs, salvebugs, etc. All have a flattened body, in which the three regions—head, thorax, and abdomen—are clearly distinguishable. The six segments composing the head are firmly united, while the seven of the thorax are usually free. In the abdomen there is a tendency toward the disappearance of segments. The appendages of the head are for sensation and for eating, those of the thorax are for locomotion, while those of the abdomen are modified into gills. It is interesting to note that in the terrestrial forms these gills become permeated by air-tubes or tracheæ analogous to those of insects. The eggs are carried about in a brood pouch beneath the thorax until they hatch. Most of the Isopoda are small, few exceeding an inch and a half in length, but deep-sea dredgings have revealed veritable giants, nearly a foot in length. Some are marine, some live in fresh water, and some on land. The latter, known as sow-bugs (*Porcellio* and *Oniscus*) and pill-bugs (*Armadillidium*), live in moist places, in cellars, under logs and boards, where they eat up decaying vegetation. Many of the marine forms live as parasites on the bodies and in the mouth and gills of vari-

ous fishes. An especial pest is the "gribble" (*Limnoria*), which in many places rapidly destroys the piles of wharves and bridges.

LITERATURE.—Harger, *Marine Isopoda of New England*, in *Report* of the U. S. Fish Commission for 1878; Stuxberg, *North American Oniscidæ*, in *K. Vetensk. Akad. Forhandl.*, 1875. J. S. KINGSLEY.

Isop'tera [Gr. *ἴσος*, equal; *πτερόν*, wing]: a term sometimes applied to that group of insects which includes the white ants (TERMITES, *q. v.*). See ENTOMOLOGY.

Isothermal Lines: See METEOROLOGY and CLIMATE.

Ispahān', or **Isfahān'**: city of Persia and capital of the province of Irak-Ajami, on the Zāyanda-Rūd (Zendarūd), in lat. 32° 39′ N. and lon. 51° 44′ E. (see map of Persia and Arabia, ref. 3–G). It is one of the oldest cities in Persia, and is with reason identified with Ptolemy's *Ἀσπαδάνη*. Ispahān was an important city and well known in Sassanian and in mediæval times, but it suffered much under the Tartar invasion in the fourteenth century. Recovering from this, however, it again flourished, and in the seventeenth century, when Shāh Abbas made it his residence and the capital of Persia, it became one of the most magnificent cities of Asia. In 1722, however, it was taken and sacked by the Afghans, and although it was retaken in 1729 by Nadir Shāh, yet Teherān became the capital of Persia, and Ispahān fell into decay.

The buildings and public works of Ispahān are among the finest not only in Persia, but in the East. Among its splendid monuments is the bridge over the Zendarūd, 1,000 feet long, resting on thirty-four arches, and bearing arched galleries. Notable also is one of the palaces of Shāh Abbas the Great; it is called Chihil-Sutūn, "the forty columns"; its front is formed of a double row of columns, each 40 feet high and resting on a base formed by the united backs of four lions in white marble. There is also a famous mosque, the handsomest in Persia, called Mesjid-i Shah, or "royal mosque," the vast dome of which rises among a forest of spires, towers, minarets, and open galleries. But these and many other wonderful monuments are rapidly decaying, and they are surrounded by ruins.

At the time of the celebrated traveler CHARDIN (*q. v.*), in the seventeenth century, the population of Ispahān was supposed to number 500,000 or 1,000,000 inhabitants; to-day the census would perhaps show hardly more than 50,000. Much of the city has fallen into ruins and is deserted; miles of streets have no inhabitants. There are signs, however, which indicate that Ispahān may rise once more. Its manufactures of gold, silver, silk, velvet, glass, weapons, and earthenware have maintained their high reputation, and its artisans are esteemed the best in Persia. Its situation on the main commercial route between India and Europe is as in olden times, and its surroundings are still exceedingly fertile and well cultivated; the climate in general is very healthful, though cholera at times has raged.

Revised by A. V. WILLIAMS JACKSON.

Israel, iz'rā-el [= Heb. *Yisrāēl*, contender, soldier of God, from שָׂרָה, *sārāh*, fight]: the name bestowed upon JACOB (*q. v.*) when an angel wrestled with him at Peniel (Gen. xxxii. 28); afterward the distinctive name of his descendants, the Jewish people, and particularly that portion of it which formed the northern kingdom of the ten tribes.

Israelites: See JEWS and HEBREW LANGUAGE.

Israels, JOZEF: genre-painter; b. at Groningen, Netherlands, in 1824. He was a pupil of Cornelis Kruseman, in Amsterdam, and of Picot, in Paris; was awarded a first-class medal at the Paris Exposition of 1878; medal of honor, Paris Exposition of 1889; was made an officer of the Legion of Honor 1878. His technique is peculiar, and his figures are enveloped in a sort of hazy atmospheric effect, in which there is little exactness of form or outline. *Alone in the World* (1878) is in the Amsterdam Museum, and *The Frugal Meal* is in the collection of Mrs. W. H. Vanderbilt, New York. Studio at The Hague. WILLIAM A. COFFIN.

Issikul', or **Issik-Kul** (i. e. Warm Lake in Kirghiz): a lake of Central Asia; in the government of Semiriets Kensk, Russian Turkestan; on the north side of the Thian Shan Mountains; 120 miles long by 35 broad. Area, 2,200 sq. miles. It is about 5,000 feet above sea-level. The waters are brackish and full of fish. The lake is said to never freeze over, hence its name. It is now contracting, and was formerly very much larger, to judge by the beaches on the hills about; yet ruins are known to exist beneath the present surface. M. W. HARRINGTON.

Issue: in the law of pleading, the point which arises when a material proposition of fact or a conclusion of law is directly affirmed by one party to the suit and controverted by the other; the point in dispute which is presented for decision to the court or jury. Issues as to their subject-matter are of two kinds—issues of *law* and issues of *fact*; issues of fact, in the common-law system of pleading, are subdivided into *feigned* issues, special issues, and general issues. An issue of law arises upon demurrer, and presents a question of law, which is adjudicated by the court sitting without a jury; an issue of fact arises upon a traverse or answer to the allegations of the opposite party, and presents a question of fact, which in a common-law action is determined by a jury and in an equity case by a judge. In some of the U. S. both classes of issues may by consent of parties, or by order of court according to statutory provisions, be tried by a referee. It is the object of various rules of pleading that the issue shall be upon a point material to the controversy, shall be free from uncertainty or ambiguity, and shall present but a single question for decision upon each separate subject of litigation.

A *feigned issue* is so called from the peculiar manner in which it originates, although the application of the term "feigned" to the issue is not appropriate, since the fiction is not in the issue, but in the action which is framed and in the state of facts upon which it is founded. Such issues occur in the progress of a cause before a tribunal sitting without a jury, when some question of fact arises upon which the decision of a jury is desired. A fictitious suit is framed involving the point to be determined, and is brought to trial before a jury, and carried on to verdict in the usual way. The verdict rendered is then returned to the court in which the cause first arose for its further action. Feigned issues almost invariably arise in the progress of suits in courts of equity, and are ordered by the court to be heard before some tribunal proceeding according to the forms of common law with a jury. Sometimes, however, they arise in courts of law. In some of the U. S. feigned issues have been abolished, and statutory provisions made for the trial before a jury of the point to be decided.

The *general issue* is a summary, unqualified denial of the material allegations contained in the plaintiff's declaration. It brings at once into controversy the entire substance of the charges alleged, and is distinguished from a *special issue* which brings into controversy a specific portion, consisting of a material allegation necessary to the cause of action. The denial does not consist of a negation of the complaint made in its express language, but certain particular formulas have been established as appropriate in the various instances in which a plea of general issue may be introduced, and their use is obligatory. For example, in actions for torts, where a recovery of damages is sought, as in trespass or trover, the general issue is *not guilty*; in debt on simple contract it is *nil debet* (he owes nothing); in actions for a breach of covenant or upon an instrument under seal it is *non est factum* (it is not his deed or covenant). A plea by general issue affords an opportunity for the introduction of a great variety of testimony which would serve to prove that the defendant was subject to no liability; if specific assertions only were made in defense, it would be necessary for the proof to correspond with them, and the range of evidence could not, in general, be as extensive as under a comprehensive form of denial. See PLEADING. Revised by F. STURGES ALLEN.

Is'sus [= Lat. = Gr. *Ἰσσος*]: an ancient city of Cilicia; near the mouth of the river of the same name; at the head of what is now the Gulf of Iscanderoon or Alexandretta. In Xenophon's time it was great and prosperous. Here Alexander (333 B. C.) gained a great victory over Darius, whose family was captured. Here, too, the Byzantine emperor Heraclius (610–641) defeated a large Persian force. It is probable that its site is covered by the sea.

Revised by J. R. S. STERRETT.

Ister: the ancient name of the DANUBE (*q. v.*).

Isthmian (is'mi-an) **Games**: a national Greek biennial festival of athletic exercises and horse-races, under the direction of the Corinthians, on the Isthmus of Corinth. This accessible location, and the wealth and attractiveness of Corinth itself, undoubtedly had much to do with the great popularity and importance of the Isthmian games from early to late antiquity. The site, at some distance from Corinth, has become very easy of access by the com-

pletion of the Peloponnesian Railway (Station Isthmia, 50 miles from Athens), and more recently (Aug., 1893) of the Corinth Canal. For an accurate account of extant remains of the temple of Poseidon (Neptune), the marble stadium, a Roman theater, the wall and gates of the pentagonal precinct, and of the celebrated Isthmian wall which skirts it, see Baedeker's *Greece*, and Curtius, *Peloponnesos*. The fullest account of its antique splendor is that in Pausanias's *Description of Greece*. According to the Corinthian legend, the Isthmia had been founded by Poseidon and Sisyphus as a funeral tribute to the boy Melicertes, when his body was washed ashore at the isthmus. Melicertes is obviously identical with the Phœnician solar deity, Melkarth, and there was a Corinthian version in which Poseidon, as the principal founder, was associated with the sun-god worshiped on the height of Acrocorinth. It is clear that the games obtained their prominence, as they afterward maintained it, under Neptunian auspices. The Athenian tradition credited Theseus, a son of Poseidon, and subsequently King of Athens, with their establishment or effectual revival. Historically, we may date the Isthmia from 582 B. C. (*Olympiad*, xlix., 3), the beginning in all probability of the regular biennial celebration, alternately in spring and summer. The ancient usage of reserving for Athenians the seats covered by the mainsail of their official galley, and Solon's assignment of a premium of 100 drachmas to Athenian victors, show the more than local popularity of the Isthmia at this early period. Sparta was less friendly. The Eleans, jealous of the repute of their own Olympian festival (see OLYMPIAN GAMES), abstained from attending the Isthmia. In the fifth and fourth centuries B. C. the athletic contests and the races drew competitors and attendance not only from such neighboring states as Athens, Ægina, Thebes, but also from remote Greek colonies of Asia, Italy, and Africa. The Kings of Syracuse and Cyrene, notably, often sent winning teams. Pindar's *Isthmian Odes* celebrate a number of contemporary victors. The contests themselves and the rules governing them can not have differed much from the Olympian. Entries were permitted for two or more events on the same day. Three classes of competitors were recognized in the athletic exercises—men, beardless youths, and boys. The wreath was of celery; the palm-branch went with it. With one brief interruption by the Argives (392–386 B. C.), the Corinthians retained control of the games until the destruction of Corinth by Mummius in 146 B. C., when the Sicyonians took charge until the re-establishment of Corinth, as a Roman colony, by Julius Cæsar. In the imperial period a wreath of fir was substituted for that of celery, and so-called Isthmia were held elsewhere also, as at Syracuse and Ancyra. The Corinthian festival continued to flourish, however, until Theodosius suspended all the national festivals on account of their pagan associations, A. D. 393. Alexander was proclaimed champion of Greece against Asia (336 B. C.), and the Greek states were twice declared independent of Rome—by Flamininus (196 B. C.) and by Nero (A. D. 54)—at the Isthmia. The oration pronounced by Nero on the last occasion has been recovered. At his death (A. D. 68) Greece again became a Roman province. See Krause, *Die Pythien, Nemeen, und Isthmien* (Leipzig, 1841), and his article *Isthmia* in Pauly's *Realencyclopädie des klassischen Alterthums* (Stuttgart, 1846).

ALFRED EMERSON.

Isthmus of Panama: See PANAMA, ISTHMUS OF.

Is'tria: county of the Austrian province of the coast districts (Küstenland). It consists of a mountainous peninsula projecting into the northeastern part of the Adriatic, and is bounded by the territory of the city of Trieste and the county of Görg. Pop. (1890) 317,610. Capital, Pissino.

Isyllus of Epidau'rus: a Doric local poet, who flourished about 280 B. C. His awkward and lumbering poems in honor of Apollo and Æsculapius (Ἀσκληπιός) were brought to light during the excavations at Epidaurus, where they were found inscribed on stone. See *Isyllos von Epidauros*, by von Wilamowitz-Möllendorff in his *Philologische Untersuchungen*, Heft 9. B. L. G.

Itacolumite: See FLEXIBLE SANDSTONE.

Itagaki, ĕē-tăă-gää'kēē, TAISUKE, Count: general and statesman; b. in the province of Tosa, island of Shikoku, Japan, in 1838. He was educated for the military profession, and served as a general in the imperial army during the war of the restoration in 1868, taking an active part in the subjugation of the province of Aidzu, in Northern Japan. In 1871 he became a privy councilor, and served, but not continuously, for several years thereafter. He was actively associated with the suppression of the Satsuma rebellion in 1877. He subsequently held the offices of Minister of Public Works (1878) and Minister of the Interior (1880), but his radical proclivities threw him out of sympathy with the politicians of the Satsuma and Choshu clans, which, with Tosa, had guided Japan since the downfall of the Shogunate. Soon after Itagaki resigned, withdrawing the influence of Tosa, and henceforth the Tosa radicals became a considerable source of apprehension to the Government. A peerage conferred on Itagaki in 1887 was with great unwillingness accepted. J. M. DIXON.

Itajahy, ĕē-tăă-zhăă-ee': a seaport-town of the state of Santa Catharina, Brazil; on the right bank of the river Itajahy, a little way above its mouth. Pop. about 7,000. The Itajahy river is navigable for 45 miles to the Blumenau colony; this and other agricultural colonies have their natural outlet at the port of Itajahy, which promises to be of great importance. The river-mouth is somewhat obstructed, and vessels drawing over 12 feet anchor outside.

H. H. S.

Italian Architecture: See RENAISSANCE.

Italian Language: the national language of Italy; in its usual written form; originally the Tuscan dialect as used by the great writers of the fourteenth century, Dante, Petrarch, Boccaccio. In other parts of Italy the local dialects, often markedly different from the Tuscan, are much more in use, even among educated people, than is the case in other countries where a common literary language has become established, but the standard Italian is also used whenever occasion calls for it in speaking, and is generally employed everywhere for literary productions. The standard language of Italy is closer to the Latin of classic times than is any other of the Romance languages, though in some respects it has changed more than some of the other members of the family. The political boundary is not exactly the same as the linguistic boundary. Italian dialects stretch, for example, somewhat into a part of Switzerland and into Tyrol, though Friuli belongs for the most part to the Rhæto-Romance group of dialects, and Italian also appears in Trieste and somewhat farther S. along the coast. In the northwest the so-called Franco-Provençal (see FRENCH LANGUAGE) reaches a little into Italy. Corsica belongs to Italy by its language, as do Sicily and Sardinia. But the Sardinian dialects offer some very striking peculiarities, and in Northern Italy are dialects which in many respects resemble those of Southern France and the Rhæto-Romance group. There are also in Italy colonies of various dates which have preserved locally more or less of German speech (very little) in the north, Greek, Albanian, and Slavic in the southeast and south, and in Northern Sardinia, Catalan, other foreign colonies being comparatively unimportant. The number of speakers of Italian can not be exactly given, it not being the same as the number of inhabitants of the kingdom of Italy and of Corsica combined, and there being no statistics available for Italian speakers in other countries, but the total is probably at least 28,000,000.

The sounds generally recognized for Italian are as follows: The vowels are seven in number: *i* (as in French), a close *e* and an open *e* (as in French, but the two are not distinguished in the usual spelling), *a* (as in English *father*), a close *o* (about as in English *note*, written *o*), an open *o* (resembling English *aw* in *saw*, written *o*), *u* (like French *ou*, or about as English *u* in *rule*). All these vowel sounds are pronounced distinctly, even when occurring in unaccented syllables. There are twenty consonants; *p*, *b*, *f*, *v*, *w* (a consonantal *u*, about like English *w*, written *u*), *m*, *t*, *d*, *l*, *r* (trilled with the tip of the tongue), *n* (this and *t*, *d*, *l* are more dental than in English), *s*, *z* (written *s*), a sibilant nearly like English *sh* in *ship* (written *sc* before *e* and *i*, *sci* before *a*, *o*, *u*), a palatal *l* resembling English *lli* in *million* (written *gli*, except before *i*, when *gl* alone is used), a palatal *n* resembling English *ni* in *union* (written *gn* as in French), *y* (written *i* or sometimes *j*), *k*, *g* (these two written *c*, *g* before *a*, *o*, *u*, and *ch*, *gh* before *e* or *i*; but *qu* is used with the same value as in English), and the sound of English *ng* in *sing*, *song* (written *n* and occurring only before a *k* or *g* sound.) A few consonant combinations occur very frequently, and are so regularly represented by single letters as to be worthy of mention; these are the sound of English *ch* in *chin*, represented by *c* before *e* or *i*, by *ci* before *a*, *o*, *u*; of English *g* in *gem*, represented by *g* or *gi* under the

same circumstances: of *ts* and *dz*, both written *z*. The frequency of doubled consonants, generally written as they are pronounced, is a marked characteristic of Italian (*coppa, babbo, atto, quello, leggo*, etc.). With the exception of a few words, mostly short unaccented forms, such as the preposition *in* and the article *il*, which are pronounced in close connection with the word next following in the sentence, every Italian word in its full form ends in a vowel. If the dialects are taken into consideration, a number of other vowel and consonant sounds must be added, but it is enough to mention here a few Tuscan peculiarities, especially common in Florence, such as simple open *e* and open *o* for written *ie* and *uo*, the use of sibilants like English *sh* in *ship* and *z* in *azure* for written *c* and *g* standing alone before *e* or *i* and preceded by a vowel, and the substitution for a *k* sound standing alone between vowels of an aspirate like English *h* or even German *ch* in *ach*. These peculiarities have not been generally adopted, and the last is considered vulgar even in Tuscany, though it is in general use there in the careless speech of all classes of people. Less frequent is the sound of English *th* in *thin* for a single *t* between vowels. The spelling of Italian is much closer to the pronunciation as generally accepted than is the case with most other literary languages; with the exceptions which appear above, and with that of *h*, which is sometimes written outside of the combinations *ch* and *gh* (as in *ha*, "has"; compare *a* "to"), there are no silent letters written, and any sound is expressed always in the same way. From the phonetic standpoint the spelling is not perfect; the open and close sounds of *e* and *o* are not distinguished regularly, nor are *s* and *z*, *ts* and *dz*, and the position of the accent, which is generally on the same syllable as in the corresponding Latin word, is not always indicated. Such matters as these are therefore specially noted in some dictionaries, but the need of a reform in orthography is not felt in Italy to any such extent as in France or England and the U. S.

The grammatical structure of Italian is very similar to that of French; it distinguishes two grammatical genders, masculine and feminine, the neuter being practically lost. Case forms are limited to some pronouns, and there are disjunctive (accented) and conjunctive (unaccented) forms of personal pronouns. In verbs the four infinitive endings of the Latin conjugations are preserved, but the second and third conjugations are not otherwise distinguished in regular verbs. The simple tenses are the same as in French, but the preterite indicative is still in conversational use. There are two distinct forms of the present participle, one ending in *-ndo*, invariable and never agreeing with a noun, sometimes called a gerund, the other in *-nte*, generally used adjectively, a distinction which is much obscured in French. Compound tenses and the passive voice are formed in a way similar to that used in French. The various inflectional forms are, however, better distinguished than in that language, and in consequence pronouns are less frequently expressed as subjects of verbs. The order of words is freer than in French, and the influence of grammarians' somewhat artificial rules has been less. The system of negation is similar to that of French, but the doubling of the negation is less extensive, and the development of words now felt as negative out of originally positive forms has not gone so far.

The main source of Italian is the popular Latin, but a few features of its phonology have been more or less doubtfully ascribed to other languages or dialects spoken in ancient Italy by the side of Latin, and, as is true of other Romance languages, its vocabulary includes a number of words adopted later from classic Latin, from Teutonic, and other sources, as Greek and Arabic, while Provençal and, especially in later times, French have made their influence felt. The foreign additions find their explanation partly in the political and partly in the literary history of Italy. Though there are traces of the vulgar speech in the early mediæval Latin written in Italy, yet Italian did not become generally used for writing so early as French and Provençal, for the Latin and Roman tradition had a stronger hold, and, the popular speech being less different from classic Latin, the latter was more readily intelligible. The earliest complete sentence in Italian thus far found is in a document of the year 960, now most conveniently to be studied together with several other very early specimens of the language in E. Monaci's *Crestomazia italiana dei primi secoli*, the first part of which was published in 1889. Since the fourteenth century the literary Italian has undergone no very great changes, the respect for the great writers of that time being a powerful conservative influence. In the sixteenth century the grammatical treatment of the language begins with Fortunio's *Regole grammaticali della volgar lingua* (1516), and soon after the question of regulating the orthography was intelligently discussed, Trissino urging the distinction of *i* and *j*, *u* and *v*, and proposing the use of Greek ε and ω in addition to *e* and *o*, in order to distinguish the close and open sounds of *e* and *o*. In the same century begins the lexicographical work, and in 1612 appeared the first edition of the *Vocabolario* of the Accademia della Crusca. See ACADEMY.

Besides the books named above, the following may be mentioned (see also ITALIAN LITERATURE and ROMANCE LANGUAGES): Dictionaries (in Italian)—Fanfani, *Vocabolario della lingua italiana* (new impression 1881); *id.*, *Vocabolario della pronunzia toscana* (1863); *id.*, *Vocabolario dell' uso toscano* (1863); Petrocchi, *Novo dizionario universale della lingua italiana* (2 vols., 1884–91); Rigutini e Fanfani, *Vocabolario italiano della lingua parlata* (1875, and a supplement 1876); Tommaseo e Bellini, *Dizionario della lingua italiana* (4 vols., 1865–79); Blanc, *Vocabolario dantesco*, trans. into Italian by G. Carbone (2d ed. 1877); Tommaseo, *Dizionario dei sinonimi* (6th ed. 1872); Fanfani, *Vocabolario dei sinonomi* (new ed. by Frizzi 1884); Zambaldi, *Vocabolario etimologico italiano* (1889), etc.; (Italian-English) Baretti, Millhouse, etc.; (Italian-French) Alberti Ferrari et Caccia, Buttura et Renzi; (Italian-German) Valentini, H. Michaelis; (for dialects) Biundi (1857), for Sicilian; Boerio (3d ed. 1867), for Venetian; Casaccia (2d ed. 1876), for Genoese; Cherubini (4 vols., 1839–43, and a supplement 1856), for Milanese; C. Coronedi Berti (2 vols., 1869–74), for Bolognese; V. di Sant-Albino (1859), for Piedmontese; Spano (1851), for Sardinian, etc.

Grammars and other works: Blanc, *Grammatik der italienischen Sprache* (1844); Caix, *Studi di etimologia italiana e romanza* (1878); *id.*, *Origini della lingua poetica italiana* (1880); Fornaciari, *Grammatica italiana dell' uso moderno* (2d ed. 1880); *id.*, *Sintassi italiana dell' uso moderno* (1881); Grandgent, *Italian Grammar* (3d ed. 1891, an excellent elementary work); Gröber, *Grundriss der romanischen Philologie* (vol. i. 1888, vol. ii. now (1894) in course of publication); Meyer-Lübke, *Italienische Grammatik* (1890, a historical treatment, including dialects, but not covering syntax); Nannucci, *Analisi critica dei verbi italiani* (1844); *id.*, *Teorica dei nomi della lingua italiana* (1858); d'Ovidio, *Sull' origine dell' unica forma flessionale del nome italiano* (1872); Robello, *Grammaire italienne* (1829 and since); Vockeradt, *Lehrbuch der italienischen Sprache* (1878), etc. See also many articles in periodicals and in the publications of learned societies. For dialects, see dictionaries above, Gröber's *Grundriss*, the list of works in Meyer-Lübke's *Italienische Grammatik*, and articles by Ascoli and others in the *Archivio glottologico italiano*, begun in 1872.

E. S. SHELDON.

Italian Literature: While there are documents, especially in prose, written in Italian of earlier date than the thirteenth century, yet their number is small and their literary value inconsiderable. It is by no means certain that more than one or two rude specimens of verse preserved, as a song of a Tuscan minstrel, and perhaps the *Ritmo Cassinese*, were really written by Italians as early as the second half of the twelfth century. For these and for the early specimens of prose, which, like the verse, have a decided linguistic interest, see Monaci's *Crestomazia dei primi secoli* (fasc. i., 1889). Verse in Italian was, beyond doubt, produced earlier still, but the first manifestations of vernacular literature preserved which have a clear organic connection with the later productions belong to the thirteenth century, and are mostly lyrics in imitation of the verse of the Provençal troubadours. The more popular poetry, for example that produced by religious or patriotic feeling, though the latter is only of a local kind, has left a few traces in the early period, and the influence of Latin is not to be left entirely out of consideration. Girard Pateg (Girardo Patecchio) da Cremona, who wrote a paraphrase (*splanamento*) of the Proverbs of Solomon, was perhaps one of the earliest writers of the century, and the *Laudes creaturarum*, or *Song of the Sun*, of Francis of Assisi, belongs about the year 1224. The so-called *Book* of Uguçon da Laodho (Lodi?) belongs to the first half of the century, as does also probably the *Sermone* of Pietro da Barsegapè, or Bascapè; but the many religious poems of Jacopone da Todi, the reputed author of the *Stabat Mater*, come later in

the century. The *laudi* which he wrote are early instances of a kind of religious verse frequent afterward, out of which later developed the dramatic form in Umbria. Other religious verse is not lacking in this century, as that of Fra Giacomino di Verona and Fra Bonvesin da Riva. The poets who imitated Provençal verse are very different from these writers in tone and in the language itself which they use, the latter varying but little from the literary Tuscan of the later years of the century; they are generally grouped together under the name of the Sicilian school, for it was in Sicily that they most flourished, at the court of Frederick II. This application of the name Sicilian dates back to Dante. Yet the writers thus classed were not all Sicilians, some were Apulians, and some seem to have been Tuscans. The real bond of union among them is that they were essentially imitators of the Provençal manner, who found favoring circumstances for the production of their verses in Italian at Frederick's court, while in the north of Italy, where the Provençal influence was even more strongly felt, a number of Italians actually themselves wrote in Provençal. The verse of the Sicilian school, to which Frederick himself belonged, is a court poetry which could scarcely take root elsewhere in Italy, the political conditions being different, and in the hands of these poets it became even more conventional than it had already become in Provence. It did, however, furnish a basis of form for the expression of a better and more really felt lyric verse, and seems to have even had some influence on the more popular poetry in Sicily, as appears from the poem ascribed to Cielo dal Camo or d'Alcamo (wrongly called Ciullo d'Alcamo), beginning *Rosa fresca aulentissima*. This poem, in the form of a dialogue between a maiden and her lover, was for a time looked on as the oldest monument of Italian literature, but it can not be earlier than 1231. As the Provençal manner of the Sicilian school spread to other parts of Italy, notably to Bologna and Tuscany, a new element was needed to give its poetry a stronger life and take the place of its artificial commonplaces. The new element introduced is an intellectual one, a more philosophical conception of the nature of love and its origin, and Guido Guinicelli (or Guinizelli), of Bologna, is recognized by Dante as the founder of the new school of the *dolce stil nuovo*, which culminates in Dante himself. This intellectual element may have been assisted by the influence of the University of Bologna. In the best poets of the school, mostly Tuscans, there is also a directness and a simple elegance which suggest the influence of real life and perhaps of unpreserved popular verse. A certain influence of Latin, and hence a learned influence, shows itself in Guittone of Arezzo, who was born a few years before Guinicelli. As Provençal lyric verse had furnished the motive force for the growth of poetry in Italy, so the extensive and widely admired Old French literature became known and imitated not long after, and gave the material for more distinctly popular narrative verse. The French epics of the Charlemagne cycle, describing the exploits of Roland, Oliver, and the other peers, were recited in Northern Italy by minstrels, and many such poems are preserved in manuscripts written in an Italianized French. Just as some Italians wrote songs in Provençal, so others wrote French, that language then seeming the most appropriate for narrative and allegorical or didactic verse and prose. So Brunetto Latini wrote in French his encyclopædic work, the *Trésor*, though his *Tesoretto*, an allegorical work of a similar kind, is in Italian verse. The Franco-Italian versions of French poems, with additions and alterations, were very popular, and they and the distinctly Italian versions produced a considerable literature, much of which is now lost, but from which developed the later poems of chivalry which tell especially of Roland (in Italian from Orlando). Nor were the other subjects of Old French literature, as Arthur and his knights, and the story of Troy, unknown in the thirteenth century in Italy.

The prose of the time for the most part belongs to the latter part of the century. From French and Latin were drawn some works of legendary, religious, or didactic character; of those from French sources may be named the *Dodici conti morali*, *I Fatti di Cesare*, *I Conti di antichi cavalieri*. Rusticiano di Pisa wrote in French, about 1270, a compilation of the stories of Arthur and the Round Table, and some Italian versions founded on this belong probably to this century. *Il libro de' sette savi* also belongs here, and probably, in part at least, *Il Novellino* or *Cento novelle antiche*. These tales are from various sources. There is an old Venetian version of the so-called *Disticha Catonis*. Dante's *Vita Nuova* probably belongs to the thirteenth century.

The strife of factions, notably of Guelphs and Ghibellines, which was so prominent a feature in the political life of the thirteenth century, continues in the fourteenth as it does long after. The captivity, so called, of the popes at Avignon occupies a very large part of the century, and the beginning of Spanish rule with the acquisition of Sicily is to be noted about the beginning of this, the most brilliant period of Italian literature. It is the Tuscan period in which the already strong literary position of Tuscany, and especially Florence, becomes permanently established in an undoubted pre-eminence, and the dialects of other parts of Italy sink into comparative insignificance. Most of the work of Dante (1265–1321) belongs to this century. His prose as well as his minor verse shows a superiority over his predecessors and contemporaries, though his fame as one of the greatest of poets rests mainly on the *Divina Commedia*, in which he represents himself as passing through hell, purgatory, and paradise under the guidance first of Vergil and afterward of Beatrice. The *Vita Nuova* and the *Convivio* are necessary for the understanding of his work, nor should his Latin writings, *De vulgari eloquentia*, *De Monarchia*, and his letters be forgotten. (See DANTE ALIGHIERI.) Had not Dante accomplished it successfully, a modern man would consider it impossible that one of the greatest poems ever written should have such an apparently artificial form and contain so much of allegory and mediæval scholasticism, and yet have directness, conciseness, and force in the highest degree, and be still able to hold the interest and excite the deep admiration of readers. The form of a vision of the life after death is, to be sure, older than Dante, but this in no respect diminishes the essential originality of his work. The metrical structure, the *terza rima*, is one that would be extremely difficult in most languages. The verse itself is the so-called *endecasillabo*, practically the same as the Old French common heroic or epic verse, and it became the usual heroic verse in Italian. The arrangement of rhymes may be thus represented: aba bcb cdc . . . yzy z. Dante represents the culmination of the mediæval in literature; after him appears as a characteristic of this period the beginning of a revival of classical learning, the better appreciation of the Latin and Greek classics as literature, and of their value as the foundation of culture. Petrarch (in Italian Francesco Petrarca, 1304–74) was one of the first to begin the study of Greek, while he also brought to light works of the classical writers, as some of Cicero's letters, and acquired an elegant Latin style. Less clear-sighted than Dante, who had deliberately chosen the vulgar tongue for his great work, Petrarch expected his fame to be secured by his works in Latin (of which it is enough to mention his poem *Africa*, with Scipio Africanus as the hero, and his letters) and thought, or professed to think, but little of the poems in Italian which have made his name as well as that of Laura famous. The verse of the *Canzoniere* shows, however, an elegance of form and style not attained before him, and his skillful treatment of artistic forms is one great cause of his poetical repute. The sonnet, which before his time had been, as it still is, a favorite kind of verse composition, was first recognized as a distinct form in Italy, the corresponding Provençal word not having had this special sense. It received at his hands its highest polish, and by far the largest number of poems in the *Canzoniere*, or over 300, are sonnets. The poem of the *Trionfi*, written some years after the death of Laura, is after the model of Dante's *Divina Commedia*, in *terza rima*, representing in the form of a vision the triumphs of six allegorical figures: Love, Chastity, Death, Fame, Time, Divinity. Petrarch's verse naturally had many imitators, and his influence is still felt. It is worth while to add that some of his works are preserved in manuscripts from his own hand, among them the *Canzoniere*. His friend Giovanni Boccaccio (1313–75) likewise wrote works in Latin which showed erudition, and were of utility for the advancement of classical studies. He studied Greek and had Homer translated into Latin. He wrote love songs in Italian, the *Amorosa visione*, the *Filostrato* (intended to mean the one overcome by love), whence comes the story of Troilus and Cressida told by Chaucer; the older source for Boccaccio is legends of the Trojan cycle as related by the French poet Benoit de Sainte-More; further, the *Teseide* (Chaucer's *Knight's Tale*) and the *Ninfale fiesolano*, a pastoral poem of the loves of Affrico and Mensola. The last three of these are among the earliest examples in narrative verse of the *ottava rima* used afterward regu-

larly in heroic verse, as by Ariosto and Tasso. The single line is the *endecasillabo* and eight lines with the rhyme scheme a b a b a b c c make the stanza. Among the minor prose works are the *Filocolo*, written for Maria, natural daughter of the King of Naples, during the period of his love for her; it is essentially the French *Floire et Blanchefleur*; also the *Fiammetta*, the story of the love of Fiammetta (Maria) and Pamfilo (Boccaccio); both these were written before the *Decameron*. Later than that is his *Vita di Dante*, and near the close of his life comes the *Commento sopra la Commedia di Dante*, not the first of the many commentaries on that poem. Boccaccio's prose works suffer somewhat from the influence of Latin on his style, and this is true even of the *Decameron*. This collection of tales, deservedly one of the most famous ever written, which had many imitators, and not in Italy alone, was begun probably about the time of the plague of 1348 and finished in 1353. The sources for the tales are various; many of the stories are to be found in Old French *fabliaux*, but it does not follow that in all such cases Boccaccio's immediate source was French. These three—Dante, Petrarch, Boccaccio—are the authors who give distinction to the fourteenth century (the *trecento*) in Italy, and they alone more than paid the debt which Italian literature owed to foreign sources. Among other productions may be mentioned the verses of Cino da Pistoia, a friend of Dante's (b. before 1270; d. 1336 or 1337), and historical works or chronicles such as that of Dino Compagni, born a little before 1260. His *Cronica delle cose occorrenti ne' tempi suoi* covers a period of Florentine history of much interest, because it is the time of Dante. The work has been suspected of being a later production, but without sufficient grounds. We note further the chronicle of Giovanni Villani (b. in the second half of the thirteenth century) and his continuators. An imitator of Dante is Fazio degli Uberti in his *Dittamondo*. Tales, like those of Franco Sacchetti (b. about 1335; *Trecento Novelle*) and Giovanni Fiorentino's *Pecorone*, illustrate the popularity of work like Boccaccio's. There is a version in Italian of the travels of Marco Polo. Legends and religious or devotional compositions are prominent; we mention here the so-called *Fioretti di san Francesco* and the letters of Catherine of Siena. Finally are to be noticed poems of chivalry; for example, some of the productions of Antonio Pucci, the *Buovo d' Antona*, the *Spagna*, etc.

The impulse given in the fourteenth century to classical studies, assisted by the spread of Greek learning in the early part of the fifteenth century and by the invention of printing, produces in the latter century the Italian Renaissance in full flower. The new learning is not restricted to Florence, but other places share in it and begin to show its effects in literature, though Florence still holds the foremost place. We shall confine ourselves here to the vernacular literature, and take up first the romances of chivalry. Andrea da Barberino, about the beginning of the century, composed many of these in prose from the Franco-Italian and Italian or French poems previously spoken of. Two of these, *I Reali di Francia* and *Guerino il meschino*, have not yet lost the favor of the uneducated in Italy. About this time, perhaps in the preceding century, was written by some unskilled popular rhymer the *Orlando*, which was later taken up by Luigi Pulci (1432–84) and worked over so as to produce the first and longest part of his poem, *Il Morgante maggiore*, the last part having another old poem as its source. The general subject of Pulci's poem is the traitorous plottings of Gano (the French Ganelon) and the death of Orlando (Roland), but the title is from the name of the giant converted by Orlando and then becoming his faithful companion. Morgante is an often burlesque character, and not the only occasion for the introduction of the burlesque. The second great work of this class is the *Orlando Innamorato* of Boiardo (*circa* 1434–94), a long poem in which Orlando is represented as in love with Angelica, daughter of the King of Cathay, and in which the material of the Carolingian epics is combined with that of the romances of adventure and with that drawn from classical sources. Boiardo was a man of classical learning, and the most famous of the non-Tuscan writers of the century. Following the custom of the time he wrote lyrics in the manner of Petrarch, and he also produced translations from classical authors. Besides Pulci, Florence shows two other writers of renown, Lorenzo de' Medici (*il Magnifico*) and Politian. The former (1448–1492), under whom the Florentine republic practically died, was a patron of literature and the arts, and himself found time to produce poetical works of various kinds, lyric, pastoral, and religious. Politian (Poliziano, properly Angelo Ambrogini, 1454–94), the best representative of the classical culture of the time, wrote in Italian *Rime*, *Stanze per la giostra*, and *Orfeo*, the first non-religious dramatic work in the language. Besides these writers may be noticed Leon Battista Alberti (1407–72), who wrote a treatise, *Della famiglia*; Antonio Manetti (1423–97), who wrote the *Novella del Grasso legnaiuolo*; Il Burchiello (properly Domenico di Giovanni; died 1448), noted for burlesque poetry which is often obscure; the *Sermoni* of Savonarola (1452–98); the treatises of Leonardo da Vinci (1452–1519); and particularly the most famous work of Jacopo Sannazaro, of Naples (1458–1530), the *Arcadia*. This was written about 1490, or in part, perhaps, some years later; it is a pastoral romance in mingled prose and verse. Religious drama appears in Tuscany at Florence in this century under the name of *rappresentazioni sacre*, and lasts into the next. These were almost certainly developed from the older *laudi* in dialogue, which are found as early as Jacopone da Todi, and which in Umbria assumed a dramatic form and were called *devozioni*. These religious dramas correspond to the French *mystères* and the English miracle-plays (the *laudi* themselves probably have a liturgical origin), and may have been influenced by similar productions outside of Italy; they are not to be confounded with those dramatic productions of this century and the next, which draw their inspiration from classical sources. The earliest of the *rappresentazioni sacre* of which the date of performance (1449) is known is Feo Belcari's *Abramo ed Isac*.

The sixteenth century is the second classic period of Italian literature, and but for the absence of a genius comparable with Dante it would hold a higher position than the *trecento*. The political conditions were, or soon became, very discouraging, on account of the contests in which the popes, France, Spain, and the German emperor were engaged. The republic of Florence ceased to exist in 1530, and Tuscany became a hereditary grand duchy under the Medici. Lombardy and the kingdom of Naples became Spanish provinces, and Spanish rule was not favorable to literature. In other parts of Italy literature and the arts were, it is true, encouraged, especially by Pope Leo X., by Cosimo dei Medici in Tuscany, and by the house of Este at Ferrara. The literature of the time continues and perfects that of the preceding century. Unfortunately the literary refinement and the luxury of the age are often accompanied by a looseness of morals, and deep religious convictions were not much fostered by the cultivation of classical studies. We notice first poetry, particularly romantic and epic poetry, then prose, and finally dramatic productions. Lodovico Ariosto (1474–1533), one of the most brilliant of Italian writers, produced in the *Orlando Furioso* the crowning work of chivalrous poetry in Italy. It continues the subject of Boiardo's *Orlando Innamorato*, describing how Orlando lost his reason on discovering that Angelica had bestowed herself on another much his inferior, and how he recovered it again; but the fortunes of so many knights and ladies are narrated in the poem that no one person appears clearly as the leading character. Boiardo's work is assumed as familiar to the reader, and the poet therefore does not explain at length the relations of all his characters. But the *Orlando Furioso* in Ariosto's hands is not merely a poem of chivalry; he introduces numerous episodes and stories drawn from different sources, and his marvelous skill as a narrator and his mastery of the *ottava rima* make his poem still interesting, while Boiardo's became neglected. Ariosto wrote also minor poems, including love verses, eclogues, elegies, and seven *Satire in terza rima*. The numerous imitations of the *Orlando Furioso* are now almost forgotten. Francesco Berni (*circa* 1498–1535) wrote a *rifacimento* of the *Orlando Innamorato*, in which he improved the original in language and in formal respects, but it lost much of its real poetical value in the process. His *Rime*, of a burlesque character, had many imitators. Bernardo Tasso (1493–1569) wrote a long epic poem, *Amadigi*, but his fame has been eclipsed by that of his greater son, Torquato Tasso (1544–95), the second eminent poet of the time. The latter's youthful poem *Rinaldo* belongs among the poems of chivalry, but his *Gerusalemme Liberata* is a Christian epic, with Godfrey of Bouillon for its hero, which ends with the capture of Jerusalem by the crusaders, the whole poem having unity of plan, while yet romantic elements are not lacking in it. This unity gives it a certain advantage over the work of Ariosto, from which it also differs in contain-

ing nothing so licentious in character as some portions of the *Orlando Furioso*. Both Ariosto and Tasso show many passages imitated from the poets of antiquity, but these are so wrought in as not to seem extraneous or mere imitations. Moreover, the feeling of the time favored such imitations, which were considered evidence of the taste and literary cultivation of the modern poet. Nor is either writer to be much blamed for what in the present changed circumstances seems flattery of their patrons of the ducal house of Este at Ferrara. The *Gerusalemme Liberata* was finished in 1575, but the poet unfortunately later made ill-judged alterations which produced the longer and less poetical *Gerusalemme Conquistata*, now scarcely ever read, though the author himself preferred it. The mental disorders of the poet did not prevent the completion of this work nor of some others, which also belong to his later years. His love verses and religious verses need no extended notice; the most important of his other works are mentioned below. Most of the lyric verse of the time is in imitation of Petrarch, for example, that of Bembo (1470–1547). We notice also the verses of Michelangelo Buonarroti (1475–1564), Vittoria Colonna (1492–1547), Francesco Maria Molza (1489–1544), Luigi Tansillo (1510–68), and the translation of the *Æneid* by Annibal Caro (1507–66). The didactic poem *Le Api* (The Bees), in blank verse, of Giovanni Rucellai (1475–1526), is in imitation of Vergil's *Georgics*, as is the *Coltivazione* of Luigi Alamanni (1495–1586). Imitation of antique meters was attempted by Claudio Tolomei (1492–1554), as had been indeed done by Leon Battista Alberti in the preceding century, and as was done later by Chiabrera (see below).

The prose of the time is mostly too much under the influence of classical models, and lacks the simplicity and naturalness to be found in the *trecento*. Most important are the political and historical works of Machiavelli and Guicciardini. Niccolò Machiavelli (1469–1527) was a patriot who longed for the freedom of Italy from foreign rule, as his classic work *Il Principe* (The Prince) clearly shows; his moral character has often been too severely and unjustly judged. The work was intentionally written in a plain and unadorned style, and in general Machiavelli's style is freer from defects than that of his contemporaries. Besides the *Principe*, he wrote *Discorsi sopra la prima deca di T. Livio*, *Istorie fiorentine* (to the death of Lorenzo il Magnifico), and other works in prose, besides some verse. A higher rank as a historian was taken by Francesco Guicciardini (1482–1540), whose chief work is the *Storia d' Italia*, covering the period 1492–1534. He also wrote a *Storia fiorentina*, *Ricordi politici e civili*, etc. Several other historical writers of less note belong to this century. Pietro Bembo, of Venice, mentioned above for his verse, had a considerable influence which assisted the spread of the literary language outside of Tuscany; we notice here his *Prose della volgar lingua*, and his many letters. Baldassare Castiglione (1478–1529) may be mentioned for his *Cortegiano* (Courtier), in which he describes the courtier as he should be, and touches also the question of the literary language (then and since much discussed), opposing Bembo's exclusive preference for the pure Tuscan. A noteworthy production of the time is *La Vita di Benvenuto Cellini* (1500–71), written by himself; this autobiography, written in a colloquial style, reaches to the year 1562. Well known is Giorgio Vasari's (1511–73) *Vite de' più eccellenti pittori, scultori ed architetti*. The prose writings of Tasso are extensive, including dialogues in imitation of Plato on philosophical subjects; the *Discorsi del poema eroico* and other discourses; the *Apologia*, his share in the controversy with the Florentine grammarian Salviati after the publication of the *Gerusalemme Liberata*; and a large number of letters. Letters are the most noteworthy prose-writings of Annibal Caro, mentioned above. The letters written by and to the notorious Pietro Aretino (1492–1556) must also be mentioned on account of the respected position he then held in literature. Of the writers of *novelle*, story-tellers who imitated Boccaccio, it is enough to mention Matteo Bandello (*circa* 1490–*circa* 1560) and Agnolo Firenzuola (b. in 1493).

In the preceding century the *rappresentazioni sacre* had already assumed a realistic and then a romantic character, so that they soon came to resemble romantic stories given in successive scenes accompanied with dialogue. In the first part of the sixteenth century they began to disappear from the cities, and after the middle of the century they are much less heard of. Even in modern times, however, there are traces of religious drama in various parts of Italy. The decadence of these performances is largely due to the revival of the classical drama, which had begun to be imitated like other forms of ancient literature. The models followed for tragedy were works of Euripides, Sophocles, and Seneca; while the comedies were usually imitations of Plautus or Terence. The first tragedy in Italian is assigned to Giangiorgio Trissino (1478–1550), whose *Sofonisba* belongs to the year 1515. Among other tragedies are to be noted those of Giovanni Rucellai, the *Orazia* of Pietro Aretino, the *Torrismondo* of Tasso. The most notable comedies—some in verse, some in prose—are those of Machiavelli (particularly his *Mandragola*, considered the best of all), Ariosto, Pietro Aretino. Indecency and more or less immoral intrigue was only too common in the comedies of the time, and dramatic composition in general did not reach so high a level as other forms of literature. The pastoral drama, however, which grew out of the eclogue, was cultivated and quickly reached its highest development in Tasso's *Aminta* (1573), and in the *Pastor fido* of Battista Guarini (1538–1612). The learned comedy did not appeal so much to the popular taste as the rustic comedies and farces, sometimes in dialect, appearing in various places—for example, Naples, Siena, and the Venetian territory—and as the so-called *commedia dell' arte*, in which the dialogue was improvised by the actors, the scenes being only outlined in writing; in this last appear the masks of *Arlecchino* (Harlequin), *Pulcinella*, *Pantalone*, etc. Comedies of this sort were assisted by the Italian talent for improvisation, and after the middle of the century they began to spread over all Italy, largely displacing the regular comedy, and thus seriously interfering with the growth of a successful dramatic literature. The origin of the various forms of the more popular dramatic representations is not entirely clear. See for the early history of the drama in Italy, d'Ancona, *Origini del teatro italiano* (2d ed. 2 vols., 1891).

Since the sixteenth century there has been no time in which Italian literature has risen into a position of so high and universally recognized excellence. That classic period was followed by one of decadence, in which imitation of the former masterpieces and an empty and artificial cultivation of the formal side of literature prevailed. Much of the responsibility for this rests on the oppressive Spanish domination, the narrow spirit of the papacy with the Inquisition, and the still continuing interventions of France and Germany in Italian affairs. The decrease in material prosperity, partly caused by changes in the course of commerce, may also be mentioned. There are, however, some literary manifestations which deserve attention, though the most credit for achievement belongs to men of science. In poetry, epic verse consists largely of imitations of Tasso. A somewhat different form is the mythological poem *Adone* of Giovanbattista Marini (1569–1625), who also wrote lyrics and other poems. His style had many imitators. The mock-heroic is exemplified by *La secchia rapita* of Alessandro Tassoni (1565–1635). Lyric verse is in the seventeenth century generally artificial and of little value; among the best of the poets are Gabriello Chiabrera (1552–1638), an imitator of Pindar and of Greek meters, Fulvio Testi (1593–1646), and Vincenzio da Filicaia (1642–1707), whose sonnets to Italy are famous, also Salvator Rosa, the painter (1615–73). An ineffectual attempt to reform the prevalent taste in poetry was the foundation of the academy Arcadia in Rome (1690), which grouped together a number of poets, none of them of very high rank. Dramatic poetry shared the general decadence, but it is to be mentioned that the opera begins with Ottavio Rinuccini (1575–1621). In prose we notice the historians Paolo Sarpi (1552–1623), Arrigo Caterino Davila (1576–1630), Guido Bentivoglio (1579–1644), Sforza Pallavicino (1607–67), the grammarian Benedetto Buommattei (1581–1647), who wrote *Della lingua toscana*, the famous Galileo Galilei (1564–1642), whose scientific and polemic prose is deservedly admired, and Lorenzo Magalotti (1637–1712), for his *Saggi di naturali esperienze*.

In the eighteenth century there is a beginning of improvement. After the war of the Spanish succession Austria instead of Spain became for a time the dominant power in Italy, and the peace of Aix-la-Chapelle, closing the war of the Austrian succession, left Italy in a better state than before, only a part of Lombardy being a province depending on Austria, while no other foreign power occupied Italian soil. At the end of the century begin the effects of the French Revolution in Italy. The literary influence of France beginning in the time of Louis XIV. became strong, and has continued to be so ever since, but the English and German literatures also begin to affect that of Italy. The

greatest names are those of Metastasio, Goldoni, and Alfieri. Pietro Metastasio (1698-1782), who lived at Vienna after 1730, is remembered partly for his lyrics, but mainly for his operas; he is the most famous representative of the Arcadia. The Venetian Carlo Goldoni (1707–93) is celebrated in Italy as the reformer of the Italian stage. His numerous comedies, except the earlier ones, show a return to naturalness and reality, and the abandonment of improvisation and of the types of the *commedia dell' arte*; they represent with success scenes of Venetian life, and are in great part written in the Venetian dialect. He met with opposition, notably from Carlo Gozzi (1722-1806), whose dramatic fables (*fiabe*) had a brief popularity. Tragedy is represented in the first half of the century by poets under the influence of the French school, such as Pier Jacopo Martelli (1665–1727), who used verses resembling the French Alexandrines, the so-called *versi martelliani*, as, after him, they are called, Scipione Maffei (1675-1755), author of *Merope*, and by others. The foremost, however, of Italian writers of tragedies is the Piedmontese Vittorio Alfieri (1749–1803), who, adopting the accepted form established by the French, put into it modern ideas of liberty and patriotism, and thus contributed to the political regeneration of Italy. He also wrote some comedies, satires, and, among other things, an autobiography. A place of honor among the poets of the century belongs to Giuseppe Parini (1729–99) for his poem *Il Giorno*, a satire in blank verse on the daily life of the aristocracy, and for his odes. We mention also the voluminous writer Melchiorre Cesarotti (1730–1808) for his translation of Ossian, the lyric verse of Eustachio Manfredi (1674–1739), the *Coltivazione del Riso* of Giambattista Spolverini (1695–1762) another of the poems resembling Vergil's *Georgics*, the satirical poem *Gli animali parlanti* of Giambattista Casti (1721–1803), and *Poesie campestri e marittime*, by Aurelio Bertòla (1753–98), the inspiration for which came from the German idyls of Gessner.

Prominent among the prose-writers is Gaspare Gozzi (1713–86), brother of Carlo Gozzi mentioned above. His *Difesa di Dante* assisted the revival of the study of Dante, but he is better known for his *Osservatore*, after the model of *The Spectator*, with which he became acquainted through a French translation. Giuseppe Baretti (1719–89), for many years resident in London, where he died, wrote *Lettere familiari* and severe articles in his critical journal, the *Frusta letteraria*, besides works in English. Girolamo Tiraboschi (1731–94) wrote a useful *Storia della letteratura italiana*, and we may mention further historians and philosophers, such as Giambattista Vico (1669–1744), Cesare Beccaria (1738–94), famous for his work *Dei delitti e delle pene*, and especially Ludovico Antonio Muratori (1672–1750) for his *Annali d' Italia*, to say nothing of his other works of erudition.

As we reach the nineteenth century in this survey we have to recognize not only the literary development along former or classic lines, but also new influences, or influences which if not entirely new yet make themselves especially felt so as to produce somewhat new effects. Political conditions still have to be allowed for, especially the results of the French Revolution and the Napoleonic wars, the position of Austria in Italy, the suppression of freedom of speech, with the resulting plots and the imprisonment or exile of many patriots, and, finally, the establishment of united Italy as a monarchy, with Rome as its capital. The influence of foreign literatures—French, English, and German—is considerable, as is natural in these modern times when literature tends to become, like science, cosmopolitan, though it can not fail to have varying national characteristics in different countries. Most typical of the new lines of literature are the romantic movement in the first half of the century, of which Manzoni is recognized as the head, and, of similar origin, the modern novel in all its forms; the former is inspired largely by English and German literature, while the latter owes also much to French influence, an influence which is likewise strongly felt in the field of dramatic composition; but there has been no such strong contrast between classicism and romanticism in Italy as showed itself elsewhere, and the similar contrast between idealism and realism, which appears to some extent in the more modern productions, hardly justifies a division into two camps. Vincenzo Monti (1754–1828), a poet of great artistic skill, wrote some of his works in the preceding century; among his most noted productions are the *Bassvilliana*, written in imitation of Dante on the occasion of the murder of M. de Basseville at Rome in 1793, and intended to illustrate the horrors of revolution, and his translation of the *Iliad*; he also wrote tragedies and minor poems. Ugo Foscolo (1778–1827), after 1815 a refugee in England, is known chiefly by his poem *I Sepolcri* and his essays; we notice also his *Ultime lettere di Jacopo Ortis*, written in imitation of Goethe's *Werther*, and his tragedies. Ippolito Pindemonte (1753–1828) wrote *Poesie campestri* and a translation of the *Odyssey*; his *Sepolcri* was written in answer to Foscolo's poem. Giovanni Giraud (1776–1834) wrote comedies, and Cesare Arici (1782–1836) didactic poems. Antonio Cesari (1760–1828) is one of the many purists who seek their models in the *trecento*. Giacomo Leopardi (1798–1837) was a distinguished classical scholar, and holds also a place among the really eminent poets of Italy; we mention his *Canti*, especially the poem *All' Italia*, and his prose is also excellent. Here, too, may be mentioned Giambattista Niccolini (1782–1861), author of many tragedies; Pietro Giordani (1774–1848), a critic and composer of eulogies; the philosopher and statesman Vincenzo Gioberti (1801–52); the historians Carlo Botta (1766–1831) and Cesare Balbo (1789–1853).

In contrast with the classicists, at the head of whom is Leopardi, appear the romanticists, who appeal to a more popular taste; their greatest representative is Alessandro Manzoni (1785–1873). His most important works were the *Inni Sacri* (1815); the ode *Il cinque maggio*, on the death of Napoleon (1821); two remarkable tragedies, *Il Conte di Carmagnola* and *Adelchi*; and his masterpiece, the historical novel *I Promessi Sposi* (1825–26), the scene of which is laid in Lombardy in the seventeenth century. This caused him to be ranked in Italy by the side of Walter Scott, and the work was translated into various languages, while a number of historical novels were written by others. It is worth mention, as illustrating the much discussed question of language in Italy, that Manzoni afterward revised this novel to make its language more purely Tuscan, changing the phraseology so much that the new form (1840–42) appears almost completely rewritten. As romanticists may be classed, among others, Giovanni Berchet (1783–1851), Tommaso Grossi (1791–1853), and the better known Silvio Pellico (1789–1854), who wrote lyrics, tragedies (of these *Francesca da Rimini* is the most esteemed), and in prose *Le Mie Prigioni*, describing his long confinement in Austrian prisons—a book which had a great effect in rousing public opinion against Austrian rule in Italy; further, Giuseppe Nicolini (1788–1855, the translator of Byron), Bartolommeo Sestini (1792–1822), Giuseppe Giusti (1809–50), whose satirical verse gained much popularity, Massimo d'Azeglio (1798–1866), Francesco Domenico Guerrazzi (1804–73), Giuseppe Mazzini (1808–72).

Of writers whose productions belong mainly or entirely to the second half of the nineteenth century it is not always easy to speak, their places in literature being as yet not clearly fixed. We mention among the many poets Giovanni Prati (1815–84), Aleardo Aleardi (1812–78), Francesco dall' Ongaro (1808–73), Mario Rapisardi (b. 1844), Bernardino Zendrini (1840–79, the translator of Heine), Lorenzo Stecchetti, properly Olindo Guerrini (b. 1845, a realist), and above all Giosuè Carducci (b. 1836), the most famous of living Italian poets, noteworthy among other things for his imitations of classical meters, and scarcely less eminent for his studies in literary history than for his verse. His *Opere* are in course of publication; eight volumes have now (1894) appeared. In the dramatic literature of the present time are noteworthy, among others, Tommaso Gherardi del Testa (1815–81), a writer of many successful comedies, Paolo Ferrari (1822–89), Pietro Cossa (1830–81, author of historical dramas), Paolo Giacometti (1816–82, writer of tragedies), Luigi Suñer (b. 1832), Leo di Castelnuovo, properly Leopoldo Pullè (b. 1835), Felice Cavallotti (b. 1842), Giuseppe Giacosa (b. 1847). Prose fiction, including novels and short stories, is represented by many writers, such as Luigi Capranica (b. 1821), Vittorio Bersezio (b. 1830, also a writer of plays, some of them in the Piedmontese dialect), Anton Giulio Barrili (b. 1836), a popular and very productive author, Enrico Castelnuovo (b. 1839), Giovanni Verga (b. 1840), whose *Cavalleria rusticana* furnished the subject of Mascagni's opera of the same name, Salvatore Farina (b. 1846), one of the most pleasing of Italian novelists, Edmondo de Amicis (b. 1848), whose sketches of travel have made his name widely known, and Matilde Serao (b. 1856). We notice further among prose-writers historians, such as Gino Capponi (1792–1876), Federico Sclopis (1798–1878), Pasquale Villari (b. 1827), Ruggiero Bonghi (b. 1828), the philologist and multifarious writer Angelo de Gubernatis (b. 1840), the philosopher Terenzio Mamiani (1799–1885), and the popular

physiologist Paolo Mantegazza (b. 1831). Some of the names of historians of literature appear at the end of this article. Science in its various branches, not the least important of which is linguistic science, claims the attention of many of the best minds of Italy; their names will more naturally appear elsewhere. Many men whom there is not space to name here are contributors to Italian periodicals, such as the excellent *Nuova Antologia*, the *Giornale storico della letteratura italiana*, and many others of special interest; but one branch of science, the modern study of folklore, may be mentioned here on account of the popular songs and tales which have been collected in Italy by Pitrè, d'Ancona, Comparetti, Imbriani, and others.

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Italic Languages: the languages represented in the early history of the Italic peninsula. The population of the Italic peninsula offers the most striking contrast to that of Greece in historical times. In Greece, though the indistinct traditions of Pelasgians, Carians, etc., doubtless have some foundation in fact, we know of the country only as in the possession of one race, the Hellenic branch of the Indo-European family. In Italy, on the other hand, the Italic branch of this great family is only one of at least six distinct peoples, some of them not even of Indo-European origin. These races and their languages may be described briefly as follows:

(1) The *Ligurians*.—The Ligurians once occupied a much wider territory than is comprised by the Liguria of ancient and modern times. The evidence of tradition and of geographical names shows that they at one time spread over all of Northern Italy and part of Southern France, and there is every reason to believe that they, like the Iberians, were the relics of an old pre-Indo-European population of Southern Europe. They still show marked physical characteristics, and form one of the distinct race-types of the anthropologists. Of their language nothing is known beyond a few words mentioned by classical writers, and geographical names. These also point to a non-Indo-European origin.

(2) The *Etruscans*.—It will not be necessary here to speak of the Etruscans as a people, of the eminent *rôle* they played in the early politics and civilization of Italy, or of their trading capacities, in which they rivaled the Phœnicians, being the pioneers of the overland trade, as the Phœnicians were of maritime traffic. The question of the origin or affiliations of such a people must always be one of the deepest interest, and it is obvious that a solution can be reached only by means of the language. Unfortunately the study of the Etruscan language forms, as has been remarked, one of the saddest chapters in the history of the human intellect. The material at hand consists of over 5,000 inscriptions, ranging in date from 500 B. C. to imperial times, but of these less than 300 contain more than mere names, and of these, again, only about half a dozen are of any length. The alphabet is derived from the Greek, and offers no difficulty, so that the great obstacle which had to be overcome in the decipherment of Persian, Assyrian, and Egyptian monuments does not exist in this case. Etruscology was for a long time a favorite field for dilettanteism, in which the wildest freaks of the Celtomaniacs were outdone. Hebrew, Sanskrit, Finnish, Celtic, Old High German, Slavic, and other languages have served their turn as the basis of interpretation. Even among scholars of scientific attainments, not to be confused with the class just referred to, the results are unsatisfactory. If we look at the record of three very prominent Etruscan scholars, the Germans Deecke and Pauli and the Norwegian Bugge, we find no unanimity either between their respective theories, or, if we except Pauli, between the earlier and later opinions of the same individual. Deecke, who began his career as an Etruscologist by pointing out the fallacies of Corssen's exhaustive attempt to stamp the Etruscan as a dialect of the Italic branch of the Indo-European family, returned himself, later, to the same view, and within a few years promulgated it in the most positive manner, even going so far as to assign dogmatically the Etruscan to one of the subdivisions of the Italic branch. His latest utterances, however, show that he still regards the question as an open one. Bugge's first theory was that Etruscan was Indo-European but not Italic, his second that it was Italic, and his latest, that it is closely related to the Armenian. Notwithstanding Bugge's high rank as a scholar, his Etruscan studies can hardly be regarded as successful. Pauli has been consistent throughout in his belief in the non-Indo-European character of the Etruscan. This view of Pauli, shared also by eminent scholars like Bréal, whose Italic studies have drawn them to some extent into the field of Etruscology, has more inherent probability than the others (the very fact that so slight progress has been made in the interpretation of Etruscan would lead one to doubt its Indo-European character), and bids fair to be placed beyond a doubt. Between 1860 and 1865 an Egyptian mummy was brought into the museum of Agram, and some of its wrappings were, soon after, seen to be inscribed. It has been discovered that the inscription is Etruscan, and furnishes an amount of continuous text far surpassing anything before known. The results of the study of this text have been only partially made public, but enough has been done to make the Indo-European character of its language more doubtful than ever.

(3) The *Illyrians*.—At the head of the Adriatic dwelt the Veneti. Among the various accounts of their origin, most of them palpable fabrications, the incidental mention of them as Illyrians by Herodotus has commended itself to historians as offering a rational hypothesis, and this is supported by a comparison of Venetian and Illyrian proper names. Our knowledge of the Venetian tongue is, however, no longer confined to geographical names and names of persons figuring in the Latin inscriptions of the region. There are several hundred Venetian inscriptions, a large part of them unearthed at Este, S. W. of Padua. These inscriptions, chiefly dedications on small objects of bronze and clay, are short, few containing more than two or three words, and the interpretation, though already made the object of a most careful study, is far from being final. In the southeastern extremity of Italy, the Ἰαπυγία of the Greek geographers, dwelt a number of stems which are also believed to be of Illyrian origin. The most prominent of these stems is that of the Messapians, and the Messapian language is expressly mentioned by Strabo. Of this Messapian language we have scanty remains in the shape of about 160 short inscriptions. In the Messapian and Venetian there are, then, according to the prevalent belief, two dialects of old Illyrian speech. It must be noted that another hypothesis, also extremely probable, but not admitting of anything like demonstration, regards the modern Albanians as of Illyrian descent. The two theories would receive mutual support if it could be shown that striking points of similarity exist between the languages of the Venetian and Messapian inscriptions and the modern Albanian. This proof, however, is not yet forthcoming, but, on the other hand, no direct or indirect refutation is furnished. Certain explanations which have been advanced for Venetian words are indeed inconsistent with derivation from a language of which Albanian is a daughter, but these interpretations are of a doubtful nature; and not much stress can be laid on the absence of direct proof of relationship, when one realizes the meagerness of the Venetian and Messapian remains, and, on the

other hand, the comparatively small amount of old Indo-European material which has been preserved in Albanian, a language which barely escaped becoming thoroughly Romance, to say nothing of the Slavic, Turkish, and Greek borrowings.

(4) *The Greeks.*—The colonization of Southern Italy by the Greeks introduced upon Italian soil Hellenic civilization and Hellenic speech, which continued to exist long after the country had fallen under the political domination of Rome, in fact, until Rome herself had fallen prey to the invasions of the barbarians. Greek was the only one of the various languages of Italy which exerted any serious influence upon Latin, and even here it must be borne in mind that only a small portion of the Greek element in Latin has any connection with the colonization of Magna Græcia. An early stratum of Greek words did indeed find its way into Latin through this medium, and such words may often be distinguished by their un-Ionic form, but the great mass of Greek words was due to a direct intellectual influence of Greece proper.

(5) *The Celts.*—The Celtic peoples, who at one time were spread over a more extensive territory than perhaps any other branch of the Indo-European family, did not leave Italy exempt from their invasions. They make their first appearance in Roman history in the early part of the fourth century B. C., and may have established themselves even before this in the plains of Northern Italy. Celtic inscriptions have been found at Briona (Piedmont), Voltino (Lago di Garda), at Verona, Este, and even as far south as Todi in Umbria.

(6) There remains for consideration that race, a branch of the Indo-European family, which, owing to its leading *rôle*, deserves to be known specifically as Italic. (The name *Italia* was first applied by the Sicilians to the extreme southwest point of the peninsula. In the time of Thucydides it covered Bruttium and part of Lucania. When the Romans occupied the region they adopted the name, making it include all the peninsula as far north as the Arnus and Rubicon. Augustus was the first to include Gallia Cisalpina under the same name, and so advance the boundaries to the Alps. In the social war the allies assumed the name "Italian" as opposed to "Roman," and their coins bear the device *Viteliŭ*.) The earliest traces of Italic settlement belong to the realm of prehistoric archæology. It has been conclusively shown that the oldest of the *terramare*, the pile-dwellings in the valley of the Po, were inhabited by people of the Italic race. They were followed by Etruscans, and a still later Celtic period is distinguished.

In historical times the Italic, like the Hellenic race, was divided up into numerous stems, each with its respective dialects. In the classification of these dialects two groups are to be distinguished, to one of which belong the Latin and Faliscan; to the other all the remaining dialects, Oscan, Umbrian, Volscian, etc. These groups are sometimes known according to their geographical position as Western (Lat.-Falisc.) and Southeastern (by which must be understood Southern and Eastern, as in the case of the "Southeastern" Slavic group), but more frequently as Latin-Faliscan and Umbro-Samnitic, Umbro-Sabellian, or Oscan-Umbrian, after the most important dialects. Some of the most striking characteristics of the second group are: Complete labialization of the Indo-European velars, e. g. *pod*: Lat.-Fal. *quod*, Osc. *bivús* (nom. plur.): Lat. *vīvo-s*, Umbr. *benust*, "venerit"; more frequent syncope of vowels, Osc. *actud*, "agito," Umbr. *fiktu*, "figito," Osc. *húrz*, "hortus," Umbr. *Ikuvins*, "Igovinus"; infinitive in *-om*, Osc. *ezum*, Umbr. *erom*, "esse," Osc. *deicum*, "dicere," Volsc. *ferom*, "ferre"; nom. plur. in *-ōs*, Osc. *bivús*, "vivi," *Abellanús*, "Abellani," Umbr. *prinuvatus*, *prinvatur*, "legati"; *s-* future, formed from the subjunctive of an *s-* aorist, Osc. *deivast*, "jurabit," *herest*, "volet," Umbr. *prupehast*, "piabit." *ferest*, "feret," Osc. *censazet*, "censebunt"; fut.-perfect in *-us-* (in reality a periphrastic formation made up of the perfect participle and the verb "to be") Osc. *dicust*, "dixerit," *fefacust*, "fecerit," *tribarakattuset*, "ædificaverint," *comparascuster*, "consulta erit," Umbr. *benust*, "venerit," *benurent*, "venerint." Taking up the dialects separately we have, then:

I. Latin-Faliscan Group.—(1) Latin. See article Latin Language.

(2) Faliscan, represented by a small number of short inscriptions (epitaphs). These show few peculiarities which can not be paralleled in early Latin, the occurrence of *f* in *loferta*, "liberta," in contrast to the Latin development of internal *dh* before *r* to *b*, being an exception.

II. Oscan-Umbrian.—(1) *Umbrian.* The material at our command for the study of Umbrian is more extensive than for any other Italic dialect outside of Latin. Aside from a few short inscriptions, this is found in the so-called Iguvinian tables, discovered in 1444 near the ruins of a theater at Gubbio (ancient *Igurium*, mediæval *Eugubium*). These are bronze tablets averaging 50 by 30 cm. in size, and were originally nine in number; but in the sixteenth century two of them were transported to the arsenal at Venice, and all trace of them lost. All but two of the tablets are inscribed on both sides, and the whole document contains between 4,000 and 5,000 words. Tables vi., vii., and a part of v. are in Latin characters, the others in the epichoric alphabet, also derived from the Greek, but through the medium of the Etruscan. The terms Old and New Umbrian are sometimes used, and there is no doubt that the portions in the Latin alphabet are of later origin (they probably belong to the early part of the first century B. C., those in the epichoric alphabet perhaps a century earlier), but one must not be misled into supposing too great a difference in the language. The variations are almost wholly orthographical. The contents of the tables consist of the acts of a certain corporation of priests calling themselves the Atiedian Brothers, and, like the Roman *Acta Arvalium*, are made up of precepts for sacrifice, purification, taking of auspices, etc. The Umbrian dialect, while sharing in the special characteristics of the Oscan-Umbrian group, shows many secondary developments, some of them similar to those which took place in Latin within historical times. Such are the reduction of diphthongs to monophthongs, rhotacism, and loss of final *d*. Characteristic of Umbrian are further assibilation of *k* before light vowels as in *fašia* = Osc. *fakiiad*, Latin *faciat* (cf. Romance), change of intervocalic *d* to a sound represented in Latin alphabet by *rs*, in the epichoric by a special sign transcribed *đ* or *ř*, as in *piři*, *pirsi* = *pid-ī*, Lat. *quid* + *ī*; change of gutturals + *t* to *it*, *aitu* = Osc. *actud*, "agito," *kuveitu*, "convehito"; *f* for *ns* in acc. plur., *eaf*, "eas"; cf. Marruc. *iaf*. The following sentence may serve as an example of Umbrian: *arfertur pisi pumpe fust eikvasese Atiieřier, ere ri esune kuraia, prehabia pire uraku ri esuna si herte, et pure esune sis.* "Flamen qui quomque erit pagis Atiediis, is rei divinæ curet, præhibeat quidquid ad illam rem divinam sit oportet et qui in divino sint."

(2) *Oscan.*—The remains of this language are found in Samnium (inclusive of the Frentani and Hirpini), Campania, Northern Apulia, Lucania, Bruttium, and in Sicilian Messana from the period after its occupation by the Campanian "Mamertines." These are precisely the regions which we know were occupied by Samnitic stems, and it is clear that we have to do with the language of the Samnites. In calling this language Oscan rather than Samnitic we are following the usage of the Latin authors, as when Livy relates how in one of the *Samnite* wars the Roman consul sent out spies who were acquainted with the *Oscan* language. This usage is to be attributed mainly to the fact that the Oscans of Campania were the first people speaking the language in question with whom the Romans came in contact. But aside from this, the Oscans were far more advanced in civilization than the Samnites of the mountains, and if, as many believe, an Oscan literature once existed, it must have taken its rise and found its standard of expression in Campania. In this case the designation Oscan would have more than an incidental foundation.

As the Samnite people was Rome's only contestant for the hegemony of Italy, so their language was at one time the most widely spoken of all the Italic dialects, and speculations as to the result of a Samnitic victory upon Italy and the world are scarcely less interesting from a linguistic than from an historical standpoint. The Romans knew more of Oscan than, for example, of Umbrian, and the well-known remark attributed to Ennius, himself a native of Calabria, that he had three souls since he could speak Greek, Oscan, and Latin, seems to imply that Oscan was regarded as something more than a mere *patois*. The two hundred odd inscriptions, which, together with the glosses of Roman grammarians and lexicographers, represent all that is left us of the Oscan dialect, range in date from the second half of the fourth century B. C. to the second half of the first century A. D., and in provenience over the territory already named. Three alphabets are in use: the epichoric (like the Umbrian, derived from the Greek through the Etruscan), the Latin, and the Greek. Of these inscriptions four are of considerable length. These are:

(*a*) The Cippus Abellanus, inscribed on both sides with

the terms of an agreement between the two cities of Nola and Abella in regard to a certain sacred precinct owned in common. The stone was found in 1685, and is now preserved in the so-called seminary at Nola. (*b*) The dedicatory inscription of Agnone, a bronze tablet found at Agnone and now in the British Museum. (*c*) The Curse of Vibia, a leaden roll found at Capua in 1876. This is an execration such as are frequently found in graves where they have been placed in order to make the curse, or devotion to the avenging gods of the lower region, more effective. (*d*) The Tabula Bantina, a fragment of a bronze tablet, found near the site of Bantia in 1793. The inscription, of which perhaps not more than a sixth is preserved, consists of a decree in regard to municipal government. The other side of the stone contains a Latin inscription, but it is uncertain whether or not we have to do with two versions of the same law.

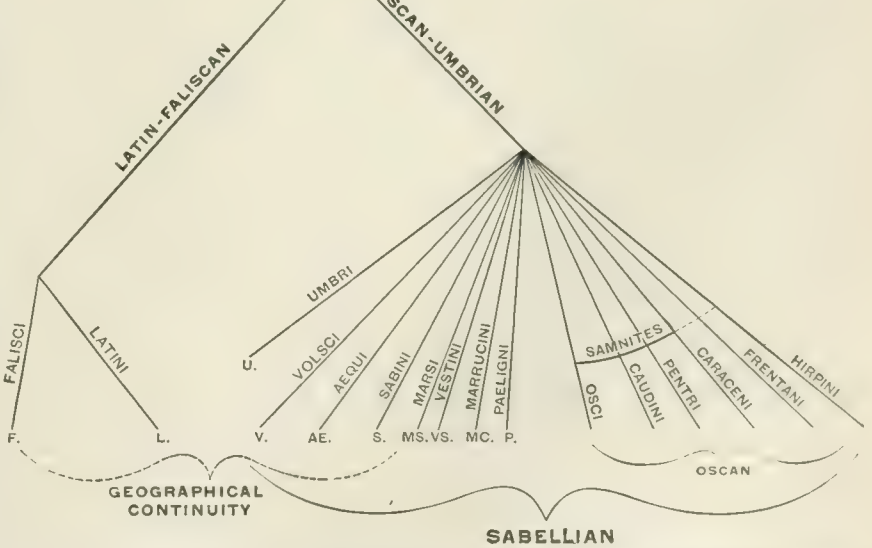
Next in importance to these four monuments are a series of road-makers' tablets and dedications found at Pompeii, and the "jovilæ" inscriptions found at Capua. Coins with Oscan legends are numerous, and among them are the earliest remains of the language. Notwithstanding its inferiority to Umbrian in amount of material, Oscan is of all the Italic dialects the most important to the philologist. In relative antiquity it is to the Italic branch what Gothic is to Germanic and Old Bulgarian to Slavic. In conservatism and transparency its vowel system is rivaled by the Greek alone in the whole Indo-European field.

Diphthongs are preserved intact in all positions (cf. dat. abl. pl. in *-ais*, Greek *-αις*, *kerssnais*, "cenis," *deivinais*, "divinis," dat. abl. pl. *-ois*, Greek *-οις*, *lígatúis*, "legatis," *nesimois*, "proximis," loc. sg. in *-ei*, Greek *οἴκει*, *múiníkeí tereí*, "in communi territorio," gen. sg. of *u*-stems, *castrovs*, "fundi," Goth. *sunaus*, Skr. *sūnos*, further *deicum*, "dicere," Gr. *δείκ-νυ-μι*, *úíniveresím*, "universim," Old Latin, *oino-*, *oeno-*), the weakening of vowels in unaccented syllables is, with certain possible limitations, unknown, as also in Umbrian (cf. *Anterstatai*, "Interstitae," Umbr. *antakres*, "integris"), and the finer nuances of pronunciation are expressed by a highly developed and consistently employed orthographical system. The qualitative difference between long and short vowels (except the *a*-vowels), a difference which the Romance languages show to have existed in Latin, is more marked in Oscan than elsewhere. Short *e* is denoted by the *e*-character, but the long *e* has become so close in pronunciation as to be represented by the *i*-character, in the epichoric alphabet by that particular *i*-character (*i*) which denoted the open *i*-sound as contrasted with the character denoting the close *i*-sound (= *i*, *e*, *ī*). So, too, long *o* is regularly denoted by *u*, not *o*, or by *ú*. Contrast *estud* (Lat. *estō*) : *ligud* (Lat. *lēge*); *púd*, *pod* (Lat. *quod*): *estud*, *líkítud* (Lat. *licētō*, cf. Gr. *-τω*, Skr. *-tād*); *píd* (Lat. *quid*) : *ímad* (Lat. *īmu-s*).

The following sentence from the *Cippus Abellanus* illustrates many of the characteristics of Oscan: *Avt púst feihúis, púz físnam amfret, eísei terei nep Abellanúis nep Núvlanúis pídum tríbarakattins.* "At post fines, qui fanum ambiunt, in eo territorio neque Abellani neque Nolani quidquam ædificaverint."

(3) *The Intermediate Dialects.*—(The "Sabellian" dialects and the Volscian.) In Central Italy, midway between the Umbrians and the Samnites, dwelt the small stems of the Picentes, Vestini, Marrucini, Paeligni, Marsi, Sabini, Aequi, Hernici, and Volsci. Of their dialects the Paelignian is the best known, being represented by some two dozen inscriptions. It shows a very striking similarity to Oscan, even in cases where the point in question is a departure from, rather than a retention of, the original (as the development of the anaptyptic vowel between liquids and following consonant, Pael. Helevis, Osc. Helleviis "Helvius"). But variations from Oscan are not wanting. The dialect of the Marrucini is represented by one well-preserved inscription and a fragment. This, too, is more closely related to Oscan than to any other dialect, but in acc. plur. *iaf* "eas" agrees with Umbrian (*eaf*) rather than with Oscan (cf. *viass*, "vias"). Volscian is known through only one inscription, the bronze of Velletri. It shows a number of secondary changes, such as monophthongization of diphthongs, loss of final *d*, assibilation of *k* before light vowels, which give it a stronger similarity to Umbrian than to Oscan. The Marsian and Vestinian dialects also have the diphthongs no longer preserved. Of the other dialects even less is known, either because of total lack of material or of palpable Latin influence in the little we have.

The Roman historians ascribe a Sabine origin to several of these central stems as well as to the Samnites, and certain it is that the names *Sabīnī*, *Sabellus*, and *Samnium* are only different formations of the same stem (*Sabīnī* from **Safīnoi*, *Sabellus* from *Saf-no-lo-s*, *Samnium* from *Safnio-m*; Osc. *Safinim* belong with either **Safīnoi* or **Safnio-m*). The dialect of the Paeligni, one of the stems to which a Sabine origin is expressly attributed, offers, as has already been noted, the closest resemblance to the language of the Samnites. The term Sabellian has been used in modern times as a general name, sometimes for the four stems of the Paeligni, Marrucini, Vestini, and Marsi, sometimes for all the smaller stems with the exception of the Volscian. From an historical or linguistic standpoint the Samnites and their language have an equally valid right to the name Sabellian, and it would be strictly proper to speak of Oscan as one of the Sabellian dialects. It is only owing to the superior importance of the speech of the Samnitic tribes that it is given a place by itself. Again, there is no sufficient reason for singling out the Volscians as non-Sabellian and giving their dialect a place by itself. We find no direct reference to their Sabine connection, but this is equally true of other stems which are included under the term Sabellian, and as for the divergence of the dialect from Oscan it was little greater than in the case of Marsian, as far as we can judge from the scanty material. True conservatism would seem to consist, then, in classing Volscian with the other intermediate dialects, hoping that increased material will throw light upon this as well as the others. The following scheme, though inadequate as all such devices must be, may serve to illustrate the interrelations of the Italic dialects:



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Pauli, *Die Veneter* (Leipzig, 1891); Conway, *The Italic Dialects* (in preparation; to contain texts, commentary, and vocabulary); Deecke, *Die Falisker* (Strassburg, 1885); Aufrecht und Kirchhof, *Die umbrischen Sprachdenkmäler* (1849-51); Bréal, *Les Tables Eugubines* (Paris, 1875); Bücheler, *Umbrica* (Bonn, (1883); Mommsen, *Die unteritalischen Dialekte* (Leipzig, 1850); Zvetaieff, *Sylloge inscriptionum Oscarum* (Leipzig, 1878); *Inscriptiones Italiæ mediæ dialecticæ* (Leipzig, 1884); *Inscriptiones Italiæ infimoris dialectæ* (Moscow, 1886); von Planta, *Grammatik der Oskisch-Umbrischen Dialekte* (vol. i., Strassburg, 1892); Buck, *Vocalismus der oskischen Sprache* (Leipzig, 1892); Bronisch, *Die oskischen I und E Vocale* (Leipzig, 1892).

CARL DARLING BUCK.

Italy: a kingdom of Southern Europe, comprising the peninsula of the same name, together with Sicily, Sardinia, and several smaller islands. The peninsula lies between about 38° and 46° 40′ N. lat., and between 6° 35′ and 18° 35′ E. lon.; projecting in a boot-like form into the Mediterranean between the Tyrrhene and Adriatic Seas, from N. W. to S. E., and united to the continent by the basin of the Po; lying between the northern extremities of these two seas and the semicircle of the Alps. On the mainland the boundaries of the kingdom are—on the N., a line considerably to the S. of the Central Alps, which separates it from Switzerland and the Austrian Tyrol; on the E., the Eastern Alps, separating it from the Austrian provinces of Carinthia and Carniola and the Adriatic Sea; on the S., the Ionian Sea; on the W., the Tyrrhene and Ligurian Seas, and the Western Alps, which, together with the lower course of the Var, separate it from France. The length of the peninsula is 718 English miles, and its breadth varies from 90 to 350 miles. The total superficies of the kingdom is 110,623 sq. miles. The greatest length from N. W. to S. E. is between Mont Blanc in the Pennine Alps and Cape Spartivento in Calabria; the greatest breadth in the continental portion, from W. to E., is between the Cottian and the Julian Alps, and following the curve of the Alpine chain from Monte dello Schiavo on the Mediterranean and the Bittoray on the Adriatic. In the peninsula itself the greatest breadth is between Monte Argentario on the Tyrrhene Sea, and the promontory of Ancona on the Adriatic.

Physical Features.—Seas.—Italy and her islands are washed by five seas forming distinct arms of the Mediterranean: (1) The Ligurian Sea, between Liguria, Corsica, Sardinia, France, and Spain; (2) the Tyrrhene or Lower Sea, between the peninsula, Corsica, Sardinia, and Sicily; (3) the African or Libyan Sea, between Sardinia, Sicily, and Africa; (4) the Ionian Sea, between Italy, Sicily, and Greece; (5) the Adriatic or Upper Sea, between Italy and the dominions of Austria-Hungary and Turkey. The deepest portions of these seas are, as a rule, those which are not included between the Italian peninsula and its islands, a depth of over 1,700 fathoms being attained at a short distance W. of Sardinia, and over 2,100 fathoms S. E. of Sicily; but there are also parts of the Tyrrhene Sea, between Sardinia, Naples, and Sicily, where the depth exceeds 2,000 fathoms. Sardinia and Corsica are connected with the mainland by a shallow bank, and the Adriatic attains only a depth of 765 fathoms in its southern portion, while the northern two-thirds of its extent are under 100 fathoms, and the deposits of the Po have within historical times silted up and filled many ancient harbors, such as those of Classis, near Ravenna, and Adria, now some 15 miles from the sea. The Italian seas have always been renowned for their azure color, and the phosphorescence of the water is remarkable. See MEDITERRANEAN SEA.

Coast-line.—The coast-line of the peninsula is 2,272 miles long, and that of the islands 1,944 miles. On the extreme west boundary are Cape Bordighera, the roadstead of San Remo, and the port of Oneglia. From the roadstead of Vado and the port of Savona to Genoa the entire line of coast resembles a continuous shipyard, in which hundreds of vessels are frequently on the stocks at the same time. Genoa has a spacious artificial harbor of about 320 acres. Along the Reviera di Levante the coast is rugged and almost destitute of harbors or anchorage. Beyond the beach of Levanto the chief features are small bays, rugged rocks and cliffs, forming a picturesque but dangerous coast-line, extending to the Gulf of Spezia, which, by the construction of a breakwater, has been transformed into a vast roadstead, and has become a great naval arsenal. The Ligurian coast is succeeded by long stretches of sand on the North Tuscan shore. S. of the stretch which contains the shallow roadstead of Leghorn are the fever-stricken coasts of the Tuscan Maremma, where are Port Baratto, the harbor of Piombino, the large basin of Grosseto, the lagoon of Orbetello, and the harbors of Santo Stefano and Port Ercole. The next large harbor is that of Civita Vecchia, on the Roman seacoast, formed by the alluvium of the Tiber. The Neapolitan seacoast begins at the Gulf of Gaeta, 25 miles below which is the beautiful Bay of Naples, with the islands of Ischia and Capri, and next to it in importance as a harbor is the Gulf of Salerno. The Gulfs of Policastro, Santa Eufemia, and Gioja follow; then the Straits of Messina separates Sicily from the mainland, and at Reggio di Calabria the Ionian Sea begins. The Gulf of Squillace terminates at Cape Rizzuto, close to which the vast Gulf of Taranto opens. On turning the "heel" of Italy the Adriatic Sea is entered, with the harbor of Otranto, the Bay of Brindisi, the roadstead of Barletta, and the Gulf of Manfredonia. At Comacchio is an immense pool, 164 miles in circumference, and only from 3 to 6 feet deep, where the famous lagoon fisheries are carried on. The morasses of Aquileia and Grado terminate the political confines of the kingdom on the E. Sicily has three capes and six bays and gulfs of importance, the chief of the latter being Catania and Palermo. Sardinia has five capes, five important gulfs, and the Straits of Bonifacio, which separate the island from Corsica, to which belong two capes and the important Gulf of Ajaccio.

Mountains.—The mountains naturally fall into three divisions: the Alps, the Apennines, and the Sardo-Corsican chain. The Alps constitute a chain of about 700 miles in length, a great portion of which forms the political frontier on the N. The Maritime Alps are almost entirely Italian, and after them the Cottian and the Graian Alps form the boundary. In the central chain, the Pennine Alps extend as far as the Simplon Pass. Here begin the Helvetian or Lepontine Alps, of which the chief peak, Mt. St. Gothard, lies entirely in Switzerland, but the frontier rejoins the central ridge at St. Bernardino and Splügen Passes. The Phœtian Alps then form the boundary as far as the Oertlerspitze; the frontier then again leaves the central ridge of the Phœtian chain on the N., and, passing through the head of Lake Garda, follows the Tridentine Alps, bending to the N. E. In the Eastern chain, the Carnic Alps are in part Italian. (See ALPS.) The Apennines are entirely Italian. They are about 800 miles in length, and divide Italy into two great slopes, western and eastern. The Northern Apennines or Ligurian Alps follow the curve of the coast-line as far as the valley of the Magra, where they throw off an isolated group, higher than the main chain, called the Apuan Alps or Carrara Mountains; they then trend inland as far as Monte Cimone. The Central Apennines run thence as far as Monte Velino, in a latitude little N. of that of Rome, throwing off the sub-Apennine spurs of Tuscany and Latium. The Southern Apennines begin at Monte Velino and extend to the extremities of the peninsula, dividing themselves into an eastern and a western branch, the latter of which may be said to prolong itself throughout Sicily, this including Mt. Etna. (See APENNINES.) The Sardo-Corsican chain, parallel with the Apennines, rises in Sardinia to a height of 6,250 feet, and in Corsica, at Monte Conto, to nearly 9,000 feet.

Lakes.—There are two very distinct groups of lakes belonging respectively to the Alpine and the Apennine systems. The Alpine lakes are those usually known to tourists by the name of the Italian lakes, and are famous for their beauty. The most important are: Lake Maggiore, 38 miles long, with extreme breadth of 6 or 7 miles, and of unascertained depth; Lake Lugano, between Maggiore and Como, 14½ miles long and of irregular shape; Lake Como, considered the most beautiful of the inland waters, 30 miles long, with extreme breadth of 2¼ miles; and Lake Garda, drained by the Mincio, 38 miles long, and from 2 to 12 miles wide. The Apennine lakes are usually craters of extinct volcanoes, and include those of Trasimeno or Perugia, Bolsena, Bracciano, Fucino (which was the largest, but about half its former surface has been drained away), Albano and Nemi (near Rome), and Averno (near Naples).

Rivers.—The Po is the greatest of the rivers, its length being 417 miles, including the chief windings. It rises on Monte Viso, crosses Piedmont, divides Lombardy and Venetia from Emilia, and falls into the Adriatic by two mouths, 15 miles apart, and several subsidiary channels, forming a delta of 20 by 25 miles. The Po is navigable for small boats as far up its course as Turin, and for vessels of 900 quintals burden below its confluence with the Ticino. Its waters are always turbid, owing to the vast quantity of earth which

ROME
SWITZERLAND
LOMBARDY
EMILIA
TUSCANY
LIGURIAN SEA
SARDINIA
TYRRHENIAN SEA
MEDITERRANEAN SEA
IONIAN SEA
BOSNIA
HERZEGOVINA
MONTENEGRO
ITALY

they carry with them. Of the many tributaries of the Po, the chief are the Dora Riparia, the Dora Baltea, Sesia, Ticino, Adda, Oglio, Mincio, Tanaro, Trebbia, Parma, Enza, Panaro, and Reno. The tributaries of the Ionian Sea are not of great importance, and include the Bradano, Basenta, Agri, Sinno, and the Crati. The tributaries of the Western Mediterranean include the Roja on the frontier, Magra, Serchio, Arno (which is 140 miles long and is swollen by the Chiana, Sieve, Greve, Elsa, and other streams), Omborne in Tuscany, Tiber, which is about 220 miles long, Garigliano, Volturno, and the Sele.

Geology.—The Alpine region is one of the greatest geological interest, as these mountains have undergone repeated upheavals and submersions. The central ridges are usually of granite, gneiss, schist, and other crystalline rocks of every geological age from the Archæan down to the older Tertiary. In the Apennines, also, the rocks are of various periods, from the Palæozoic to the Post-Pliocene; the great mass of the range may be said to consist of limestone and marls, largely overlaid and flanked by more recent deposits. The marbles of Carrara belong to the Liassic and Oolitic periods. The Central Apennines consist of a main ridge of secondary rocks with offshoots and lower ranges formed of Tertiary deposits. Toward the S. are great masses of ferruginous limestone and hippuritic chalk. In the lower ranges of the Apennines fossils are abundant, especially in the S. The mountains of Calabria are chiefly of granite and gneiss. The most noteworthy geological feature is the volcanic system, divided into four districts: (1) The small group of the Euganean Hills near Padua, of which Monte Venda, 1,806 feet, is the highest point; (2) the Roman district, of considerable extent, including the Alban Hills with some other groups, attaining at Monte Amiata a height of 5,650 feet, and inclosing the lakes of Bolsena, Albano, Nemi, and others; (3) the neighborhood of Naples with the Phlegræan Fields and Vesuvius, the only active volcano on the continent of Europe, over 4,000 feet high; (4) Monte Voltore in Apulia. In the Lipari islands is Stromboli, in perpetual eruption, and in Sicily the enormous mass of Mt. Etna, 10,935 feet high, with a base 112 miles in circumference. The marbles are famous, especially the statuary marble of Carrara, but the sea-green of Bocchetta, the gold-veined of Porto Venero, the jasper of Barga, the green marbles of Tuscany, the black of Pistoia, the lapis-lazuli and the yellow of Siena, are noted for their beauty. Alabaster is abundant in Tuscany. There is a total absence of good coal; lignite, however, is found. The iron of Elba is of the highest quality; lead is found in Sardinia and copper in Tuscany, and there are small veins of other metals.

Climate.—The geographical position is such as to render it obvious that the climate must be one of the warmest in Europe; nevertheless, there are considerable variations in the temperature, and a very notable circumstance is that the comparative latitude has far less to do with the average of heat than have the local conditions, such as the proximity of the sea or of the great mountain ranges, and the prevailing winds. Practically, the climate of the Lombard plain, of the mountain heights, and of the more northerly Adriatic shores, is in winter not unlike that of Central Europe; while that of Southern Italy and Sicily has many points of resemblance with the climate of Northern Africa. In January the thermometer sometimes falls to zero at Turin, while at Catanzaro the lowest figure is 26°. At Udine the annual mean is about 56° F.; at Syracuse about 65°. In July the heat is generally great, and in Apulia it has been known to rise to 109° F. The coast of the Riviera of Genoa, though relatively northern, enjoys the same warm climate as the shores of Southern Italy, while the mountains of the Abruzzi in the S. are in winter subject to excessive snowfall and bitter cold. In the N. the *tramontana* wind, passing over the Alps, chills in winter the plains even of Central Italy, while the mistral blows along the shores; on the other hand, the stifling, sand-laden sirocco from Africa is of scorching heat, and does not lose its evil effects until it reaches the upper Apennines. October is almost universally the rainy month. Malarial fevers are a most serious feature in many parts of the country, notably in the Tuscan Maremma, in the Roman Campagna, and in Calabria, but in many places drainage operations are gradually reclaiming districts for centuries depopulated.

Flora and Fauna.—The flora of the higher Alps is of an almost Arctic character, yet the jonquil and columbine are found wild in abundance on the lower slopes. In the upper Apennines the chestnut abounds; on the more southerly slopes, the olive. The edible pine grows along the coasts of Tuscany, and the vine is cultivated almost everywhere. On the Riviera, as in Southern Italy, oranges, citrons, and date-palms are grown successfully in the open air; farther to the S. rice is cultivated, and maize is abundant; the fig is grown almost everywhere. In Southern Italy the flora gradually changes its character, and the cactus and the Indian fig grow wild. The mulberry and the watermelon are among the valuable products of Central and Southern Italy. The wolf, wild boar, lynx, wildcat, and the fox are found in various parts of the country, and the mouflon in Sardinia. In the N. the birds are those of Central Europe, but more to the S. are found the vulture, pelican, flamingo, and ibis. Fish are fairly abundant in the rivers, while in the sea the anchovy, mackerel, sardine, and tunny fisheries are of great importance. The chief fishing-grounds are off the coasts of Sicily, Istria, Dalmatia, and Tunis. Coral is gathered off Sicily, and is worked principally at Naples, Leghorn, and Genoa.

Divisions, Area, and Population.—There are naturally three sections: (1) The Northern, which is the strictly continental portion—that is, Venice, Lombardy, Piedmont, and Liguria; (2) The Central, including about half of the peninsular portion, with the ancient Etruscan, Umbrian, and Latin territories, with Corsica (politically French), the Tuscan archipelago (Ceba, Capraia, Gorgona, and Giglio), and the Tonga islands; (3) The Southern, including the Samnite, Apulian, and Calabrian districts, with Sardinia and Sicily, the islands of the Bay of Naples, the Lipari group, Malta (politically British), and the Tolmiti islands in the Adriatic. The kingdom is politically divided into 69 provinces, subdivided into 197 circuits, and 87 districts (the latter being the name adopted in Venetia and at Mantua), which together comprehend 8,254 communes or townships. The 69 provinces are usually grouped into 16 compartments, though this grouping is now no longer officially recognized. The following is a table of the population according to the last census (1881), and as officially estimated on Dec. 31, 1892 (no census having been taken in 1891), and of the area as determined by a government survey:

PROVINCES AND COMPARTMENTS.	Population, 1881.	Estimated population, 1892.	Area in sq. miles.
Alessandria	729,710	780,333	1,950
Cuneo	635,400	655,455	2,882
Novara	675,926	737,721	2,553
Turin	1,029,214	1,097,479	3,955
Piedmont	3,070,250	3,270,988	11,340
Genoa	760,122	816,394	1,582
Porto Maurizio	132,251	142,200	455
Liguria	892,373	958,594	2,037
Bergamo	390,775	417,196	1,098
Brescia	471,568	489,438	1,845
Como	515,050	559,745	1,091
Cremona	302,138	305,899	695
Mantua	295,728	308,974	912
Milan	1,114,991	1,247,166	1,223
Pavia	469,831	497,238	1,290
Sondrio	120,534	131,605	1,232
Lombardy	3,680,615	3,957,261	9,386
Belluno	174,140	176,097	1,293
Padua	397,762	437,703	823
Rovigo	217,700	238,274	685
Treviso	375,704	403,519	960
Udine	501,745	525,802	2,541
Venice	356,708	379,254	964
Verona	394,065	425,697	1,188
Vicenza	396,349	436,538	1,052
Venetia	2,814,173	3,022,884	9,476
Bologna	457,474	486,059	1,448
Ferrara	230,805	249,488	1,032
Forlì	251,110	271,260	725
Modena	279,254	287,462	987
Parma	267,306	272,049	1,250
Piacenza	226,717	229,039	954
Ravenna	225,764	237,178	715
Reggio Emilia	244,959	244,812	876
Emilia	2,183,391	2,268,582	7,907
Perugia (Umbria)	572,060	597,930	3,748
Ancona	267,398	272,925	762
Ascoli Piceno	209,185	216,201	796
Macerata	234,513	242,756	1,087
Pesaro and Urbino	223,043	234,526	1,118
Marches	939,279	966,408	3,763

PROVINCES AND COMPARTMENTS.	Population, 1881.	Estimated population, 1892.	Area in sq. mile
Arezzo	238,744	243,340	1,273
Florence	790,776	817,980	2,265
Grosseto	114,295	122,291	1,738
Leghorn	121,612	124,902	133
Lucca	284,484	289,053	558
Massa and Carrara	169,469	179,562	687
Pisa	283,563	304,268	1,179
Siena	205,926	207,351	1,471
Tuscany	2,208,869	2,288,747	9,304
Rome (Latium)	903,472	994,400	4,663
Aquila degli Abruzzi	353,027	377,068	2,484
Campobasso	365,434	378,593	1,691
Chieti	343,948	349,290	1,138
Teramo	254,806	265,017	1,067
Abruzzi and Molise	1,317,215	1,369,968	6,380
Avellino	392,619	412,242	1,172
Benevento	238,425	245,834	818
Caserta	714,131	736,960	2,033
Naples	1,001,245	1,115,007	350
Salerno	550,157	568,541	1,916
Campania	2,896,577	3,078,584	6,289
Bari delle Puglie	679,499	773,080	2,065
Foggia	356,267	397,305	2,688
Lecce	553,298	626,960	2,623
Apulia	1,589,064	1,797,245	7,376
Potenza (Basilicata)	524,504	541,865	3,845
Catanzaro	433,975	460,029	2,030
Cosenza	451,185	465,842	2,568
Reggio di Calabria	372,723	395,167	1,221
Calabria	1,257,883	1,321,038	5,819
Caltanisetta	266,379	312,904	1,263
Catania	563,457	648,761	1,917
Girgenti	312,487	340,534	1,172
Messina	460,924	509,587	1,246
Palermo	699,151	801,204	1,948
Syracuse	341,526	401,224	1,442
Trapani	283,977	350,726	948
Sicily	2,927,901	3,364,940	9,936
Cagliari	420,635	453,839	5,204
Sassari	261,367	282,575	4,090
Sardinia	682,002	736,414	9,294
Totals	28,459,628	30,535,848	110,623

The estimated population Dec. 31, 1892, of the principal cities and towns was: Naples, 532,500; Rome, 440,000; Milan, 426,500; Turin, 330,000; Palermo, 273,000; Genoa, 212,500; Florence, 197,500; Venice, 149,500; Bologna, 141,500; Messina, 141,000; Catania, 119,000; Leghorn, 104,000.

Religion.—The religion of practically the entire nation is the Roman Catholic. The Albanians in the S. follow the Greek rites. There is entire religious freedom. The monasteries, once very numerous and wealthy, have been suppressed and their property has been taken by the state. By decrees and statutes of 1870 and 1871, the supreme pontiff is declared to be an independent sovereign prince, his person is sacred, and his residences inviolable, the latter consisting of the Vatican and Lateran palaces and the villa of Castel Gandolfo. The law of guarantees also assigned to the pope a yearly income of 3,225,000 lire ($645,000), which, however, neither Pius IX. nor Leo XIII. would accept. There are 49 archbishoprics and 221 bishoprics, besides 6 cardinal-bishops (those of Ostia, Porto, Sabina, Albano, Palestrina, and Frascati).

Education.—Elementary instruction is provided in at least one lower-grade school in every commune, and communes of over 4,000 inhabitants must have a higher-grade school as well. Secondary classical instruction is given in the 733 *ginnasi* and 310 *licei* (gymnasia and lycei), of which the latter leads to the universities; and secondary technical instruction in 397 technical schools. Higher education is provided for by high institutes and schools and by the universities, of which there are twenty-one; the state universities of Bologna, Cagliari, Catania, Genoa, Macerata, Messina, Modena, Naples, Padua, Palermo, Parma, Pavia, Pisa, Rome, Sassari, Siena, and Turin, and the free universities of Camerino, Ferrara, Perugia, and Urbino. Many of these are of small importance. The most numerously attended universities are those of Naples, Turin, Rome, Bologna, Palermo, Padua, and Pavia. The Institute of Superior Studies at Florence, among others, is a university in all but name. The great public libraries are those of Turin, Milan, Naples, and Florence, but there are twenty-eight others under state management. In 1891 there were 10,311 books published in Italy, and 1,779 periodicals of all kinds.

Occupation and Social Conditions.—Agriculture is the main source of sustenance for the lower classes, and employs almost one-third of the population, while about one-sixth are engaged in manufactures. The poverty of a great portion of the people is deplorable, and pauperism a serious evil. The average wage of an agricultural laborer has been calculated at about one lira (nineteen cents) a day; that of an artisan at about double that sum. The poorer classes very rarely eat meat, their food consisting chiefly of bread (often made of maize, barley, rye, or chestnuts), vegetables, and the various preparations of flour known as paste, of which macaroni is the most general. There are villages in the Abruzzi where acorns are a main article of diet. Maize is chiefly eaten in the N., especially in the form of *polenta*; the use of unripe and often decaying maize, together with the effects of insufficient food, produces a terrible disease called *pellagra*, to which the poor are very subject. The less important towns are frequently very ill provided with sanitary arrangements, but great improvement has taken place in the large cities. The Italians are sober, industrious, and thrifty; they are, however, of a passionate nature, and the number of homicides per 100,000 of the population is nearly twenty times as great as in England. Crimes of violence are also prevalent, especially in the S., where brigandage still exists, notably in Sicily. Capital punishment has been abolished.

Emigration.—The emigration is considerable, and amounted in 1892 to 223,667, of which about half is described as temporary, but many of those thus classified do not return: thus in 1891 only 60,710 Italians re-entered Italy from abroad, while the same year 69,297 landed in the U. S., and 116,561 in Brazil. There are altogether about 2,000,000 Italians in foreign countries (1891), of which the Brazilian colony (554,000) is the largest; the U. S. come fourth in the list with 286,000.

Agriculture.—Agriculture is of the highest importance to the nation, and it is, moreover, of an extremely varied character; yet it is not advanced in its methods, though improvements are being gradually introduced. Of the area 86⅕ per cent. is productive, the chief agricultural districts being (1) the plain of the Po, which is very fertile and well cultivated; (2) the Apennine slopes and valleys, the region of the olive and, in a minor degree, of the chestnut; and (3) the pasture lands, both of mountain and plain, the latter being often interspersed with rice-fields and marshes, the chief causes of malaria. Of cereals, wheat, maize (*gran turco*), rye, barley, oats, and rice are the chief, but the produce is seldom sufficient for exportation. To these may be added chestnuts, potatoes, and other vegetables. The vine is cultivated everywhere, though with varying success. The wines, formerly exported only for purposes of adulteration, now command a large and increasing market of their own. The olive comes next in point of importance, and the oil of Lucca is reputed the best known. Oranges and lemons are extensively cultivated and exported. The cultivation of the mulberry-tree for the purposes of silk culture is also considerable. The yield from the forests, including timber, charcoal and secondary products, exceeds in value 88,000,000 lire. Hemp, cotton, and tobacco are also grown, and in the pastures there were enumerated in 1890 about 5,000,000 cattle, 6,900,000 sheep, 1,800,000 goats, and the same number of swine. Cheese, especially the Parmesan and Gorgonzola varieties, is extensively exported. The following figures give the produce for 1891 of four of the principal agricultural crops: Wheat, 49,852,468 hectoliters; maize, 25,538,542; wine, 36,992,135; olive oil, 2,739,554.

Industries and Manufactures.—The most important industry is the production of silk, in which the country is second to China alone. Silk-worms in 1890 were being reared in 5,246 communes, the work employing 174,440 persons. The total weight of cocoons produced in 1891 was 85,494,748 lb. In silk-weaving, however, Italy does not hold so high a position. Lombardy, and especially the town of Como, is the chief center of this industry. Taking the silk-trade generally, in 1892 the excess of exports over imports amounted in value to 218,928,378 lire. Cotton is the next important industry; the civil war in the U. S. gave it an impetus, but it has since greatly declined. The goods produced are chiefly of the coarser descriptions. There is a

considerable wool industry, especially in the N., but it is not sufficient for home consumption. Jute, flax, hemp, and linen are also largely manufactured, but in textile industries generally the hand-loom is still predominant. The mineral products give rise to some important industries, the total produce of 1891 being 1,222,131 tons, valued at 79,890,726 lire, and giving employment to 58,453 persons. There is a large manufacture of the simpler kinds of machinery, but much of the more complex work is imported. Of much interest to the lover of art are the glass and mosaic industries of Venice, the ceramic wares of Ginori at Florence, and those of Faenza; the mosaic work of Florence and that of Rome, and the various products of the jeweler's art. The coral-fisheries are of great importance; the trade in straw hats is large; and the marbles are known all over the world.

Government.—The form of government is that of a constitutional monarchy, hereditary in the male line, and is based upon the Sardinian Constitution of Mar. 4, 1848. The Parliament, which is quinquennial, consists of two chambers: (1) the Senate, of unlimited numbers, at present 390, formed of life members nominated by the king, at least forty years of age; (2) the Chamber of Deputies, 508 in number, of thirty years of age or over. Money bills must originate in the Chamber. The franchise is extended to all males twenty-one years of age who can read and write and who pay direct taxes to the amount of 20 lire, the method of election having been regulated by the laws of 1891 and 1892, which abolished the *scrutinio di lista* and substituted for it the *scrutinio uninominale*, the former method having been tried for ten years (law of 1882) and given unsatisfactory results. The persons entitled to vote in 1892 numbered 2,934,445, of whom 1,639,298, or 55·86 per cent., exercised the franchise. The Ultramontane Catholic party abstain from voting, their motto being "neither electors nor elected." The prefects or governors of provinces are government appointees, and so are the syndics or mayors of the smaller communes (under 10,000 inhabitants). Otherwise the elective system prevails generally, and local government is in the hands of provincial, municipal, and communal councils. There is complete freedom of the press.

Army.—Every citizen is liable to military service from the age of twenty to thirty-nine. This supplies an annual contingent of about 290,000 men, of whom 82,000 (to be increased to 95,000 by a law of 1891) pass into the first category, to serve for three years (four for the cavalry) with the colors, and to be liable to be called upon for six years further duty; they then pass into the active militia for four years and to the territorial militia for the last six years. The second category consists of the available men left over from those selected for the first line. They receive only a few months' training, but are liable for service in the permanent army for nine years, and then successively in the active militia for four and in the territorial militia for six. Those in the third category are subjected only to a few weeks' training, being exempted for various humane or necessary reasons; they can hardly be said to form a military class, except in cases of extreme need. The nominal strength of the army in 1893 was as follows: Permanent army, officers 19,453, troops 804,801; active militia, officers 6,096, troops 369,998; territorial militia, officers 9,925, troops 1,543,533; total, officers 35,474, troops 2,718,332. The army of the first line consists therefore of less than 650,000 men, but there is a large reserve to draw upon in the two classes of militia, which can supply 500,000 men of three years' service between them. The war effective in case of need would thus be about 1,500,000 men, with a further reserve of 500,000. The troops are armed with the Wetterly repeating rifle (Vitali system).

Navy.—The peculiar position and the extensive and exposed seaboard have necessitated a great expansion of naval power. The navy contains some of the largest ships afloat. In 1892 there were in the navy 15 first-class war-ships (146,000 tons displacement), all armored; 22 second-class, all but one of which were fully or partly protected; and 34 third-class war-ships, besides a very large number of torpedo-vessels, etc. The Italia and the Lepanto are 400 feet long by 74 broad, and have a mean draught of over 30 feet. They have most powerful engines (11,986 and 15,797 horse-power respectively), and attain a speed of from 17·8 to 18·4 knots. Each of these vessels cost more than 25,000,000 lire, and so will the Re Umberto, the Sicilia, and the Sardegna. The Duilio and Dandolo are most formidable vessels of the central citadel type, and probably superior to any other war-ships of that class. In 1893 the navy was manned by 11 vice-admirals, 17 rear-admirals, 190 captains, 377 lieutenants and sub-lieutenants, 863 other officers, and 17,871 men, besides 4,090 men employed on the coast service. There was an efficient reserve of 47,113 officers and men, bringing the war effective of the navy up to 70,532.

Finances.—The finances are not in a flourishing condition, and taxation is very heavy. The chief imposts are (1) direct taxes, on land, houses, and income; (2) indirect taxes, customs octroi, taxes on manufactures, the monopolies of salt and tobacco, and the lottery—these produced in the financial year 1891–92 the gross sum of 73,596,176 lire. The heaviest items in the national expenditure are the interest on the debt and the cost of the army and navy. The following are the figures for the financial year 1891–92: Revenue, 1,747,951,589 lire; expenditure, 1,796,090,394 lire; deficit, 48,138,805 lire. In the budget for 1893–94 the following figures were given: Revenue, 1,755,676,344 lire; expenditure, 1,753,058,303 lire; surplus, 2,618,041 lire. The great bank failures of 1892–93 and the disorders of Jan., 1894, seriously overcast the financial prospects.

The interest on the national debt amounted, July 1, 1893, to 594,672,180 lire; the sinking fund to 1,370,168 lire. The capital of the consolidated and redeemable debt in 1892 was 11,979,718,057 lire (about $2,395,943,611). Including the floating debt and the provincial and communal debts, the official indebtedness exceeded 14,055,000,000 lire.

Trade, Commerce, and Navigation.—The total imports in 1892 were to the value of 1,173,400 lire, the total exports 958,200,000 lire. The value of the imports from the U. S. and Canada (which are calculated under one head) was 78,800,000 lire, and that of the exports to the same countries 100,200,000 lire. The chief objects imported are cereals, silk, coal, and cotton; the main objects of export are silk, olive oil, and wine. The value of silk exported is about three and a quarter times that of the same material imported, and about five times that of olive oil, which stands next in the list of exports. The total number of ships entering Italian ports in 1892 was 121,099, tonnage 23,043,131, and there cleared 119,985 ships, tonnage 23,297,089. The mercantile marine consisted of 6,624 vessels, tonnage 811,264, of which 316 vessels, tonnage 201,443, were steamships. The registered seafaring population was 218,106.

Coinage and Weights and Measures.—The metric system is generally employed, and the names of weights, measures, etc., are the same as in France, excepting some slight differences in spelling (*chilogramma* = kilogramme; *ettaro* = hectare, etc.). The currency is based on the lira, which is the same as the French franc, and is worth about nineteen cents; it is subdivided into 100 centesimi. Paper money is very largely used (though there is no longer a forced currency), and there is a premium on gold.

Internal Communications.—There are few large rivers, and of these only a small number are navigable. There are, however, many canals for navigation as well as for irrigation. The length of the navigable canals is 435 miles. The most notable are the Canal Cavour in Piedmont and in Lombardy, the Grand Canal, and those of Pavia and Martesana. Venetia and Emilia are also well provided with canals, Tuscany fairly; in the south they are not numerous. The high-roads, national, provincial, and communal, have a length of nearly 80,000,000 km., and there are 10,000,000 km. in course of construction. In 1891 there were steam or electric tramways open for a length of 2,539 km. A considerable number of the railways belong to the state. The chief lines are the Mediterranean, Adriatic, Sicilian, and Sardinian. In 1893 (Jan. 1) there were 13,987 km. open. The following figures are for 1889: Number of passengers carried, 50,989,457; revenue, 254,748,017 lire; expenses, 168,394,065 lire. The great expenditure involved in the construction of these railways has been one of the main causes of the increasing national debt.

Foreign Possessions.—The colony of Eritrea consists of the African shore of the Red Sea from Cape Kasar, near Suakin, to the French possessions at Obock, on the Straits of Bab-el-Mandeb. The capital is Massowah, the best port in the Red Sea. The population of Eritrea is variously estimated at from 200,000 to 450,000. There are important pearl-fisheries, but the soil is not very productive, and the colony does not pay expenses. The African army consists of 189 Italian and 33 native officers, and of 1,906 Italian and 4,192 native troops. The kingdom of Abyssinia is within the Italian sphere of influence, and its foreign affairs are (by a treaty concluded in 1889) under the control of Italy.

(See Abyssinia.) Italian Somaliland is the African coast of the Indian Ocean from the mouth of the river Jub to 8° N. lat., with the back country as far as Abyssinia. The frontiers between the Italian and the British and Egyptian spheres were laid down by treaty in 1891. The area of Italy's foreign possessions is estimated at 316,100 sq. miles, and the population at over 5,500,000. By the treaty of 1872 the little Apennine republic of San Marino, 32 sq. miles in area, with a population of 8,000, placed itself under the protection of Italy.

History.—Of all histories that of Italy is perhaps the most difficult to compress, every city having its own special and illustrious story, and the histories of all the nations of Europe converging into that of this peninsula. It may be divided into four great periods:

I. *Conquest and Feudalism.*—The barbarians, having passed the confines of the empire, entered Italy; under Alaric they sacked Rome; under Attila they destroyed Aquileia, the fugitives from which founded Venice; under Odoacer they put an end to the empire (476), but Theodoric, King of the Ostrogoths, came from the Danube (489), vanquished Odoacer on the Isonzo, then at Verona, slew him at Ravenna, and founded (493) a monarchy, although it was stained by the blood of Boetius and Symmachus, and soon broken up by the Greeks under Belisarius and Narses (553). Under Alboin the Lombards descended from Pannonia (Hungary), and established the most lasting government which had existed in Italy since the downfall of the Roman Empire in the West (568–774); but they were Arians at first, and soon came into conflict with the popes. Summoned first by Gregory III., then by Stephen II., the French came into Italy under Pepin, who founded the states of the Church (754); then, invited by Adrian I., Charlemagne made war upon the Lombards under Desiderius, and put an end to their kingdom (774). In 800 Charlemagne was elected Emperor of the Romans and crowned by the pope. This restoration of the Roman empire was only apparent, as the vitality of the new Cæsarism was not Roman, but German and theocratic. On the death of Charlemagne his weak successors were unable to restrain the nobles and the clergy, and the feudal system was allowed to develop itself. Italy was first under the rule of Bernard, nephew of the great emperor, then of Louis, then of Lothair, then of Louis II., then of Charles II. the Bald, then of Carloman, and finally of Charles the Fat (879–888). On the dethronement of this last sovereign five or six Italian feudal lords laid claim to the power, but Berengarius I., Marquis of Friuli, prevailed over the rest (894). Under his reign, that of Hugh, Duke of Provence (926), and that of Berengarius II., Lord of Ivrea, Italy passed through one of the most unhappy periods of her history, being desolated by civil wars, invasions from Hungary and from the Saracens, corruption, and barbarism.

II. *The Communes and the Republics.*—Otho I. restored the Holy Roman Empire (962). The chief aims of his policy were to reduce the number and the authority of the vassal nobles; to favor the growth of the cities, the towns, and the municipal authority; to diminish the papal power—not by usurping the territory, but by undermining its moral influence, and by taking part himself in the pontifical elections. The communes, and first of all the maritime towns (Amalfi, Pisa, Genoa, Venice), profited by this disposition to organize a free government. The bitter conflicts between the papacy and the empire, having reached their height under Gregory VII. (1073–85) and Henry IV., brought upon Italy the curse of the Guelph and Ghibelline factions. Representing the imperial principle against republicanism, Frederick Barbarossa descended into Italy (1154), besieged and took Tortona, was crowned King of Italy in Pavia, assisted Pope Adrian IV. to crush Arnold of Brescia, received in reward the imperial crown, and returned into Germany. But the pope soon broke away from the imperial alliance, and Frederick crossed the Alps again (1158), took Brescia, besieged Milan for the first time, established his magistrate under the name of *podestà* in every province, treated Crema with great severity, and besieged Milan anew and razed it to the ground (1162). Against this barbarity the Guelph cities solemnly concluded, at Pontida, the Lombard League. Frederick, returning, assaulted Alessandria and met the confederates at Legnano, where the Italians (chiefly through the valor of the Milanese, headed by their *carroccio*, or great war-chariot) defeated the imperial host in a great battle. The peace of Constance (June 25, 1183) confirmed the triumph of the free cities, which were thereafter governed by consuls, who were to receive their investiture from the emperor, and render him feudal homage. In Southern Italy the republican spirit was overshadowed, first by the Norman monarchy founded by the brave Roger, and then by the Swabian. An illustrious and heroic descendant of this latter house, Frederick II., with the help of Pope Innocent III., wrenched the imperial crown from Otho IV., but the ambitious pontiff, the founder of the Holy Inquisition, soon afterward turned against him. At Cortenuova, Frederick defeated the new Lombard League formed against him at the instigation of the pope (1239). Frederick dying in 1250, the papal hatred followed his race, and was never appeased until Charles of Anjou, at the invitation of Pope Urban IV., by the battles of Benevento and Tagliacozza, and by the death of Manfred and of Conradin, put an end to the Swabian dominion in Italy (1266–68). The new French rule, however, was of short duration, and was overthrown partly by an insurrection headed by John of Procida, and yet more by the insolence of the soldiers of Charles, who provoked at Palermo the revolution of the Sicilian Vespers (1282). Meanwhile, internal discords were bringing ruin upon the republics in other parts of Italy; and the houses of Della Torre, and afterward of the Visconti of Milan, of the Ezzelini at Padua, of the Scaligeri at Verona, of the Pallavicini in other parts of Lombardy, had acquired great power. The people were, in fact, rapidly approaching what has been aptly termed the age of the despots. At Florence the Buondelmonti and the Amedei, at Bologna the Geremei and the Lambertazzi, at Genoa the Grimaldi and the Fieschi on one side, the Doria and the Spinola on the other, were in continual quarrels, and rivaled each other in their efforts to destroy the liberty of their fellow citizens. The maritime towns, in their disputes for the dominion of the sea and for commercial superiority, ruined each other by turns. Pisa wasted Amalfi, and in her turn, after the battle of Meloria (1284), was crushed by Genoa; but Genoa atoned for it by her long struggle with Venice, until the war of Chioggia (1378–81) left the two republics completely exhausted. Florence, always torn by factions, was imperiled by the revolution of the Ciompi, headed by the wool-comber Michael di Lando, the precursor of modern Socialism (1378). Everything, in short, was on the decline in Italy; the papacy, which had transferred its seat from Rome to Avignon (1309), the Ghibelline party, which, headed at first by Matteo Visconti, and then by Castruccio Castracani, was losing its power. Scourged, now by the troops of Philip the Fair, now by those of Louis of Bavaria, Italy had become the battle-field in which foreign ambition exercised its worst passions. In vain Cola da Rienzi struggled (1347) to rekindle the spirit of a dying civilization.

III. *The Decadence.*—The cause, and at the same time the consequence, of the civil debasement of Italy was the lack of a military spirit in her people, so that she was completely at the mercy of domestic and foreign ambition. Hence the origin of the companies which overran and plundered the country with impunity under the banners of Ladrisio Visconti, of Fra Moriale, of Raimondo da Cordova, of Sir John Hawkwood, of Anichino Baumgarten, of Braccio da Montone, of Giovanni d'Oleggio, of Carmagnola, of Piccinino, of Sforza, etc. The house of Savoy alone, in the midst of all this corruption, maintained itself by the valorous enterprises of Amadeus VI. (il Conte Verde) and by those of Amadeus VIII. In Florence the Medicis family became a ruling dynasty. Cosimo the Elder assumed the title of "father of his country" (1429), and his successors exercised a kingly authority. In the meantime the power of the Turks was increasing in the East, to the injury not only of Italy, but of the civilization of all Europe. Amurath I. threatened Constantinople (1360); Bajazet would have taken it had he not been arrested by Tamerlane and his army (1402). But Amurath II., and then Mahomet II., returned with renewed energy to the enterprise, and the fall of Byzantium (1453) sealed the ruin of the colonial power of the Italians. Not long after, the discovery of the New World, made by the Genoese Columbus (1492), and that of the East India passage round the Cape of Good Hope by the Portuguese Vasco da Gama (1497), then the conquest and discoveries of Cortez, Pizarro, Almagro, Vasco Nuñez de Balboa, of Cabot, Verazzani, and of Vespucci in America, together with those of Almeyda and of Albuquerque in India, diverted commerce from its old channels, depriving Italian navigators of the palm, and bestowing it upon more Western nations. Nothing now remained to Italy but the glory of letters, of arts, and of science, but in these she shone without a rival. Meanwhile the crooked policy of Ludovico il Moro again brought a foreign power into Italy.

Charles VIII., King of France, overran the peninsula from one end to the other (1495). The French under Louis XII., and the Spaniards under Ferdinand the Catholic, disputed the dominion of Italy. The papal throne was made infamous by Alexander VI., and Cæsar Borgia, his son, was the complete personification of that base policy which Machiavelli systematized in *Il Principe*. Almost all Europe united in the League of Cambray against the republic of Venice (1508), whose forces were defeated in the battle of Ghiara d'Adda (1509), and Julius II., who had been the soul of the League, turned against the foreigners with the cry, *Fuori i Barbari!* and formed the Holy League in order to drive out the French (1511), who, in spite of the prowess and ferocity of Gaston de Foix and the valor of Bayard, La Trémouille, and Trivulzio, were obliged to abandon Italy. But soon afterward Francis I. descended the Alps, was victorious at Marignano (1515). Then followed the four great conflicts between this king and Charles V., in the first of which Francis was defeated and taken prisoner at Pavia (1525). Italy was the principal theater of the wars. This period includes the pontificates of Leo X. and Clement VII., the Reformation in Teutonic Europe, the siege of Florence, the valorous enterprises of Giovanni delle Bande Nere, the exploits and the death of Francesco Ferruccio, the siege and sack of Rome by the imperialists under the Constable de Bourbon, who there lost his life (1527); the expedition against Algeria, conducted by Andrea Doria; the Peace of Crespy (1544); then that of Cateau-Cambrésis, which established despotism rather than peace in Italy and in all Europe (1559); the glorious enterprises of Emmanuel Philibert; the battle of Lepanto (1571), in which the Italian navy shone brilliantly for the last time, and by which the final blow was given to the Turkish power. During the seventeenth century, while all the ancient states of Italy had fallen to the lowest point, the house of Savoy arose with new splendor through the deeds of the three Charles Emmanuels and of Victor Amadeus.

Yet throughout this century and the next Italy was merely the subject of warfare and diplomacy exercised from abroad and by foreign powers. Venice, it is true, retained her independence till 1797, but in great decadence, and Genoa and Modena were only nominally free, being subject to a French protectorate. Parma and Naples and Sicily were under the Spanish Bourbons, Tuscany under Austria, and the popes held a long strip across the center from Gáeta to Ancona and northward as far as the Po.

IV. *The Regeneration.*—With 1792 a new period began under the influences of the French Revolution. The victories of Napoleon in 1796 and subsequent years enabled him, while destroying the freedom of Venice and handing her over to Austria, to create new republics (the Cisalpine, Ligurian, Roman, Parthenopœan, etc.), which were, however, soon afterward merged into new kingdoms erected for himself or for his creatures. The Congress of Vienna in 1814 and 1815 restored the former divisions, giving Genoa to the house of Savoy and Venice to that of Hapsburg. Italy was therefore still divided into seven or eight states, large and small, and still under the yoke of the foreigner. But the revolution had given rise and scope to an intellectual and moral movement which was destined to free Italy. At first all attempts to shake off the yoke were vain. The revolts of 1820 and 1830 were easily suppressed by foreign mercenaries and vindictively punished. Yet in 1848 for a moment Italy thought herself free. It was in Sicily that the movement began which ultimately spread to the Baltic and to the Irish Sea, and which for a time endangered almost every throne in Europe. In Piedmont Charles Albert gave his people a constitution and put himself at the head of the national movement. Defeated, however, by the Austrians at Custozza and again next year at Novara, he abdicated in favor of his son, Victor Emmanuel II., under whose great minister, Cavour, the leadership of the Italian struggle for freedom passed out of the hands of the republican Joseph Mazzini into those of the house of Savoy. Cavour's policy was to make powerful friends for Sardinia abroad, and with this end in view he joined the allies in the Crimean War. In 1859 his statesmanship succeeded in obtaining the powerful help of Napoleon III. After the victories of Magenta and Solferino the French emperor, however, retired from the war by the Peace of Villafranca, which left Venetia to the Austrians and exacted from Piedmont the cession of Savoy and Nice in exchange for Lombardy. The movement once started was not to be arrested. All the central Italian states, except Latium itself, overthrew their sovereigns and annexed themselves to the dominions of Victor Emmanuel. Naples and Sicily also rose against the Bourbons, and the popular leader Joseph Garibaldi, leaving Genoa with 1,000 volunteers, in a few months conquered the entire South, which was added to the new kingdom of Italy (1861). To the new state Venetia was added by the results of the war of 1866, and Rome, with its remaining territory, as a consequence of the Franco-German war in 1870. Rome then became the capital of the kingdom of Italy. In 1878 Victor Emmanuel died and was succeeded by his son Humbert. Since 1870 the history of Italy is chiefly concerned with matters of domestic policy. Her international relations have been friendly in spite of the agitation of the Irredentists, who foster the hatred of Austria and demand that Italy shall secure all such territories as for racial or geographical reasons seem naturally to belong to her. The Dreibund or Triple Alliance (*q. v.*) between Italy, Germany, and Austria was adopted in 1882. In this period Italy has been active as a colonizing nation. For further details of the history of Italy, see articles Lombards, Frederick I., Frederick II., Milan, Florence, Venice, etc.

Bibliography.—For statistics and other valuable information, consult the *Annuario Statistico Italiano*, and for special points the official publications for the various public departments, e. g. the *Annuario del Min. delle Finanze*. Bodio, *Progresso economico e sociale d'Italia* (Rome, 1890), gives a full account of the advance made since the foundation of the united monarchy. Of value also are Dr. W. N. Beauclerk's *Rural Italy* (London, 1888); E. de Laveleye's *L'Italie Actuelle* (Paris, 1881); A. Gallenga's *Italy Revisited* (2 vols., 1876), and the same author's *Italy, Present and Future* (2 vols., 1887). Mrs. Ross's *Land of Manfred* (1889) refers to the southern provinces. A. J. C. Hare's various volumes on the *Cities of Italy* (Northern, Central, and Southern), his *Walks in Rome*, and *Days near Rome* are invaluable. In general history, see Villari's *Storia politica d'Italia* (8 vols., 1883, *et seq.*); Sismondi, *Républiques Italiennes* (transl. into English); and W. Hunt, *Italy* (in Prof. Freeman's Historical Course). John Addington Symond's *Renaissance in Italy* (5 vols., 2d ed. 1880, *et seq.*) is essential to the student of either history, art, or letters; as is, in the special art of which it treats, Crowe and Cavalcaselle's *History of Painting in Italy* (3 vols., London, 1864–66). As to local history, every large center has its own considerable bibliography; the following are a few works that will prove useful: Horatio Brown, *Venice* (1893); Trollope, *History of the Commonwealth of Florence*; Gino Capponi, *Storia della Republica di Firenzi*; Metta, *History of Naples*; von Ranke, *History of the Popes*; Miss Duffy, *Tuscan Republics* (Story of the Nations Series), which also includes Genoa. For one special period, see Oscar Browning's *Guelphs and Ghibellines, 1250 to 1409* (London, 1893). G. A. Greene.

Itapuá, ĕē-tăă-poo-aa', or **Villa Encarnación'**: a town of Southern Paraguay; on the river Paraná, near the point where it changes from a southwesterly to a westerly course; lat. 27° 20′ S., lon. 55° 50′ W. It was founded by the Jesuits in 1614, and was one of their most flourishing missions; subsequently it fell into decay, but after 1870 it recovered, and promises to be of great importance as the emporium of the upper Paraná. The projected railway from Asunción, to connect with the Argentine system, will have its terminus here. The situation is low and somewhat unhealthful. Pop. about 6,000. Herbert H. Smith.

Itard, ĕē'taar', Jean Marie Gaspard: physician; b. at Oraison, in the south of France, in 1775; after service as surgeon in the Revolution he was appointed physician to the deaf-mutes' institution, Paris, in 1799, where he made a specialty of diseases affecting the organs of hearing, in which department he speedily acquired a European reputation. His experiments in the education of "the wild man of Aveyron," a boy twelve years old captured in the woods, were described by him in two works published in 1807, which excited great interest. Itard wrote an important work on *Diseases of the Ear and the Organs of Hearing* (1821). D. in Paris, July 5, 1838, leaving large bequests to the Institution for Deaf-mutes and the Academy of Medicine. Revised by C. H. Thurber.

Itas'ca Lake: a body of water in Beltrami and Cass cos., Minn. Its elevation is 1,575 feet. It is surrounded by pine-clad hills some 100 feet higher than the lake. The Mississippi river leaves the lake with a breadth of some 12 feet, and is ordinarily less than 2 feet deep at this point. The lake is not strictly the actual source of the great river,

as it receives several streams of small size, and on these streams lie ponds or small lakes. Capt. Glazier claimed a distinct lake farther up, which he discovered and named after himself. This led to a more careful survey of this very interesting but neglected spot, resulting in the confirming of Lake Itasca as in a proper sense the source of the Mississippi. The name Itasca was made by Schoolcraft from the Latin barbarism *veritas caput*. The Indian name was Omuskosesagaiegoum. Revised by M. W. Harrington.

Itatiaia, ĕē-taă-tĕē-ī'yăă: the highest mountain of Brazil; in the Mantiqueira sub-chain of the Coast Range, at the angle where the states of Rio de Janeiro, São Paulo, and Minas Geraes meet. Altitude, according to Glaziou, 8,898 feet. It is a gigantic mass of gneiss, capped by three peaks; heavy forest extends nearly to the top, the higher portions being formed largely of araucaria pines. Snow sometimes lies on the summit for several days. The Paraná takes its rise on the northern and western sides of Itatiaia. H. H. S.

Itch: See Scabies.

Ith'aca, or **Thea'ki** [anc. Gr. Ἰθάκη. Mod. Gr. Θιάκιον, or Ἰθάκη]: one of the smallest of the Ionian islands. Area, 37 sq. miles. It is mountainous but fertile, producing olive oil, wine, and currants of a superior kind. It consists of two mountain-masses, each rising a little above 2,000 feet, connected with each other by a narrow isthmus of low hills. As only portions of the hillsides are arable land, the inhabitants are dependent upon commerce for their supply of grain. Great numbers of goats are kept; hares are abundant. Ithaca is famous as the dominion and home of Ulysses, and contains some cyclopean ruins, which still are called the Castle of Ulysses. Pop. 10,650. The principal town is Vathi, with a good harbor and 2,500 inhabitants. See Stillmann, *On the Track of Ulysses* (Boston and New York, 1888). Revised by J. R. S. Sterrett.

Ithaca: village (founded in 1856); capital of Gratiot co., Mich. (for location of county, see map of Michigan, ref. 6–I); on the Detroit, Lans. and N. and the Toledo, A. A. and N. M. railways; 42 miles N. of Lansing. It is in an agricultural region, and has 5 churches, water-works, iron-works, creamery, electric-light plant, and a monthly and 2 weekly periodicals. Pop. (1880) 600; (1890) 1,627; (1894) 1,968.
Editor of "Journal."

Ithaca: city (organized as a town in 1821, chartered as a city in 1888); capital of Tompkins co., N. Y. (for location of county, see map of New York, ref. 5–F); at the head of Cayuga Lake, and on the Del., Lack. and W., the Elmira, Cort. and N., and the Lehigh Val. railways; 142 miles W. by S. of Albany. It is in an agricultural region; manufactures calendar-clocks, spokes and hubs, horse-rakes, paper, glass, leather, musical instruments, firearms, and machinery, and receives by railway and ships by canal a large quantity of coal from the Pennsylvania anthracite region. The city is situated in a region of much beauty, having numerous waterfalls and cascades and picturesque gorges. It is the seat of Cornell University (*q. v.*), and has 12 churches, public-school property valued at about $150,000, a parochial school, and 3 libraries (Cornell University, High School Reference, and Cornell Free). The city is provided with an excellent system of water-works, gas and electric light plants, electric street-railways, and 2 daily, 5 weekly, and 2 monthly periodicals. Pop. (1880) 9,105; (1890) 11,079.
Editor of "Journal."

Itinera'rium [Lat., road-book, liter., a thing pertaining to roads or journeys, neut. sing. of *itinera'rius*, pertaining to roads, deriv. of *i'ter*, *iti'neris*, way, road, journey]: a Latin word generally applied to descriptions of the ancient Roman roads and routes of traffic. A number of such descriptions have come down to us, and they may be divided into two classes, *itineraria scripta*, which have the common character of books, and *itineraria picta*, which are graphic representations in the form of charts. A collected edition of the extant specimens of the former kind of itineraries was issued by Fortia d'Urban (Paris, 1845). Of the latter kind only one specimen has been preserved, the famous *Tabula Peutingeriana*, which was edited by Desjardins (Paris, 1868–74), and more recently by K. Miller under the title of *Die Weltkarte des Castorms* (Ravensburg, 1888). See also *Itinerarium Antonini et Hiero solymitanum*, ed. G. Parthey and M. Pinder (Berlin, 1847); *Alexandri Itinerarium*, ed. D. Volkmann (Naumburg, 1871); *Antonini Placentini itin.*, ed. J. Gildemeister (Berlin, 1889); and the recently discovered *S. Silvia Aquitanae peregrinatio ad loca sancta* (written about 390), ed. J. Pomialowsky (St. Petersburg, 1889). Revised by M. Warren.

It'ius Por'tus: the port on the French coast, nearly opposite Dover, from which Cæsar sailed on his second expedition to Britain. Its position has been a matter of much controversy; the majority of geographers, however, identify it with Wissant.

Ito, ee'tō, Hirobumi, Count: statesman; b. in the province of Choshu, Japan, in 1840. When quite a young man he was associated with the negotiation of the treaty with the four foreign powers, Great Britain, France, the U. S., and Holland, which followed the Shimonoseki affair (1864), and by which an indemnity of $3,000,000 had to be paid by Japan. A secret journey to Europe at the risk of his life convinced him once for all of the overwhelming superiority of Western civilization, and ever since he has been the leading spirit in Westernizing his native land. In 1871 he visited the U. S. to investigate the coinage system, and on his return to Japan he took a leading part in establishing the mint at Osaka. Appointed Minister of Public Works, he was transferred to the Home Office on the death of Okubo in 1878. A visit to foreign countries in 1879–80 resulted in strong German proclivities, which have procured for him the name of the Japanese Bismarck. In 1886 he assumed the leading place in the Japanese cabinet, then reorganized, with the newly created title of Minister President of State, and instituted thereafter sweeping economical reforms in the various services of state which caused the name "earthquake" to be applied to this period. During the next two years the progress of reform was very marked, and everything was done to make Japan an Asiatic counterpart of the German empire. A conservative reaction in 1888 resulted in Ito's retirement from the premiership, to which, however, he was again recalled in the autumn of 1892. Ito was the father, and is the recognized exponent, of the Japanese constitution promulgated in 1889. J. M. Dixon.

Itú, ĕē-too': a city of the state of São Paulo, Brazil, in a plain on the left bank of the Tieté, near the great fall of that river; 48 miles W. N. W. of São Paulo city, with which it is connected by railway (see map of South America, ref. 6–G). It is one of the most flourishing towns of the state, and promises to be of still greater importance, owing to the newly established navigation of the Tieté. The surrounding district is fertile, producing sugar, cotton, and coffee. The city has a cotton-factory and some foundries. Pop. about 11,000. Herbert H. Smith.

Ituræ'a (in Gr. Ἰτουραία): a small district in the northeast of Palestine, which, together with Trachonitis, in the time of Christ formed the tetrarchy or government of Philip, son of Herod the Great and brother of Herod, tetrarch of Galilee (Luke iii. 1). According to tradition the name is derived from Jetur (Gen. xxv. 15), one of the sons of Ishmael. It was S. of the river Pharpar, N. W. of Bashan, and adjoined Auranitis, the modern Hauran. It is now called Jedur, and contains thirty-eight towns and villages. See Porter's *Five Years in Damascus* and Robinson's *Biblical Researches*. Edwin A. Grosvenor.

Iturbide, ĕē-toor-bee' dā, Agustin, de: Emperor of Mexico; b. at Valladolid (now Morelia), Mexico, Sept. 27, 1783; took a distinguished part as an officer of the Spanish army in the war against the Mexican revolutionists of 1810 and subsequent years, rising to the rank of colonel; but in 1820, in consequence of the constitutional revolution which took place in Spain in that year, he decided to make an attempt for the independence of Mexico under a monarchy. Obtaining command of the Spanish forces in the south of the province of Mexico, he promulgated Feb. 24, 1821, the "Plan of Iguala" at the town of the same name. The chief feature of the plan was the independence of Mexico as a monarchy under a prince of the Spanish Bourbon dynasty. It was received with enthusiasm by native Mexicans, and a treaty by which it was virtually accepted was concluded with the Spanish viceroy, but the Spanish Government rejected the treaty. In the meanwhile a regency was established under the presidency of Iturbide, who, supported by the army, was proclaimed emperor May 18, 1822, and crowned on July 21. He encountered great opposition from the first. In December Gen. Santa Anna, then a very young man, and formerly a warm partisan of Iturbide, proclaimed the republic in Vera Cruz, and by Apr., 1823, the situation had become so hopeless that Iturbide resigned the crown and made terms with the restored assembly, by

which he was allowed to embark for Europe and enjoy a pension of $25,000. He sailed for Italy May 11, resided several months in Leghorn, thence went to England, and in May, 1824, chartered a vessel in which he returned to Mexico, ostensibly to tender his services as general against an anticipated invasion by Spanish forces, but doubtless with the expectation of recovering his throne. Meanwhile a republican government had been formed in Mexico, which, thrown into alarm by a rumor of Iturbide's intended return, issued a decree that he should be treated as an outlaw should he set foot within the territory of the republic. Ignorant of this decree, Iturbide secretly landed at Soto la Marina July 14, was recognized and taken before the state legislature, by whose orders he was shot at Padilla, Tamaulipas, July 19, 1824. His family established itself at Philadelphia, where the ex-empress died Mar. 21, 1861. Several of the sons of Iturbide were afterward honored with diplomatic or military posts by the Mexican Government, and during the ephemeral empire of Maximilian the survivors were recognized as princes. The elder, Angel de Iturbide, died in the city of Mexico July 21, 1872; the younger, Agustin, died in Paris in May, 1873. Prince Agustin, son of Angel, recognized by Maximilian as heir-presumptive, was born in 1864. The *Memoirs* of Iturbide were published in 1824 in English, French, and German. Revised by C. K. Adams.

Iturrigaray, ĕĕ-too-rĕĕ-găă-răă-ee', José, de: general; b. at Cadiz, Spain, about 1743. He served in the wars with France, and through the favor of Godoy became lieutenant-general, but acquired little real distinction. In 1802 he was made Viceroy of Mexico, assuming office Jan. 4, 1803. He immediately set about acquiring a fortune by bribery, the sale of offices, and illegal traffic. The confusion of Spanish affairs, caused by the elevation of Joseph Bonaparte to the throne and the refusal of a large portion of the Spanish people to recognize him, greatly weakened the government of the colonies. Iturrigaray adopted a vacillating course, endeavoring to retain his office while refusing allegiance to any Spanish government. The members of the Audience and others plotted against him; on Sept. 15, 1808, he was arrested in his palace, the riches he had acquired were sequestrated, and in December he was sent to Spain for trial. He was released soon after, but heavy fines were imposed on him for his peculations. D. at Cadiz in 1821.
Herbert H. Smith.

I'tys (in Gr. Ἴτυς): in Greek mythology, son of Procne and Tereus, a Thracian who lived at Daulis in Phocis. When Philomela came from Athens to visit her sister Procne, Tereus declared that Procne was dead, deflowered Philomela, and cut out her tongue that she might not tell of his crime. Philomela discovered the truth, and communicated with Procne by weaving her story into a cloak which she sent to her sister. The two then avenged themselves by slaying Procne's own son Itys, whom they roasted and served up to his father Tereus. When Tereus was about to overtake and slay the fleeing sisters the gods, in answer to the prayer of the women, changed all three into birds, Tereus into a hoopoe or hawk, Philomela into a swallow, and Procne into a nightingale, which from that time to this has never ceased to cry out "Itys, Itys." (Cf. Sophocles's *Electra*, 148.) See Keller, *Thiere des klassischen Alterthums* (Innsbrück, 1887, p. 316 ff.); von Gaertringen, *De Græcis fabulis ad Thraces pertinentibus* (Berlin, 1886, p. 35 ff.). J. R. S. Sterrett.

Iuka, ī-yu'ka: town (founded in 1856); capital of Tishomingo co., Miss. (for location of county, see map of Mississippi, ref. 3–H); on the Memphis and Charleston Railway, 115 miles E. of Memphis. It has five churches, a normal institute for both sexes, valuable mineral springs, and a weekly newspaper. A battle was fought here on Sept. 19, 1862, between the right wing of Gen. Grant's army under command of Gen. Rosecranz and a Confederate force under Gen. Sterling Price, resulting in the defeat of the latter. Pop. (1880) 845; (1890) 1,019. Editor of "Reporter."

Ivano'vo: an industrial, rapidly growing city of Vladimir province, Central Russia; on an affluent of the Volga and on the railway from Vladimir to Kineshma (see map of Russia, ref. 6–E). It is a center for the manufacture of cottons, and is called the Manchester of Russia. Pop. about 15,000.

I'van the Great, Vassilievitch [Ivan is Russ. for John, from Gr. Ἰωάννης, John, whence Eng. John]: the third Grand Duke of Russia; b. in 1440; ascended the throne in 1462. His reign is memorable for the liberation of his people from the domination of the Golden Horde, for the reconquests of Western Russia, and for the consolidation of the Russian state. He promoted art and learning, encouraging the immigration of Italian and Greek artists and professors. Unity in the Church was attained, and Moscow became the "metropolis of orthodoxy," and as such the protector of Greek Christians in the East. Though at times cruel in his punishments, he generally sought to gain his ends by negotiation rather than by bloodshed, and he deserves the credit of having laid the foundation of a great empire. D. in 1505. F. M. Colby.

Ivan the Terrible: the fourth Grand Duke of Russia having the name Ivan (John), and the first czar of that country (though reckoned as Ivan IV.); b. in 1529; succeeded his father Basil in 1533; put to death in 1543 the triumvirate of regents, and when he was crowned, in Jan., 1547, assumed the title of czar; published a new code 1550; concluded a commercial treaty with Queen Elizabeth; carried on wars with the Tartars, capturing Astrakhan, Kasan, and parts of Siberia; carried on long and undecisive wars with Poland and Sweden, but the latter nation maintained its authority over Esthonia; introduced civilization and the art of printing in Russia, but ruled with great cruelty and harshness. D. Mar. 17, 1584. Revised by C. K. Adams.

Ivi'za, or **Ivi'ça**, ĕĕ-vee'săă: the smallest and westernmost of the Balearic islands, in the Mediterranean. It belongs to Spain. It is 23 miles long, 12 miles broad, and has 22,800 inhabitants. It is mountainous, but has several fertile valleys producing good wine and olive oil. Timber and salt are the main exports. The principal towns are Iviza and San Antonio.

Ivory [M. Eng. *ivori*, from O. Fr. *ivurie* > Fr. *ivoire*: Ital. *avorio* < Lat. *eboreus*, made of ivory, deriv. of *ebur*, a Carthaginian-Phœnician loan-word, ultimately of Hindu origin; cf. Sanskr. *ibha-s*, elephant, and the Gr. ἔλ-εφας (also a loan-word)]: a substance resembling bone, of which the teeth or tusks of many animals are largely composed. It consists of an axial pulp cavity, from which a great number of minute tubules or canals radiate, with frequent curves, toward the periphery of the tooth. The minuteness of the canals and their regular disposition give to ivory its elasticity, toughness, and fineness of grain. Its chemical composition is—

Phosphate of lime	64·00
Organic matter	24·00
Water	11·15
Carbonate of lime	0·10

Ivory is for the most part the material of the tusks of the elephant. The teeth of the hippopotamus give a finer and harder variety, but owing to their hollowness they can be employed for only small objects. The large marine animals, such as the walrus, narwhal, and spermaceti whale, also yield varieties of ivory. That of the walrus was much used by the old Norsemen for making pieces for the game of draughts; several of these, beautifully carved, are in the British Museum. The material is extremely hard, of a dead pearly white, which becomes black, not yellow, with age. The fossil ivory of Siberia, dug from the ground, consists of the tusks of mammoths and elephants of extinct species. It is found in the Laichovian isles, and by the Frozen Sea. Elephant ivory comes from Africa and Asia; the latter being, with the exception of the small tusks from Ceylon, much inferior to the former, its faults being a tendency to split, an inferior color, and the more rapid deterioration toward yellow. Ivory is difficult to cut, requiring extremely sharp and very hard tools, but yields readily to the saw, lathe, and rasping tools or files, a great variety of which are used to reduce the block to form. Owing to the value of ivory—which is so rapidly increasing that it ranks as a precious substance—the greatest care is taken to avoid waste, the division into pieces or veneers being effected with thin saws. When finished, it is polished with different powders. Its natural whiteness is exquisitely delicate, bearing a great resemblance to the brightest tint of the human skin, the most beautiful hue in nature, but it soon assumes a yellow tone. Spangler, a celebrated workman in ivory at Copenhagen, discovered that ivory kept from the air, but not from the light, under a glass, will retain its whiteness for an indefinite time. The yellow tint of old ivory may be removed with finely levigated pumice-stone. It should then be put while wet under a glass, and exposed every day to the sun. The drying up and crumbling of

ivory is owing to the exhaustion of its gelatin. When the works of ivory dug by Layard from Nineveh were taken to England, and found to be in a state of rapid decomposition, Prof. Owen suggested that they should be boiled in a solution of gelatin. Under this process they became hard and firm. Elephant ivory in plates presents delicate lines resembling what is called in drawing cross-hatching or cancellation; and this, which disqualifies it for making artificial teeth, adapts it for miniature painting, and in fact increases the beauty of its tone in all works of art.

Napkin-rings, billiard-balls, card-cases, buttons, spoons, etc., are made of it, though since the beginning of the nineteenth century it has been growing scarce and dear, and Vegetable Ivory (*q. v.*), bone of different kinds, and Celluloid (*q. v.*), have replaced it in a great measure, and hard wood and vulcanized rubber have been used instead of it. In the decorative arts ivory has always occupied a very important place. Egyptian carved utensils and boxes exist in the museums, some as early as the fifth dynasty. Assyrian carvings were found at Nineveh. The Greeks are known to have used it in connection with gigantic works of sculpture. (See Chryselephantine Statues.) Under the Roman dominion ivory became common in all the Mediterranean lands, and was used for many decorative and ceremonial purposes, of which the most important to modern students has been its use for diptychs. (See Diptych.) The separate leaves of these diptychs were used afterward for book-covers and the like, and tablets carved for the purpose took their place on the splendid manuscripts of the Byzantines in the tenth century and later. Throughout the Middle Ages caskets, holy-water vessels, mirror-cases, religious triptychs and statuettes, and the heads of croziers and pastoral staves were exquisitely carved in ivory, and the museums of Europe are as rich in these as they are poor in the ivories of antiquity. In the sixteenth century beautiful powder-horns for fine priming-powder were made of ivory, and it was used for inlaying the stocks of arquebuses and the handles of halberts, and cabinets of great size and elaboration of parts, as well as in the mediæval ways. About that time a school of ivory-carvers grew up in Dieppe, Normandy, and this specialty of the place has never been lost; indeed, it has been developed and increased during the nineteenth century.

Ivory, James, F. R. S.: mathematician; b. at Dundee, Scotland, in 1765; educated at the University of St. Andrews, with Sir John Leslie. For many years he superintended a flax-spinning factory, and in 1804 was appointed Professor of Mathematics in the Royal Military College at Marlow (now at Sandhurst). He was a self-taught mathematician, and spent much of his time in retirement, studying the writings of the most learned continental mathematicians, and adding to their value by original contributions. His most celebrated paper, on the attraction of ellipsoids, was published in the *Philosophical Transactions* for 1809. Besides this paper, Mr. Ivory contributed many others on the subject of the attraction of spheroids and the theory of the figure of the earth. One of the last subjects which occupied his attention was the possible equilibrium of a spheroid with three unequal axes, which Jacobi had discovered. Next to the theory of attractions, that of atmospheric refraction most seriously engaged his attention, its great importance in astronomy, and the curious mathematical difficulties which it presents, rendering it of great interest to analysts. D. Sept. 21 1842. Revised by S. Newcomb.

Ivory Black: See Bone-black.

Ivory Coast: a part of the north coast of the Gulf of Guinea, West Africa, between the so-called Grain Coast and Gold Coast. It extends from Cape Palmas eastward to the river Assinie, and has several towns along the coast which traffic in ivory, gold-dust, and palm oil. Most of this coast is under French protection. Revised by M. W. H.

Ivrea, ēē-vrā'ăă: town; in the province of Turin, Northern Italy; picturesquely situated at the mouth of the beautiful valley of Aosta, on the right bank of the Dora Baltea; 38 miles N. N. E. of Turin by rail (see map of Italy, ref. 3–B). It was a Roman possession as early as 90 B. C., and there are many vestiges of that period. Ivrea played an important part in the mediæval history of Northern Italy. The carnival festivities of Ivrea commemorate a popular uprising of the city against the Marquis of Monferrato in the thirteenth century. The cathedral is said to have been an ancient temple of Apollo, consecrated for Christian worship early in the fifth century. The town has some manufactures. Pop. 5,883.

Ivry-la-Bataille, ēē'vree'lăă-băă'tăĭ': a village of France, 40 miles W. of Paris, on the river Eure (see map of France, ref. 3–F); noted for the decisive victory gained here by Henry IV. of Navarre (Mar. 14, 1590) against the forces of the League under the Duke of Mayenne. An obelisk to commemorate this victory was removed during the French Revolution, but renewed by Napoleon in 1809. Pop. about 1,200.

Ivy [O. Eng. *ifig*; O. H. Germ. *ebah*, *ebawi*, and *ebahewi* > Mod. Germ. *epheu*]: popular name of several plants, especially those of the genus *Hedera*, family *Araliaceæ*. The *Hedera helix*, a climbing, shrubby Old World plant, is sparingly cultivated in the U. S., where it nowhere thrives as in Europe, being impatient of the cold of winter and the dryness and heat of summer. It succeeds best in the Middle Atlantic States. It abounds in Europe, growing upon houses, churches, walls, castles, and trees. There are many varieties. The so-called German ivy, common in house culture, is not an ivy at all, but a Senecio from South Africa (*Senecio scandens*). Various clinging vines are called ivies. In the U. S. the commonest so-called ivy is the Boston ivy, *Ampelopsis tricuspidata*, better known as *A. Vietchii*. This is native to Japan. A related native plant, the Virginia creeper, *A. quinquefolia*, is sometimes called ivy. For the "poison ivy" of the U. S., see Rhus.

Revised by L. H. Bailey.

Ixi'on (in Gr. Ἰξίων): in Greek mythology, a son of Phlegyas or Ares, and king of the Lapithæ and father of Pirithous. He was espoused to Dia, daughter of Hesioneus (or Deioneus), but on his bridal day treacherously murdered his father-in-law, in order to avoid the performance of his contract. Zeus, however, magnanimously forgave him, and entertained him at the table of the gods, but Ixion rewarded his clemency by attempting to seduce Hera. The attempt was frustrated by Jupiter's substitution of a phantom resembling her, and resulted in Ixion becoming the father of the Centaurs. He was ultimately condemned, as a punishment for his treachery, to be chained to a fiery wheel perpetually revolving and consisting of four spokes in the form of a cross. Revised by J. R. S. Sterrett.

Ixtaccihuatl, or **Iztaccihuatl**, ēēz-tăăk'sēē-waatl' (Nahuatl, white woman): a mountain of the Mexican plateau, on the confines of the states of Mexico and Puebla; about 40 miles S. S. E. of Mexico city. It is somewhat lower than Popocatepetl, which lies immediately S. of it; altitude, according to Cubas, 16,077 feet. The upper portion is covered with perpetual snow, and, seen from Mexico city, it presents a magnificent appearance. Ixtaccihuatl has rarely been scaled. It is not a volcano. H. H. S.

Ixtahuacan, ēēz-tăă-wăă-kaan', or **Santa Catarina**, saan'-tăă-kăă-tăă-ree'năă: a town in the department of Sololá, Guatemala, about 10 miles W. of Sololá city; population about 10,000, mainly Indians. There are several smaller towns of the same name in Guatemala. H. H. S.

Ixtlilxochitl, ēēkst-lilk'sō-chēēt'l, Fernando de Alba: historian; b. in Mexico or Texcoco about 1568; a lineal descendant of the ancient emperors of Texcoco, who devoted himself to the collection and translation of hieroglyphical records concerning his ancestors. Very little is known of his personal history, except that he was interpreter to several viceroys, and in 1602 received from the Spanish king a grant of lands as representative of the former Aztec dynasty. He left numerous writings, which are preserved in the national archives in Mexico, only a portion of which have been printed, though copies were used by Mr. Prescott in his *History of Mexico*. His *History of the Chichimecs* was published by Lord Kingsborough in his *Mexican Antiquities*, vol. ix. D. in 1648.

Iyeyasu, ēē'yā'yăăs', Tokugawa: general, statesman, and ruler; b. at Okasaki, province of Mikawa, Central Japan, 1542. He served early as a soldier under Nobunaga and Hideyoshi, and gradually rose into notice. Obtaining land in Mikawa and the neighboring province of Suruga, he built the strong castle of Shidzuoka, a town still intimately associated with his family and dynasty. When Hideyoshi (*q. v.*) died in 1598, Iyeyasu promised to look after the interests of his son, Hideyori, a boy of six. But the child, as the son of an upstart, could not keep together the large following to which his father's abilities alone had given cohesion. Hidenobu, nephew of Nobunaga, a professed adherent of Christianity, represented a third party. The great battle of Sekigahara, fought near Lake Biwa, Oct. 15, 1600, finally de-

cided matters and made Iyeyasu master of Japan. He had been establishing himself at Yedo, which he now made the center of his rule. From this city he pacified Japan, adopting in his foreign relations that isolating policy which made it a hermit country for the next two and a half centuries. He founded the magnificent dynasty of the Tokugawas, which ruled Japan vigorously till 1868, always, however, acknowledging fealty to the ancient imperial house at Kioto. In 1616 Iyeyasu died, having given "peace" to his country. He was buried at NIKKO (*q. v.*), one of the noblest mausoleums in the world; and was deified under the posthumous title of Gongen-Sama. An interesting historical document bearing the title *Testament* or *Legacy of Iyeyasu* was written by him. The usual name by which it is referred to is *Hyakkajo*, or Hundred Articles, and these 100 sections, extending to twenty-seven pages of printed matter in the English translation, published by F. J. Lowder (Yokohama, 1874), form a wonderfully interesting summary of the conditions of Japanese society in the seventeenth century, and of the aims and policy of the early Tokugawa rulers. For an epitome of the document, see Griffis's *The Mikado's Empire* (appendix 3). J. M. DIXON.

Izabal, **Yzabal**, or **Ysabal**, ēē-zăă-baal': an eastern department of Guatemala, the only one on the Caribbean coast. Area, 4,500 sq. miles; population (1890) 5,067, being the smallest of any department in the republic. Several mountain chains or spurs, entering from the W., cross eastward toward the coast, separating wide valleys; one of these is occupied by Lake Izabal and its outlet. The coast lands are low. Much of the surface is covered with forest. Timber-cutting, boat-building, the collecting of sarsaparilla and other forest products, and banana-raising on a considerable scale are the chief industries. The former department of Livingston is now included in this one. Izabal, the capital, on the southern shore of Lake Izabal, has about 2,600 inhabitants (see map of Central America, ref. 3–E). During the period in which the Guatemala route to California was in use this was a port of importance; it has now been supplanted by Livingston, on the coast. The situation is low and unhealthful. HERBERT H. SMITH.

Izabal, Lake, or **Golfo Dulce**, gōl'fō-dool-thā: a lake of Guatemala in the department of the same name. The main portion is about 25 miles long by 10 wide; at its northeastern end it narrows to a sinuous channel, which again widens to a smaller lake called the Golfete; the latter communicates by a second narrow channel with the Gulf of Honduras. The larger sheet is from 15 to 60 feet deep, but vessels drawing more than 6 feet can not enter the channels. The river Potochie enters the western end of the lake, which may be regarded as its estuary. H. H. SMITH.

Izabel de Bragança, -dā-brăă-gaan'săă, PRINCESS: eldest daughter of Dom Pedro II., Emperor of Brazil; b. at Rio de Janeiro, July 29, 1846. On Oct. 15, 1864, she was married to Louis Gaston d'Orléans, Count d'Eu, by whom she has (1894) three living sons. The emperor having no male children the princess was, by the imperial constitution, heiress to the throne; but her subserviency to church influence, as well as her marriage to a foreigner, made the succession distasteful to Brazilian liberals, and this aided to bring about the downfall of the emperor in 1889. While her father was absent in Europe and the U. S., she acted as regent in 1871 and 1876–78; during the latter period she signed the act which freed all slaves in Brazil unconditionally. Since the establishment of the republic the princess has resided in Europe. Many Brazilian legitimists desire her return, but it can not be said that she has a strong party. HERBERT H. SMITH.

Izalco, ēē-zaal'kō: a volcano in the western part of the republic of Salvador, Central America. It burst out on a plain occupied as a cattle estate in 1770 (according to other authorities, in 1793); since that time its activity has been almost constant. The cone is now over 5,000 feet high, and owing to the constant flames at its summit it has been called the Lighthouse of San Salvador. The eruptions are accompanied by frequent earthquakes, which are less violent near the cone; the explosions are often heard at distances of 70 miles. The cone was scaled by Dollfuss and Montserrat in 1866. The volcano of Santa Ana (formerly called Izalco), to the N. of this one, appears to have a subterranean connection with it; great activity of either is accompanied by comparative quiescence of the other. H. H. SMITH.

Izam'al (from the god *Itzmatul*): a town of Yucatan, Mexico, 50 miles by road E. of Mérida; an ancient capital already ruined at the time of the Spanish conquest; now a religious center visited by many Indian pilgrims (see map of Mexico, ref. 7–L). In the town and vicinity are many important ruins which have been studied by Brasseur de Bourbourg, Charnay, and others. The municipal population is given by Reclus at 26,610 (*Nouv. Géog. Univ.*, xvii., 279).

Izard, RALPH: statesman; b. near Charleston, S. C., in 1742; grandson of one of the founders of South Carolina; graduated at the University of Cambridge, England. He inherited great wealth, and from 1771 to 1774 lived in London, removing to the Continent when war with the colonies seemed imminent. In 1776 he was appointed by Congress as commissioner to Tuscany, but he fixed his residence at Paris, where he opposed the policy of Franklin and Silas Deane, and favored that of Arthur Lee. He pledged his estate to purchase ships of war; was delegate to Congress 1781–83, and U. S. Senator from South Carolina 1789–95; was president of the Senate during the first session of the Third Congress. His *Correspondence from 1774–1784*, with a short memoir, was published by his daughter (1844). D. at South Bay, near Charleston, May 30, 1804.

Izcoatl, eez'kō-at"l: fourth war-chief or so-called emperor of ancient Mexico, and by his superior military and political talents substantially the founder of the Aztecan empire. A natural brother of his predecessor, he reigned from 1427 to 1436 (the year of his death) and during that period conquered many neighboring states, and embellished and fortified the capital. He also framed a constitution that materially improved the political system.

Izdubar': a mythical or semi-mythical king and hero of the earliest Babylonian annals, who is placed nearly upon the division line which separates the age of romance from the historical period. His name has become widely known since Mr. George Smith, of the British Museum, in 1872 discovered fragments of the Chaldean traditional account of the Deluge, embodied in one of a series of twelve "Legends of Izdubar," so called from the hero who plays a chief part in them all. By Sir Henry Rawlinson and many comparative mythologists, the Izdubar legends were considered representative solar myths, as being in fact prototype of the twelve labors of Hercules. Mr. Smith strongly objected to this view, and argued that Izdubar was a historical Chaldean monarch whom he identified with the biblical Nimrod. He cited the fact that the name occurs in a fragmentary canon of the early Babylonian kings, which he considered a copy of the original authorities used by Berosus. The cycle of legends represents Izdubar as a giant residing in the country of Accad, as a subduer of great animals immediately after the Deluge, and as a mighty conqueror who became a king and ruled in Erech or Uruk, the earliest capital of Babylonia. Apparently he was deified after his death, as one tablet contains a prayer addressed to him, and another represents him as a guardian watching over the country. See NIMROD and NOAH; also Smith's *Assyrian Discoveries* (1875); *Transactions of the Society of Biblical Archæology*, vol. iii. (London, 1874); and the works of Prof. E. Schrader and of Prof. P. Haupt. Revised by EDWIN A. GROSVENOR.

Izmaïlov, ēē-zmăă-ee lōv, ALEXANDR EFIMOVICH: poet; b. in Russia, April 14, 1779. An uneventful career as a government official in various places interfered but little with his taste for literature, to which he devoted a large part of his time. In 1814 he published twenty-six fables and tales, which achieved considerable popularity. Izmaïlov is chiefly known for his fables, 126 in number, of which thirty-nine are translations or imitations. They display a certain amount of originality and keen, good-humored observation. There have been several editions of his poems, the seventh in 1862. D. Jan. 16, 1831. A. C. COOLIDGE.

Izúcar, Puebla, Mexico: See MATAMORAS IZÚCAR.

J

J: the tenth letter of the English alphabet.

Form. The form of the letter was originally merely a variant of I, and was used interchangeably with it to express either vowel or consonant. The complete differentiation of the symbols, whereby I was appropriated for the vowel and J for the consonant, was not established in usage until the seventeenth century. Even after that dictionaries continued to group together words with initial I and initial J.

Name.—The English name *ja* (phonetically *dzē*) is made up of the sound of the consonant accompanied by the vowel of the next name in the alphabetical series (*kē*).

Sound.—J represents a double consonant made up of the voiced dental explosive *d* and the voiced palatal sibilant *zh* (*ž*). The latter part is the sound of *z* in *azure*, *s* in *pleasure*, *usual*, *si* in *vision*, *occasion*, *g* in *rouge* (French *j* in *jardin*). The combined sound *dzh* (*dž*) is the same as that expressed by *g* in *giant*, *gender*, *age*, *oblige*, *gaol*, by *dg* in *judge* (in which the same sound is expressed by *j* as by *dg*), *edge*, by *ge* in *pigeon*, by *gi* in *religion*, by *gg* in *suggest*, by *di* in *soldier*, by *d* (before *u*) in *verdure*. This sound is the voiced counterpart of the *tsh* (*tš*) expressed by *ch* in *church*, *beech*, by *tch* in *witch*, by *te* in *righteous*, by *ti* in *question*, by *t* (before *u*) in *nature*.

Source.—The sound, so far as it is denoted by *j*, appears chiefly in words of Romance origin, as the native Eng. consonant *-i* is represented in Mod. Eng. by *y*; cf. O. Eng. *iuc* > *yoke*, *iung* > *young*, *ʒēar* > *year*. The sound *dzh* (*dž*) is a development of the Old French in which *j* had this value. Modern French changes *dzh* (*dž*) to *zh* (*ž*); thus our Eng. *judge* preserves the O. Fr. pronunciation of *j* better than the Mod. Fr. *juge*. The O. Fr. *j-* represents (1) Lat. *j-* (*i-*) which was pronounced like Eng. *y*. Examples: Eng. *jet* (of water), Mod. Fr. *jet*, O. Fr. *giet* < Lat. *jactus*; *June* (month), Mod. Fr. *juin* < Lat. *Ju'nius*; *juice*, Mod. Fr. *jus* < Lat. *jūs*; *to judge*, O. Fr. *jugier*, Mod. Fr. *juger* < Lat. *judica're*; *Jews* < M. Eng. *Iewes*, *Giwes*, O. Fr. *juis* < Lat. *Judæus*, Gr. Ἰουδαῖος; *majesty* < M. Eng. *magestee* < O. Fr. *maïste* < Lat. *majesta'tem*. (2) Lat. *di*; cf. *journal*, Lat. *diurna'lis*. The Mod. Eng. *j* is sometimes written where *g* would be historically correct. This is, however, a mere matter of orthography, as Lat. *g* before *e* and *i* yielded in O. Fr. the same sound as Lat. *j-* and *di-*; cf. *jest* < M. Eng. O. Fr. *geste* < Lat. *gesta*; *jelly* < M. E. *gele*, O. Fr. *gelee* < Lat. *gela'ta*. The orthography, however, generally follows the Latin; thus *general* might be written *jeneral*, but Lat. *genera'lis* determines the matter. Other sources of Eng. *j* beside Lat. viâ O. Fr. concern a few individual words; thus *jungle* from the Hindi *jangal*, *junk* (boat) from Malay *jong*, *jibe*, *jib* from Scandin. or Dutch, *julep* from Persian viâ Span. Modern loan-words taken directly from the Latin also have *j* in the value *dzh* (*dž*), as it existed in the prevailing pronunciation of Latin; thus *juvenile*, *junction*, *jejune*.

BENJ. IDE WHEELER.

Jabalpur, or **Jubbulpore** [native name, *-pur* (< Sanskr. *pura*, stronghold, city) being added to many place-names]: a province, district, and town of the Central Provinces, British India. The province is the most northern of the four into which the Central Provinces are divided; area, 19,040 sq. miles. The country is mountainous and wild except the large plain about the city of Jabalpur on the head-waters of the Nerbudda. The sources of this river are in the southern part of the province among the mountains of Amarkantak, which are inhabited by Gonds and other aborigines who live in almost their primeval condition. The Vindhya Mountains cross the northern parts of the province, and among them rise several affluents of the Ganges. Pop. (1891) 2,376,510.

The district of Jabalpur is the central one of the five into which the province is divided, and is the most fertile and populous. It is a long narrow plain, an offshoot from the great valley of the Nerbudda, shut in on all sides by highlands. Area, 3,918 sq. miles. Pop. about 700,000. The city of Jabalpur is the chief town of the district and province; 1,458 feet above sea-level; 165 miles N. E. of Nagpur (see map of N. India, ref. 7–F). It is in a rocky basin, the gorges about which have been converted into artificial lakes of great beauty. It is a modern, growing city, and a station on the railway between Bombay and Allahabad. Pop. (1891) 84,481.

MARK W. HARRINGTON.

Jab'iru [Brazilian]: the name of several birds of the stork family, and of the genus *Mycteria* and allied genera, found in Australia, Africa, and South America. The species are few. *M. australis* is the best known. These birds, unlike true storks, have the bill upturned, and one species found in South America has the head and neck bare; those of the Old World have these parts clothed with feathers.

African jabiru.

Jablochkoff Candle: one of the earliest forms of the commercial electric arc-light. It is an arc-lamp entirely without regulating mechanism, and intended for use upon an alternating current-circuit. It consists simply of two slender rods of hard graphitic carbon mounted side by side, with an intervening layer of kaolin which acts as an insulator and also adds to the incandescent surface when the candle is in operation. (See Fig. 1.) This source of light was invented by Paul Jablochkoff, a Russian telegraph engineer (b. at Serdobsk, Sept. 14, 1847; d. at Saratoff, Apr. 5, 1894). It was perfected under the auspices of a French company in 1878, and was used in that year in lighting the Avenue de l'Opéra, Paris.

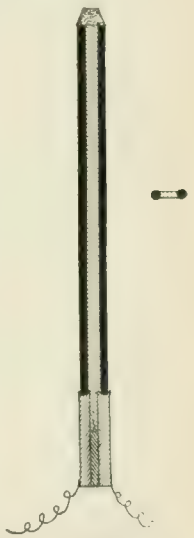


Fig. 1.—Jablochkoff candle.

The chief advantage of the candle is its extreme simplicity of construction. Its disadvantages are the singing noise which always marks the alternations of current in any lamp not used on a direct-current circuit, and its liability to extinction. Being devoid of regulating mechanism, there is no provision for the automatic restoration of the light; and since arc-lamps are almost always placed in series, the extinction of one means the extinction of all upon that circuit. The candles are started into action by means of a bit of inflammable material placed between the tips of the carbons. This carries the current for an instant, but is soon disintegrated and supplanted by the arc.

The character of the light emitted by the candle is similar to that of the arc-light, but the distribution of light is a peculiar one. The brightest portions of the incandescent tips of the carbons are on the inner surface where the arc

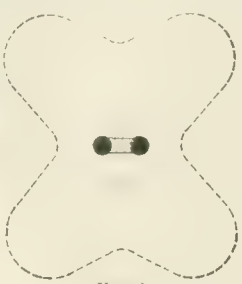


Fig. 2.

Fig. 3.

ends. Each carbon therefore partly shades the brightest region of its neighbor, and the theoretical curve of horizontal distribution is that shown in Fig. 2 with four maxima

of brightness in oblique directions. In practice, however, lack of symmetry throws the arc to one side of the line joining the axes of the two carbons, and the curve takes the form of Fig. 3. See ELECTRIC ARC, ELECTRIC LIGHT, and ELECTRICITY. E. L. NICHOLS.

Jablonski, yăă-blon skĕe, DANIEL ERNST, D. D.: Moravian bishop and Orientalist; b. at Nassen-Huben, near Dantzic, Germany, Nov. 26, 1660; was educated at the University of Frankfort-on-the-Oder, where he distinguished himself in philosophy, theology, and Oriental languages. In 1680 he visited the universities and libraries of Holland and England, remaining a year or two at Oxford. On his return to Germany he became pastor of the Reformed church at Magdeburg 1683; rector of the college of the Moravian church at Lissa 1686; and was famous as a pulpit-orator. He was appointed court-preacher—at first at Königsberg, 1691, and afterward at Berlin 1693. By request of King Frederick I. he labored earnestly for a union of all the Protestant Churches. Dr. Jablonski became a bishop among the Moravians in 1699 and their actual head. In 1735 he consecrated David Nitschmann, the first bishop of the renewed Moravian Church, and in 1737 Count Zinzendorf. In 1733 he was elected president of the Royal Academy of Sciences at Berlin. Among his numerous literary labors he translated into Latin some of the English works of Richard Bentley, and published editions of the Hebrew Bible (1699), and of the Talmud (1715–21), the former being especially valuable for its critical apparatus. D. in Berlin, May 27, 1741. Revised by S. M. JACKSON.

Jablonski, PAUL ERNST: author; son of Daniel Ernst Jablonski (1660–1741), bishop; b. in Berlin, Germany, in 1693. He studied theology and Oriental philology, especially Coptic, under La Croze, in the University of Frankfort-on-the-Oder, publishing in 1714 a dissertation on the language of Lycaonia. By royal favor he was enabled to pursue special philological studies in the principal cities of Europe. After a brief pastorate at Liebenberg (1719), he became professor in the faculty of philosophy (1721), and in that of theology (1722) at Frankfort. A little later he was elected a member of the Royal Society at Berlin. He wrote on a variety of subjects, but is chiefly known through his treatise on *Nestorianism* (1724); his *Institutes of Christian History* (1766); and his works on Egyptian topics, such as *Pantheon Ægyptiorum* (1750); *De Memnone Graecorum et Ægyptiorum* (1753); *Remphan Ægyptiorum deus* (1735, and Ugolino, vol. xxiii.); and *Opuscula* (1804–10). His works were long regarded as authoritative, but the discovery of the hieroglyphic key and the progress of investigation have made them little more than mile-stones in the march of Egyptology. D. at Frankfort-on-the-Oder, Sept. 13, 1757. CHARLES R. GILLETT.

Jablonský, yăăb'lon-skee, BOLESLAV (pseud. for KAREL EUGEN TUPÝ): poet; b. at Kardašova Řečice, Bohemia, Jan. 14, 1813; studied philosophy at Prague, intending to devote himself exclusively to literary pursuits, but, compelled by poverty and his parents' wishes, entered a convent in 1838, and in 1841 took holy orders. His being a priest did not prevent him, however, from writing fiery songs of love which became very popular, and won him the title of "Love Singer." In 1847 he was appointed provost of the Premonstratensian monastery at Zverinec, near Cracow, in Poland, where he died Feb. 27, 1881. His foremost works are the *Písně milosti* (Love Songs, shortly before 1841); *Moudrost otcovská* (The Father's Wisdom, 1840); a collection of didactic poems; and *Tři doby země české* (Three Eras of Bohemia), a patriotic poem. He also left a collection of Polish songs in MS. J. J. KRÁL.

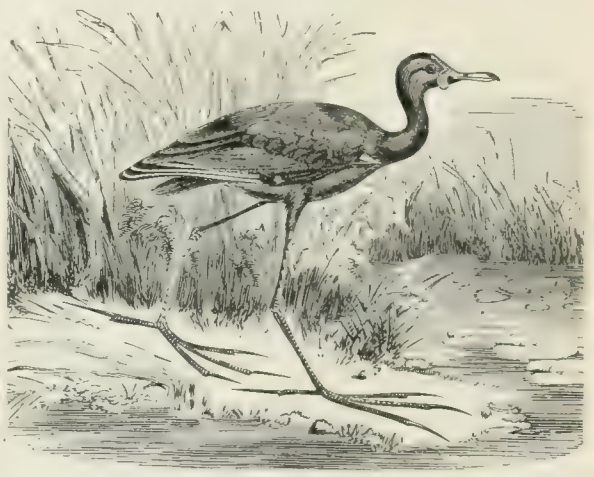
Jabneel, jăb'nĕe-el [Gr. Jamnia, Arab. Yebna, called Ibelin by the crusaders]: a town of Palestine, 12 miles S. of Jaffa and 3 miles from the Mediterranean. Generally held by the Philistines in Old Testament times, it played an important part in the wars of the Maccabees. According to tradition Gamaliel was buried there. After the destruction of Jerusalem, Jabneel was (70–135) the seat of the Sanhedrin. Close to the modern village, which doubtless occupies the ancient site, are the remains of a fortress erected by the crusaders. EDWIN A. GROSVENOR.

Jaboran'di: a drug which consists of the leaflets of *Pilocarpus selloanus* or *Pilocarpus jaborandi*, a tree—or rather a shrub—of Brazil, and of the order *Rutaceæ*, about 10 feet high, with its leaves, consisting of from two to five pairs of leaflets, placed alternately on the stem, and often 1½ feet long. Four or 5 grammes of the bruised drug are infused in boiling water. Soon after this is swallowed, whether warm or cold, a most powerful sialagogue and diaphoretic effect is produced. Streams of perspiration flow from the patient, and so much saliva and mucus is produced in the mouth and air-passages that speech is difficult. It is useful in the treatment of several diseases, chiefly cardiac dropsy. Jaborandi contains an active alkaloid, pilocarpine, which is widely used in place of the crude drug. The shrub grows chiefly in the eastern provinces of Brazil. The attention of medical men was first drawn to the peculiar powers of the drug by Dr. Coutinho, of Pernambuco, in 1875.
Revised by H. A. HARE.

Ja'ca, or **Xaca**: town in the province of Aragon, Spain; at the foot of the Pyrenees; 30 miles N. N. W. of Huesca (see map of Spain, ref. 13–I). It is situated in a fertile valley, and contains a cathedral built in 814, a castle, and several convents. The inhabitants are employed in agriculture and woolen weaving; the soil is highly productive of grain. During the Roman empire Jaca was a place of some importance, capital of the *regio Jacatania*. Pop. 4,649.

Jac'amar [from Brazilian name *jacamaricá*]: the popular name of various small birds belonging to the South American family *Galbulidæ*, related to the barbets, toucans, and bee-eaters. They have two toes in front, two behind, long, slender, sharp-pointed bills, and the plumage of the upper parts generally of a bronzed metallic green, much like that of the humming-birds. F. A. L.

Jaca'na [from Brazilian *jaçana*]: a name given to the members of the family *Jacanidæ*, a group of small birds resembling rails, but more nearly related to the plovers. They are distinguished by their very long, slender toes, by means of which they are enabled to walk over the leaves



The jacana.

of water-lilies, and other aquatic plants. Most species, like the South American *Jacana gymnostoma*, have a small sharp spur on the bend of the wing. This bird is found as far north as Texas. Related species occur in Africa, Asia, and Australia. See PARRIDÆ. F. A. LUCAS.

Jac'aré: the popular name of several South American crocodilians, nearly related to the alligator. In a scientific sense jacaré is used as the name of a genus of caymans. See CAYMAN.

Jaccoud, zhăă'koo', SIGISMOND: specialist in medicine; b. in Geneva, Switzerland, Nov. 20, 1830; was educated at Geneva and Paris; became Professor of Pathology, Paris, in 1877; became Professor of Clinical Medicine, Paris, in 1883; and member of the Academy of Medicine in 1877. Among the more important of his numerous works are *Traité de Pathologie interne* (seven vols., 1871–83); *Clinique médicale de la Pitié* (4 vols., 1885–88). C. H. T.

Jacinth: See ZIRCON.

Jack: an apparatus for raising heavy bodies and for moving machinery. The moving parts consist sometimes of a simple screw moving within a nut fixed in the shell of the instrument, and turned by a long handle or a system of gearing; sometimes of a HYDRAULIC PRESS, q.v. of compact form, small size and high power; and occasionally of com-

binations of levers or gearing. The first of these forms of the tool is variously called a jack-screw or a screw-jack; the second is usually termed an hydraulic jack; the last mentioned is a geared jack. The screw-jack or jack-screw is most commonly used for moderate weights, as a few hundred pounds, or perhaps a ton; the others are used up to 10 or 20 tons, or even more, but finally merge into the hydraulic press, as they lose portability, which is an essential characteristic of the jack. The machine is always compact, as light as is consistent with proper strength and safety in operation, simple in design, and of the best materials and workmanship, to insure the desired combination of strength and lightness. Its exterior is commonly a plain cylinder, mounted upon a properly formed foot, and having concentric with it another cylinder, moving snugly within or outside it, the impelling apparatus acting to compel this motion in the direction of its extension against any load not exceeding that maximum for which it was designed. Often a lug cast on the side of the moving cylinder—in this case exterior to the fixed part—permits the load to be carried lower than where lifted by the introduction of the whole machine beneath it. In construction it must be given such proportions that it can not "run down" without the active exertion of an external force applied by the operator; otherwise serious accidents would be liable to occur.

R. H. Thurston.

Jackal [from O. Fr. *jackal* > Fr. *chacal*: Span. *chacal*, from Arab. *joqāl*, from Pers. *shaghāl*, jackal]: a wild dog of Asia, Southeastern Europe, and Africa, the *Canis aureus*, which hunts in troops, is a carrion-eater, and is easily domesticated. It is nocturnal in its habits, and accustomed to conceal itself as much as possible during the daytime. It is gregarious. Sometimes, however, a jackal will prefer to live solitary. He takes up his abode near some human habitation and becomes a destructive foe to domesticated animals, and so wily that he is seldom surprised until he has wrought much mischief. Generally, however, jackals hunt in packs, often numbering 200, and in such cases they are very dangerous and attack much larger animals—antelopes, sheep, etc. Probably the jackal is one of the originals whence the domestic dog has sprung, as the two breed together. According to Geoffroy Saint-Hilaire, there is no constant difference between the structure of the jackal and that of the small canine races, and it is dog-like both in external appearance and in habits. Like the fox, the jackal has a peculiarly offensive odor.

Jackass, Laughing: See Dacelo.

Jackdaw: a diminutive member of the crow family (*Colœus monedula*), distinguished from its relatives by having a straighter bill. The forehead and upper parts of the body are black, the back of head and nape gray, the under parts dark-slate color. The jackdaw breeds in church towers, ruins, holes in trees, or in seacoast rock crevices. It is found throughout Europe and parts of Asia, and is extremely numerous in some localities, is readily tamed, and makes a most interesting pet. In the southern part of the U. S. the name is applied to the boat-tailed grackle, *Quiscalus major*. See Daw.

F. A. Lucas.

Jack-o'-Lantern: See Ignis Fatuus.

Jack-rabbit (short for jackass rabbit): a large rabbit (*Lepus callotis*) of the Western U. S. It has remarkably long ears, these appendages sometimes attaining a length of 6 inches.

Jack-screw: See Jack.

Jackson: city (incorporated in 1857); capital of Jackson co., Mich. (for location of county, see map of Michigan, ref. 8–J); on the Grand Trunk, the Lake Shore and Mich. S., and the Mich. Cent. railways; 37 miles S. of Lansing, 76 miles W. of Detroit. It is in the central coal basin of the State, which overlies extensive but undeveloped deposits of salt; contains 24 churches, 15 public and 4 parochial schools, free public library, public-school library, State prison library, U. S. Government building, Holly system of water-works, sewerage system emptying into Grand river, electric street railways, electric-lighting plant, and 3 daily and 6 weekly newspapers. The Michigan State prison and the main manufacturing and repair shops of the Mich. Cent. Railroad are situated here. The census returns of 1890 showed that 218 manufacturing establishments (representing 57 industries) reported. These had a combined capital of $4,956,639; employed 3,249 persons; paid $1,215,760 for wages, $2,610,043 for materials, and $348,814 for miscellaneous expenses; and had products valued at $5,013,126. The principal industries, according to the amount of capital investment, were the manufacture of foundry and machine-shop products, which had 12 establishments, $1,746,279 capital, and $374,286 in value of products; carriages and wagons, 12 establishments, $897,843 capital, and $971,772 in value of products; corsets, 4 establishments, $267,598 capital, and $375,233 in value of products; and flour and grist mill products, 5 establishments, $222,199 capital, and $618,710 in value of products. Pop. (1880) 16,105; (1890) 20,798; (1894) 22,614.

Editor of "Citizen."

Jackson: city; capital of the State of Mississippi and of Hinds co. (for location of county, see map of Mississippi, ref. 7–F); on the Pearl river, and the Ill. Cent., the Q. and C. Route, and the Yazoo and Miss. Val. railways; 45 miles E. of Vicksburg, 183 miles N. of New Orleans. It contains the State capitol, State penitentiary, State Institution for the Blind, State Institution for the Deaf and Dumb, State Lunatic Asylum, U. S. Government building, Jackson Collegiate Academy, Millsaps College, Mary Holmes Industrial Seminary for colored girls, 4 libraries (Jackson Collegiate Academy, Mississippi Institution for the Blind, Mississippi Institution for the Deaf and Dumb, and the Mississippi State), and 9 periodicals. The city is the geographical and railway center of the State, is in a rich cotton-growing region, and has important manufactures and large trade interests. A large part of the city was destroyed during the civil war. Pop. (1880) 5,204; (1890) 5,920, with suburbs, estimated, 9,500.

Editor of "Clarion."

Jackson: village (founded in 1816); capital of Jackson co., O. (for location of county, see map of Ohio, ref. 7–F); on the Ohio S. and Balt. and O. S. W. railways; 108 miles S. E. of Springfield. It is in an iron and coal region; contains 10 churches, 4 public-school buildings, and 3 weekly newspapers, and has several iron-furnaces and productive coal mines. Pop. (1880) 3,021; (1890) 4,320; (1893) 5,300.

Publishers of "The Herald."

Jackson: city; capital of Madison co., Tenn. (for location of county, see map of Tennessee, ref. 7–C); on the Forked Deer river, and the Mobile and O., the Ill. Cent., and the Tenn. Mid. railways; 72 miles E. N. E. of Memphis, 150 miles W. S. W. of Nashville. It contains 16 churches, the Southwestern Baptist University (chartered 1874), West Tennessee College (founded 1844), Memphis Conference Female Institute, 3 libraries (Institute, Free Public, and Southwestern Baptist University), and 2 daily, 5 weekly, and 2 monthly periodicals. The city has a large cotton-trade, and among its industrial establishments are railway machine-shops, 3 foundries, cottonseed-oil, flour, and woolen mills, engine and boiler works, and spoke, cotton-gin, carriage, and ice factories. Pop. (1880) 5,377; (1890) 10,039.

M. D. Meriwether, sec. board of trade.

Jackson, Abraham Reeves, A. M., M. D.: surgeon; b. in Philadelphia, June 17, 1827; was educated at the Pennsylvania Medical College in Philadelphia in 1848; practiced his profession at Stroudsburg, Pa., until May, 1870, when he removed to Chicago, Ill.; founded the Woman's Hospital of the State of Illinois, of which he became surgeon-in-chief. In the winter of 1872 he was elected to the chair of Diseases of Women by the faculty of Rush Medical College, and later became president of the College of Physicians and Surgeons, Chicago, Ill. D. Nov. 12, 1892. He published many papers, including *Removal of Large Urethro-vesical Calculus* (1858); *Obstinate Hæmorrhage from the Frænum Linguæ* (1859); *Successful Removal of both Ovaries* (1866); *Uterine Fibroid of Posterior Wall Successfully Removed* (1870); *Non-Ovarian Menstruation*, etc. (1870); *Removal of Fibrous Tumor of Uterus* (1872); *Treatment of Uterine Fibroids by the use of Ergotine* (1874), etc.

Jackson, Andrew, LL. D: the seventh President of the U. S.; b. in the Waxhaw Settlement, Union co., N. C. (at that time supposed to be in South Carolina), Mar. 15, 1767. His parents were Scotch-Irish, natives of Carrickfergus, Ireland, who emigrated to North America in 1765 and settled on Twelve Mile creek, a tributary of the Catawba. His father, who was a poor farm-laborer, died shortly before Andrew's birth, when his mother removed to Waxhaw, where some relatives resided. Few particulars of the childhood of Jackson have been preserved; his education was of the most limited kind, and he showed no fondness for books. In 1780, at the age of thirteen, he, with his brother Robert, volunteered to serve in the Revolutionary forces under Gen.

Sumter, and was a witness of the latter's defeat at Hanging Rock. In the following year the brothers were made prisoners, and confined at Camden, experiencing brutal treatment from their captors, and being spectators of Gen. Greene's defeat at Hobkirk's Hill. Through their mother's exertions the boys were exchanged while suffering from smallpox. Robert soon died at Waxhaw, and Mrs. Jackson died not long after at Charleston of ship-fever, contracted in nursing the soldiers held prisoners by the British. Young Jackson, left destitute, worked for some time in a saddler's shop, afterward taught school, and at the age of eighteen began the study of law at Salisbury, N. C. In 1786 he was admitted to the bar, and removed in 1788 to Nashville, in what was then the western district of North Carolina, with the appointment of solicitor or public prosecutor. Two years later Tennessee became a Territory, and Jackson was appointed U. S. attorney for the new district by President Washington. In 1791 he married Mrs. Rachel Robards (daughter of Col. John Donelson), whom he supposed to have been divorced in that year by an act of the Legislature of Virginia. It afterward appeared that the divorce had not become legal until 1793, when it was formally granted by a jury in Mercer co., Ky., on the application of the husband, who was a resident of that State, and it was not until Jan., 1794, that Mr. and Mrs. Jackson were legally married by a second ceremony at Nashville. Under the circumstances it was not unnatural that the facts of the case were so misrepresented by opponents in the political campaigns a quarter of a century later as to become the basis of serious charges against Jackson's morality; which, however, has been satisfactorily attested by abundant evidence. Jackson was untiring in the exercise of his duties as U. S. attorney, which demanded frequent journeys through the wilderness and exposure to Indian hostilities; he acquired considerable property in land, and obtained such influence as to be chosen a member of the convention which framed the constitution of the new State of Tennessee (1796), and was elected in that year its first representative in Congress. The following year (1797) he was chosen to the U. S. Senate, but resigned in 1798, and in the same year accepted a seat on the bench of the Supreme Court of Tennessee, which he held till 1804. He was elected a major-general of the State militia in 1801, and on the acquisition of Louisiana (1803) was an unsuccessful candidate for appointment as Governor of the new Territory. In 1804 he withdrew from politics, settled on the plantation which he called the Hermitage, near Nashville, set up a cotton-gin, formed a partnership, and traded to New Orleans, making the voyages on flatboats. Through his hot temper Jackson was involved in several quarrels and affairs of honor during this period, in one of which (1806) he was severely wounded and had the misfortune to kill his opponent, Charles Dickinson. In 1805 Aaron Burr had visited Nashville and been a guest of Jackson, with whom he corresponded on the subject of a war with Spain, which was anticipated and desired by them, as well as by the people of the Southwest generally. Burr repeated his visit in Sept., 1806, when he engaged in the celebrated combinations which led to his trial for treason; he was warmly received by Jackson, at whose instance a public ball was given in his honor at Nashville, and contracted with the latter for boats and provisions. In 1807, when Burr had been proclaimed a traitor by President Jefferson, volunteer forces for the Federal service were organized at Nashville under Jackson's command, but his energy and activity did not shield him from suspicions of connivance in the supposed treason. He was summoned to Richmond as a witness in Burr's trial, but was not called to the stand, probably because he was outspoken in his partisanship.

On the outbreak of war with Great Britain in 1812 Jackson tendered his services, and in Jan., 1813, embarked for New Orleans at the head of the Tennessee contingent. In March he received an order to disband his forces, but he refused to obey, and did not disband them till they had returned to Tennessee. Soon after this he became involved in a quarrel with his old friend Col. Benton, whom he attempted to horsewhip at Nashville, and was seriously wounded by Benton's brother, Jesse. In September he again took the field in the Creek war, and in conjunction with his former partner, Col. Coffee, inflicted upon the Indians the memorable defeats at Talladega, Emuckfaw, and on the Horseshoe Bend of the Tallapoosa (Tohopeka). In May, 1814, Jackson, who had now acquired a national reputation, was appointed a major-general of the army, and began a campaign against the British in Florida, conducted the defense of Mobile (Sept. 15), seized upon Pensacola (Nov. 6), and immediately transported the bulk of his troops to New Orleans, then threatened by a powerful naval force. Martial law was declared in Louisiana, the State militia was called to arms, engagements with the British were fought Dec. 23 and 28, and after re-enforcements had been received on both sides the famous victory of Jan. 8, 1815, crowned Jackson's fame as a soldier, and made him the typical American hero of the first half of the nineteenth century. In 1817–18 he conducted the first war against the Seminoles of Florida, during which he seized upon Pensacola, and executed by court martial two British subjects (Arbuthnot and Ambrister)—acts which might easily have involved the U. S. in war with Spain and Great Britain. Fortunately the peril was averted (1819) by the cession of Florida to the U. S., and Jackson, who had escaped a trial for the irregularity of his conduct only through a division of opinion in Monroe's cabinet, was appointed (1821) Governor of the new Territory. Soon afterward he declined the appointment of minister to Mexico. In 1823 Jackson was elected to the U. S. Senate, and nominated by the Tennessee Legislature for the presidency. This candidacy, though at first a matter of surprise, and even merriment, speedily became popular, and in 1824 the hero of New Orleans received the largest popular vote among the four candidates, though John Quincy Adams was elected by the House of Representatives through the influence of Henry Clay. In 1828 Jackson was triumphantly elected President over Adams after a campaign of unequaled bitterness, which may be considered the point of departure of the modern Democratic party. Inaugurated on Mar. 4, 1829, he at once removed from office nearly all the incumbents belonging to the opposite party—a procedure new to politics in the U. S., which naturally became a precedent. The first term of Jackson was characterized by quarrels between Vice-President Calhoun, and Secretary of State Van Buren, attended by a cabinet crisis originating in scandals connected with the name of Mrs. Eaton (wife of the Secretary of War); by the beginning of his war upon the U. S. Bank, and by his vigorous action against the partisans of Calhoun, who in South Carolina (1832) threatened to nullify the acts of Congress establishing a protective tariff. In the presidential campaign of 1832 Jackson received 219 out of 288 electoral votes, his competitor being Mr. Clay, while Mr. Wirt, on an anti-Masonic platform, received the vote of Vermont alone. In 1833 President Jackson removed the Government deposits from the U. S. Bank, thereby incurring a vote of censure from the Senate, which was, however, expunged four years later. During this second term of office the Cherokees, Choctaws, and Creeks were removed, not without difficulty, from Georgia, Alabama, and Mississippi to the Indian Territory; the national debt was extinguished, useful commercial treaties were made with several nations, Arkansas and Michigan were admitted into the Union as States, the Seminole war was renewed, the anti-slavery agitation first acquired importance, the Mormon delusion, which had originated in 1829, attained considerable proportions in Ohio and Missouri, and the country experienced (1837) its first great financial panic, which has been attributed by some to the administration's financial policy. Railways with locomotive propulsion were introduced into the U. S. during Jackson's first term (1829), and had become an important element of national life before the close of his second term. For many reasons, therefore, the administration of President Jackson formed an era in the political, social, and industrial history of the U. S. He succeeded in effecting the election of his friend Van Buren as his successor, retired from the presidency Mar. 4, 1837, and led a tranquil life at the Hermitage until his death, June 8, 1845. No public man in the U. S. during the nineteenth century has been the subject of such opposite judgments; he was loved and hated with equal vehemence during his life, but at the present distance of time from his career, while opinions still vary concerning the merits of most of his public acts, few of his countrymen will question that he was warm-hearted, brave, patriotic, honest, and sincere. Jackson's life has been many times written: by Eaton (1824), William Cobbett (1834), Amos Kendall (1844), Jenkins (1850), Headley (1852), with great fullness and completeness by James Parton (3 vols., New York, 1859, *seq.*), and again in The Great Commander Series (New York, 1893). See also Thomas H. Benton's *Thirty Years' View* (1854) for the political history of his administration, and the biography of Jackson by Prof. W. G. Sumner in the American Statesmen Series (1882). Revised by C. K. Adams.

Jackson, Charles, LL. D.: jurist; b. at Newburyport, Mass., May 31, 1775; son of Hon. Jonathan Jackson; graduated at Harvard College in 1793; studied law in the office of Chief Justice Parsons, and, removing to Boston in 1803, soon attained an eminent position at the bar; was judge of the Massachusetts Supreme Court 1813–24, member of the constitutional convention in 1820, and chairman of a commission to codify the State laws in 1833. Through his labors several important reforms were introduced into Massachusetts legislation, especially in reference to debit and credit. He published a treatise on *Pleadings and Practice in Real Actions* (1828), which is a recognized authority upon the law of property. D. in Boston, Dec. 13, 1855.

Revised by C. H. Thurber.

Jackson, Charles Thomas, M. D.: scientist and inventor; b. in Plymouth, Mass., June 21, 1805; studied medicine in Boston; took part (in 1827–29) with Francis Alger in the geological survey of Nova Scotia; studied medicine and geology in Europe 1829–32; in 1836 became State geologist of Maine (publishing three annual reports); in 1837 had a controversy with Prof. Morse regarding the invention of the telegraph, to which he had some claims; in 1839 became State geologist of Rhode Island (one vol. of reports); in 1840 State geologist of New Hampshire (one report, 1844); was (1847–49) U. S. surveyor of mineral lands in Michigan (report 1850). He also received numerous honors as the discoverer of anæsthetics—a distinction which has found several other claimants. He published various chemical reports for the U. S. Patent-office, and a *Manual of Etherization* (1861). D. at Somerville, Mass., Aug. 29, 1880.

Jackson, George Thomas, M. D.: dermatologist; b. in New York city, Dec. 19, 1852; graduated at the College of Physicians and Surgeons 1878; was interne of the Charity Hospital, Blackwell's island, N. Y.; studied medicine in Berlin, Vienna, and Strassburg 1878–80; since has practiced medicine in New York. He has been chief of clinic and instructor in Dermatology in the College of Physicians and Surgeons since 1887; visiting dermatologist to Randall's Island Hospital since 1889; Professor of Dermatology in the Woman's Medical College since 1890; consulting dermatologist to the Presbyterian Hospital since 1892; and editor of the *Transactions* of the New York Academy of Medicine since 1890. He was secretary of the American Dermatological Association from 1889–93. He belongs to the American Dermatological Association, the New York Dermatological Society, the New York Academy of Medicine, the Medical Society of the County of New York, and to the Medical Society of the State of New York. Besides many contributions to current medical literature, he has written *Diseases of the Hair and Scalp* (New York, 1887; revised ed. 1893); *Baldness* (1889); *The Ready Reference Handbook of Diseases of the Skin* (Philadelphia, 1892).

Jackson, Helen Maria (*Fiske*) (*Hunt*): author; a daughter of Prof. Nathan W. Fiske; b. at Amherst, Mass., Oct. 18, 1831; became the wife of Maj. Edward B. Hunt (1822–63) of the U. S. Engineers. She published *Verses by H. H.* (1871); *Bits of Travel* (1873); *Mercy Philbrick's Choice* (1876); *Hetty's Strange History* (1877); *A Century of Dishonor* (1881); *Ramona* (1884); and a number of minor works, including stories for children. *Glimpses of Three Coasts*, *Sonnets and Lyrics*, and two other works were posthumous (1886–87). She was married to W. S. Jackson, of Colorado Springs, Col., Oct. 22, 1875. D. at San Francisco, Aug. 12, 1885. She is thought to have been the author of the mysterious "Saxe Holm" stories. Revised by H. A. Beers.

Jackson, Henry Rootes: soldier; b. in Athens, Ga., June 24, 1820; was educated partly at Princeton and partly at Yale College. He entered the latter in 1835, and graduated there in 1839 with the first honor of his class; studied law and was admitted to the bar in Georgia in 1840; first opened an office in Columbus, but finally located in Savannah; was appointed U. S. district-attorney for the State in 1843; served as colonel in the Mexican war in 1846; after that war (in which he gained distinction) he was elevated to the circuit court bench of the State, which position he held 1849–53, when he resigned it to accept the appointment of *chargé d'affaires* to Austria. This mission was raised to the grade of minister resident in 1854, and he was continued in it until 1858, when he resigned the position and resumed the practice of law in Savannah. In 1859 he was employed by the Federal Government authorities to prosecute the Wanderer, a celebrated slave-ship, which had landed a cargo of Africans on the coast of Georgia. In 1859 he was unanimously chosen chancellor of the State University, but declined to accept the position. He was appointed major-general, to command the forces of Georgia, after the passage of the ordinance of secession, and was judge of the Confederate courts from Mar. 20, 1861, till Aug. 17, 1861, when he retired to accept the commission of brigadier-general in the Confederate army. In Dec., 1861, he was appointed major-general of a division of Georgia troops in the field; was reappointed brigadier-general in the Confederate army in 1863, and assigned a command on the upper Potomac. He was under Hood in his famous expedition to Tennessee in the fall of 1864, and was conspicuous in the battles of Franklin and Nashville; in the latter, his entire command, thinned in its ranks to only a few hundred, was surrounded and captured on the field. As a prisoner of war he was first taken to Johnson's island, then transferred to Fort Warren, where he remained till the close of the war. *Tallulah, and other Poems*, which met with general popular favor, was published in 1850. He was U. S. minister to Mexico 1885–86.

Revised by C. H. Thurber.

Jackson, Howell Edmonds: justice of the Supreme Court of the U. S.; b. at Paris, Tenn., Apr. 8, 1832; graduated at West Tennessee College 1848; studied at the University of Virginia for two years; graduated from the law school of Cumberland University 1856; was in the civil service under the Confederate Government during the civil war; practiced law at Memphis, Tenn.; was a member of Tennessee House of Representatives 1880; elected Jan. 26, 1881, U. S. Senator from Tennessee, for the term beginning Mar. 4, 1881; was appointed by President Cleveland circuit judge for the sixth district (Kentucky, Michigan, Ohio, Tennessee) 1886; was appointed by President Harrison associate justice of the Supreme Court of the U. S., Feb. 2, 1893, to succeed Justice Lamar. D. at West Meade, near Nashville, Tenn., Aug. 8, 1895. C. H. Thurber.

Jackson, James: soldier and U. S. Senator; b. at Moreton-Hempstead, Devonshire, England, in 1758; emigrated to Georgia in 1772; took an active and zealous part in the war for independence; was made brigade-major in 1778, and in 1781 commanded the legionary corps of the State of Georgia. Upon the evacuation of Savannah by the British (July 12, 1782) he received the keys. After the war was over he engaged in the practice of law, and pursued it with success. He was elected a member of the first Congress of the U. S., which assembled under the new Constitution in 1789. He was soon after chosen one of the Senators from Georgia, and held the position until 1795 and then resigned upon the passage of the famous Yazoo bill, as it was called, by the Legislature of his State; this bill he succeeded in getting condemned and finally repealed. In 1798 he was elected Governor of the State, and held the position until 1801, when he was again returned to the U. S. Senate. D. at Washington, D. C., Mar. 16, 1806. In politics he was of the Jeffersonian school.

Jackson, Mercy Bisbee, M. D.: b. in Hardwick, Mass., Sept. 17, 1802; practiced medicine eighteen years in Plymouth, Mass., and fifteen years in Boston; graduated at the New England Female Medical College in 1860; was the first woman admitted to the American Institute of Homœopathy in Philadelphia, June, 1871; was admitted to the Massachusetts Homœopathic Society in 1872 and the Boston Homœopathic Medical Society in 1873. She became Professor of the Diseases of Children in the Boston University School of Medicine in 1873; wrote in favor of woman suffrage in 1854, and was an active worker in support of that cause. D. in Boston, Dec. 13, 1877.

Jackson, Samuel Macauley, D. D., LL. D.: b. in New York city, June 19, 1851; graduated at the College of the City of New York in 1870, and from the Union Theological Seminary in 1873; studied at Leipzig; was Presbyterian pastor at Norwood, N. J., 1876–80. He was assistant editor of Schaff's *Bible Dictionary* (1878–80); associate editor of the Schaff-Herzog *Encyclopædia* (1880–84); joint editor with Dr. Schaff of the *Encyclopædia of Living Divines* (New York, 1886; new ed. 1891); editor of *The Magazine of Christian Literature* (1889–91). He wrote the elaborate biographical chapter on the literature of the Greek and Latin Churches from the seventh to the eleventh centuries in vol. iv. of Dr. Schaff's *Church History*, and the chapter on Theodore Beza in vol. vii. of the same work. He published *A Concise Dictionary of Religious Knowledge* (New York, 1891; 3d revised and enlarged edition 1893); *Bibliography of Foreign Missions*, reprinted from the *Encyclopæ-*

dia of Missions (New York, 1891). He is the brother of George Thomas Jackson, M. D., and one of the associate editors of *Johnson's Cyclopædia*. WILLIS J. BEECHER.

Jackson, SHELDON, D. D.: missionary; b. at Minaville, N. Y., May 18, 1834; educated at Union College and Princeton Theological Seminary; entered upon missionary work among the Choctaws at Spencer Academy, Indian Territory, in 1858; was home missionary for Western Wisconsin and Southern Minnesota 1859–64; retaining oversight of this field, he was pastor at Rochester, Minn., 1864–69; commissioned by three Iowa presbyteries as superintendent of missions from Iowa westward, especially along the line of the Union Pacific Railway 1869; was under commission of the board of home missions as superintendent of missions for the Rocky Mountain region 1870–82; made business manager of *The Presbyterian Home Missionary* in New York city 1882. Since 1885 he has been U. S. general agent of education in Alaska, with office in the Department of the Interior. Dr. Jackson is vice-president of the Alaska Historical Society, of the American Sabbath Union, and of the American Shipping and Industrial League. He has been seven times commissioner to the General Assembly, and has assisted at the organization of two synods, and of seven extensive presbyteries, including that of Alaska. He was editor of *The Rocky Mountain Presbyterian* at Denver 1872–82; established *The North Star* at Sitka 1887; and is the author of various monographs, including the article *Alaska* in the *United States Census Report of 1880*. C. K. HOYT.

Jackson, THOMAS, D. D.: theological writer; b. at Witton, on the river Wear, in the bishopric of Durham, England, Dec. 21, 1579; was educated at Oxford (B. A. 1599; M. A. 1603; B. D. 1610; D. D. 1622); became president of Corpus Christi College in 1630, prebendary of Winchester in 1635, and Dean of Peterborough in 1638. Dean Jackson was a voluminous and learned writer upon Anglican theology, and his name stands high on the roll of the famous divines of the seventeenth century. His *Commentary on the Apostles' Creed* is still highly valued, and his complete works, as collected and put forth by Barnabas Oley in three folio volumes (1673), were republished at Oxford in 1844 (12 vols.). D. Sept. 21, 1640. Revised by W. S. PERRY.

Jackson, THOMAS, M. A.: clergyman and author; b. at Preston, England, in 1812; son of an eminent Wesleyan minister of same name; graduated at St. Mary's Hall, Oxford, in 1834; took holy orders in the Church of England, and after holding several parochial appointments became principal of the Normal College at Battersea (1844) and prebendary of St. Paul's, London (1850). In 1850 he was appointed bishop of a projected diocese in New Zealand, and went thither, but returned without having been consecrated, in consequence of difficulties with Bishop Selwyn. Being preferred to the rectory of St. Mary, Stoke Newington (a district of London), in 1852, he built up there one of the most splendid churches in the British metropolis. He published *Sermons* (1859); *The Mourning Mother Comforted* (1862); *Our Dumb Companions* (1864); *Curiosities of the Pulpit and Pulpit Literature* (1868); *Our Dumb Neighbors* (1869); *Our Feathered Companions* (1870); *Uniomachia, a Greek-Latin Macaronic Poem* (3d ed. 1875); *Reminiscences and Anecdotes of Celebrated Preachers* (1876); a new edition of *Curiosities of the Pulpit*. D. at Stoke Newington, Mar. 18, 1886. Revised by W. S. PERRY.

Jackson, THOMAS JONATHAN (Stonewall): general; b. at Clarksburg, Va. (now West Virginia), Jan. 21, 1824. He graduated at the Military Academy at West Point in 1846; was assigned to duty in the army; was appointed second lieutenant of artillery; was complimented for gallantry in a number of battles in the campaign against Mexico, and received brevet of captain for conduct in the battles of Contreras and Cherubusco, and of major for conduct in the storming of Chapultepec. Resigning from the army in 1852 he became Professor of Physics and artillery instructor in the Virginia Military Institute at Lexington, and was there noted for great devotion to the duties of his calling, sternness in the enforcement of discipline, great purity of life and character, professed religious fervor, strong will, and intensity of purpose. On Apr. 17, 1861, he was made colonel in the Army (Confederate) of Virginia, and with a small force seized the arsenal at Harper's Ferry; was soon made brigadier-general and put in command of the Virginia Valley Brigade. At the battle of Bull Run the sobriquet of "Stone Wall" was given to him and his brigade by Gen. Bee, who called out to his own troops: "There stand Jackson and his men like a stone wall!" Gen. Bee fell mortally wounded a few minutes afterward. In Sept., 1861, he was made major-general and placed in command of the Confederate forces operating in the valley. He proved himself a dangerous foe to the Federal forces with his rapid movements, unexpected attacks, and hard fighting, defeating Milroy, fighting the battle of Kernstown, in which he was not successful, and by forced marches day and night turning on Gen. Banks and defeating him, capturing many prisoners and stores. In the battles of McDowell (May 8, 1862), Cross Keys (June 8), and Port Republic (June 9), he inflicted severe blows, capturing many guns, supplies, and prisoners. In this campaign he made manifest his rare talents for effective offensive warfare, by giving to a comparatively small force that astonishing mobility and fighting power which enabled him to deliver so many heavy blows with the effect of neutralizing an aggregate of nearly 70,000 Federal soldiers, and of arousing the greatest apprehension throughout the Northern States for the safety of the Federal capital. Fresh from such successes, Jackson was called by Lee to add his corps to the army at Richmond for the flank movement on McClellan, beginning with the battles of Mechanicsville (June 26) and Cold Harbor (June 27), and winding up with the retreat of McClellan to the gunboats at Harrison's Landing. In this campaign his striking the Federal army in flank at Cold Harbor while it was engaged in front by Hill and Longstreet was his best blow. In the other engagements in that retreat he did not especially figure. Immediately after McClellan's retreat to the shelter of the gunboats on the James river, Jackson was sent northward by Lee with three divisions to meet Gen. Pope on the Rapidan, whom he attacked and defeated. When Lee, on leaving McClellan at Harrison's Landing, pushed northward, Jackson commanded the vanguard and was a conspicuous figure in the battles of Second Manassas, Aug. 28 and 30, near Bull Run, in which Pope was overwhelmingly defeated. When Lee pushed on into Maryland after these victories, Jackson was detached for the attack on the fortified position of Harper's Ferry. He soon (Sept. 15) reported its capture with 1,100 men, 73 pieces of artillery, and large stores of arms, etc. Rejoining Lee at Antietam, he did valiant service in that battle. In Burnside's attack on Lee at Fredericksburg Jackson held the Confederate right and beat back the Federal assault, inflicting a heavy blow upon them. On Apr. 28, 1863, Lee, discovering Hooker's flank movement on his right, moved forward toward Chancellorsville with Jackson's troops in front. Ascertaining the position of the enemy he, by a signally bold piece of strategy, sent Jackson with his corps around Hooker's right wing, while he himself kept Hooker employed in front at Chancellorsville. Jackson's last note was written on the field, announcing his arrival at his position and saying, "I trust that an ever kind Providence will bless us with great success." He attacked the Eleventh Federal Corps and completely routed it. Having ridden far forward in pressing the fleeing foe, he was returning through the wooded region after dusk, when he and his staff were mistaken for Federal cavalry and fired on by his own troops, and the great leader was fatally wounded. He died on May 10, 1863, and was buried at Lexington.

Jackson inspired his troops with unbounded confidence. He always took profound interest in promoting the religious privileges of his men. They believed in his wonderful military genius and in the deep earnestness of his prayers, and fought under him in battle with almost fanatical desperation. Monuments have been erected to Jackson in Richmond and Lexington, Va. CHARLES S. VENABLE.

Jackson, WILLIAM: composer; b. at Exeter, England, in May, 1730; studied music at Exeter and London. After his return to Exeter he was appointed subchanter, organist, lay-vicar, and master of the choristers of the cathedral, and remained there until his death, July 12, 1803. He published several collections of *Songs*, which became very popular, *Twelve Canzonets for Two Voices*, *Sonatas for the Harpsichord*, and three dramatic pieces, *Lycidas* (1767), *The Lord of the Manor* (1780), and *The Metamorphoses* (1783), the last mentioned a comic opera, which was produced at Drury Lane, but without success. In 1782 he published *Thirty Letters on Various Subjects*, which contains some sharp musical criticism; in 1791, *Observations on the Present State of Music in London*, which is still more severe; and in 1798, *The Four Ages, together with Essays on Various Subjects*.

Jackson, William: soldier; b. in Cumberland, England, Mar. 9, 1759; went to Charleston, S. C., in boyhood, was liberally educated; served creditably in the patriot army during the Revolutionary war, attaining the rank of major as aide-de-camp to Washington. In 1781 he was secretary to Laurens in his mission to France; in 1782–83 Assistant Secretary of War; in 1787 was secretary to the convention that framed the U. S. Constitution; private secretary to Washington during his first presidency. He was surveyor of the port of Philadelphia 1796–1801, started in that city one of the first daily papers in America, *The Political and Commercial Register*, and was secretary of the Society of Cincinnati from 1800 until his death, which occurred at Philadelphia, Dec. 17, 1828. He pronounced a funeral oration upon Washington at Philadelphia.

Jacksonville: town; capital of Calhoun co., Ala. (for location of county, see map of Alabama, ref. 3–E); on the E. Tenn., Va. and Ga. Railway; 12 miles N. E. of Anniston, 30 miles N. E. of Birmingham. It is one of the oldest towns in the State, is in a rich mining region, has become a popular summer resort because of its delightful climate, and contains five churches, a college for young men, a seminary for young women, and a weekly newspaper. Pop. (1880) 882; (1890) 1,237. Editor of "Republican."

Jacksonville: city; capital of Duval co., Fla. (for location of county, see map of Florida, ref. 2–J); on the St. John river, and the Fla. Cent. and Pen., the Jack. and Atlantic, the Jack., Mayport and Pab., the Jack., St. Aug. and Ind. Riv., the Jack., Tampa and Key W., and the Sav., Fla. and W. railways; 15 miles W. of the Atlantic Ocean, 30 miles S. W. of Fernandina. It is a popular winter resort for Northern invalids, is the center of travel and business for the whole State, and contains U. S. Government building, Cookman Institute (Methodist Episcopal), 4 national, 3 State, and 2 savings banks, 6 hotels, several hospitals, 2 libraries (Cookman Institute and the Jacksonville Library Association), and 3 daily, 6 weekly, and 5 monthly periodicals. It ships annually about 75,000,000 feet of lumber, besides large quantities of naval stores, phosphate, cotton, oranges, and other commodities. Pop. (1880) 7,650; (1890) 17,201; (1895) 25,130. The dredging of St. John's river from Jacksonville to the sea, giving a uniform depth from the city to the bar, 20 miles, of 18 feet at low water, was completed in Mar., 1894, at a cost to Duval County of $300,000, and jetties were being constructed at the bar.
Editor of "Florida Times-Union."

Jacksonville: city; capital of Morgan co., Ill. (for location of county, see map of Illinois, ref. 7–C); on the Chi. and Alt., the Jack. S. E., and the Wabash railways; 30 miles W. of Springfield, 90 miles N. E. of St. Louis. It is a beautiful city, in a fertile prairie, and near Mauvais Terre creek, an affluent of the Illinois river, and has water, sewerage, gas, electric-light, and electric street-railway plants. Jacksonville is the seat of the Central Illinois Hospital for the Insane, the Illinois Institution for the Blind, the Illinois Institution for the Deaf and Dumb, Illinois College (non-sectarian, opened 1830), Illinois Female College (Methodist Episcopal, opened 1847), Jacksonville Female Academy (non-sectarian, opened 1830), and of a Lutheran orphan asylum. There are 16 churches, a free public and 8 other libraries, 2 surgical infirmaries, State conservatory of music, and 2 daily, 4 weekly, 1 semi-monthly, and 2 monthly periodicals. The industries include the manufacture of flour, foundry and machine-shop products, carriages, woolen goods, silk and woolen underwear, soap, ice, and brick and tile. Pop. (1880) 10,927; (1890) 12,935.
Editor of "Journal."

Jack-tree: popular name of a tree (the *Artocarpus integrifolia*) which originated in the East Indies, and is now naturalized throughout a large part of the tropical world. It produces abundantly a fruit resembling, but much larger than, the bread-fruit, to which it is very closely related. Though its taste is not pleasant, thousands of the lower classes of India eat it as food. The wood of the jack-tree is excellent for many uses, and is extensively used in Europe for inlaying, carving, and fancy joinery.

Jacme I., Jayme or **Jaume**, En: King of Aragon and Count of Barcelona; b. in 1207 or 1208 at Montpellier, then belonging to the Counts of Barcelona. D. at Xativa in 1276. To his inherited states he added by conquest the Moorish kingdoms of Majorca, Valencia, and Murcia, and he imposed tribute on those of Grenada, Tunis, and Tlemcen. Hence he is generally styled *The Conqueror* (*el Conquistador*). The title *en* is the Catalan and Provençal equivalent of the Spanish *don*, and, like it, probably comes from the Latin *dominus*. The life and exploits of En Jacme are recorded in the curious *Libre dels Feyts ssdevenguts en la vida del molt alt Senyor Rey En Jacme lo conqueridor*. This work is professedly autobiographic, though its authenticity has been disputed, and the question is not yet settled. The arguments *pro* and *con* may be found in the article *Katalanische Litteratur*, by A. Morel Fatio, in Gröber's *Grundriss der romanischen Philologie*, Bd. ii., 2te Abt., pp. 118, 119 (Strassburg, 1893). It is, historically and philologically, among the most valuable and attractive of the old Hispanic chronicles. The portion of it which describes the conquest of Valencia was printed in 1515 in the *Aureum opus Privilegiorum Regni Valentiæ*, and the entire work in 1557. A beautiful edition has been published by Aguiló, at Barcelona, in his *Biblioteca Catalana*. A Castilian translation by Flotato and Bofarull appeared at Barcelona in 1848. Revised by A. R. Marsh.

Jacme (or **Jayme**) **II.**: called The Just; King of Aragon and Count of Barcelona; b. about 1259; grandson of Jacme I., King of Aragon, and second son of Pedro III., on whose death, in Nov., 1285, he became King of Sicily. On the death of his brother, Alfonso III., in June, 1291, he succeeded him on the throne of Aragon, leaving the government of Sicily to his brother Frederic. He maintained wars with Naples, Genoa, and Pisa (conquering the islands of Sardinia and Corsica), as well as with the Moors of Granada and Tripoli; founded the University of Lérida; expelled the Knights Templar from the kingdom; and died at Barcelona in 1327, leaving the throne to his son, Alfonso IV. During his long reign Aragon enjoyed the new experience of internal peace. Jacme bore the surname of "The Just" deservedly. The whole body of laws valid in the country was subjected to a thorough revision, and anything vague or contradictory or superfluous and antiquated was carefully cut out. The great jurist Ximenes Rady he banished because by his hair-splitting subtleties he caused litigation.

Jacmel, zhäk'mel': a town and port of Haiti; at the head of a bay on the south coast; 27 miles S. W. of Port-au-Prince (see map of West Indies, ref. 6–G). The harbor is deep and commodious. The city is ill-built and often unhealthful; it is divided into an upper and lower town, the former, called Bel-air, commanding a fine view over the bay and surrounding country. Jacmel has an active trade, and is a regular port of call for mail-steamers from the U. S. It was a point of importance during the wars at the end of the eighteenth century. Pop. about 6,000. H. H. S.

Ja'cob, or **Israel**: in biblical history the immediate ancestor of the Hebrew nation, being the son of Isaac, grandson of Abraham, and father of the twelve patriarchs from whom the tribes of Israel deduced their origin. The place of Jacob's birth can not be ascertained from the narrative in Gen. xxv., except that it was in the *Negeb* or "south country" of the land of Canaan, probably near the well Lahai-roi (verse 11), the site of which has not been identified. In consequence of a quarrel with his twin-brother Esau about the supremacy in the household, Jacob was sent by his parents to his uncle Laban, at Haran in Padan-aram, to the N. E. of the Euphrates, where he married his cousins Leah and Rachel, and became wealthy in flocks and herds. The narratives mention that he served Laban fourteen years for his two wives, and six years for wages paid in cattle, but the other statements they make both justify and demand the inference that there was an interval between the fourteen years and the six, so that the whole period of his residence can not well have been less than forty years. Jacob then returned to Canaan with his family and his riches, not without a serious controversy with Laban. Arriving near home, he became reconciled with his brother Esau in a dramatic personal interview. Both on his journey to Haran and on his return Jacob had had visions (Gen. xxviii. and xxxii.) in which the greatness of his descendants was divinely announced to him, and the later sanctuaries at Bethel and Penuel commemorated these events. Jacob's old age was embittered by the conduct of his sons, who sold his favorite, Joseph, as a slave to the Midianites, who took him to Egypt. Many years later, when Joseph had become Viceroy of Egypt (Gen. xli.), the whole family of Jacob, in the course of a wonderful series of events, recorded in the last ten chapters of Genesis, was established in Egypt, where the patriarch died seventeen years later at the age of 147 years. On his death-bed he pronounced a

blessing upon each of his sons (Gen. xlix.), and commanded them to bury him with his fathers in the cave of Machpelah in the land of Canaan, which was accordingly done. The present text of Genesis locates this cave at Hebron, in Southern Canaan, and there is no reason to dispute this, however we may dispose of the difficulties arising from the route of the funeral procession (Gen. l. 10) or from the mention of Sychem by Stephen (Acts vii. 16). The chronology of Jacob's life is conjectural. Ussher dates his birth in 1837 B. C., while Kitto and others date his birth about B. C. 1985, and his death B. C. 1857. See Ewald's *History of Israel*, translated by Martineau, vol. i.; Dean Stanley's *Jewish Church*, vol. i.; and Blaikie's *Bible History in Connection with General History* (1882). Revised by W. J. Beecher.

Jacob, P. L.: See Lacroix, Paul.

Jacobæ'an Lily: popular name of a species of amaryllis (*A. formosissima*); a beautiful South American flower which has been acclimated in the U. S. Its bulb is large, dark-colored, and long-necked, protruding above the surface of the ground; the flowers, which appear before the leaves, are large, irregular in shape, and are of a brilliant crimson color.

Jacobi, yä'kō'bē, Abraham, M. D.: specialist in diseases of women and children; b. at Hartum, Germany, May 6, 1830; was educated at the Universities of Greifswald, Göttingen, and Bonn, graduating at the last named in 1851. He settled in the U. S. in 1853; was Professor of Diseases of Children in the New York Medical College 1860–69, and has held the same position in the College of Physicians and Surgeons since 1870. He is the author of *Contributions to Midwifery and Diseases of Women and Children* (with Dr. E. Noeggerath, 1859); *Dentition and its Derangements* (1862); *Infant Hygiene* (1872–74); *Hygiene und Pflege des Kindesalters*, in *Gerhardts Handbuch* (1875–82); *Diphtheria* (1876); *Treatise on Diphtheria* (1880); essays in the cyclopædias of Pepper and of Keating; *Pathology of the Thymus Gland* (1889); *Therapeutics of Infancy and Childhood* (1889–92). C. H. Thurber.

Jacobi, Friedrich Heinrich: philosopher; b. at Düsseldorf, Jan. 25, 1743; received a commercial education at Frankfort and Geneva. From 1763–70 he engaged in business, and was then appointed a councilor of finance for the duchies of Julich and Berg. This office gave him leisure and a superior social position. His country-seat, Pempelfort, near Düsseldorf, was for several years a center of literary life in Germany. In 1794, on the invasion of the French, he removed to Northern Germany, and lived for ten years mostly in Eutin. In 1804 he was called to Munich as a member of the newly elected Academy of Science, of which he was president from 1807 to 1813. In 1813 he resigned this position. D. Mar. 10, 1819. Jacobi's two novels, *Allwill* and *Woldemar*, though very important as documents of their time, must be considered as antiquated now. A certain interest is, on the other hand, still attached to his philosophical writings. He was one of the first in Germany who called attention to Spinoza's philosophy, and he was also one of the first who attempted, after a fashion at least, a reconciliation between science and religion at a time when the study of philosophy seemed to have undermined in the minds of the educated all religious belief. He achieves this reconciliation, however, rather forcibly by ignoring the laws of logic as far as supernatural things are concerned, and by claiming that the existence of God and things supernatural is assured him by his feeling. His philosophy, if it can be called philosophy at all, is therefore frequently called philosophy of feeling, and it has found its followers especially among people of poor philosophical training. See Harms, *Ueber die Lehre von F. H. Jacobi* (1876); Holtzmann, *Ueber Eduard Allwills Briefsammlung* (1878). Revised by Julius Goebel.

Jacobi, Hermann Georg Jakob, Ph. D.: Sanskrit scholar; b. at Cologne, Germany, Feb. 11, 1850; was educated at Cologne Gymnasium and at the Universities of Bonn and Berlin, where he made a specialty of Sanskrit and cognate languages. He spent a year (1872–73) in London in working at the Sanskrit manuscripts of the India Office. In the autumn of 1873 he went to India, and accompanied Dr. Bühler on his tour through Rajputana. On his return he settled in Bonn as privat docent in Sanskrit (1875); after a year he became Professor Extraordinarius of Sanskrit and Comparative Philology in the Academy of Münster, Westphalia; in 1885 he was promoted Professor Ordinarius of Sanskrit in the University of Kiel, Holsatia, and in 1889 he accepted the Sanskrit professorship in Bonn, succeeding Prof. Aufrecht. In addition to the study of Jainism and Prâkrit, the language in which the sacred books of the Jainas are written, and Sanskrit poetical literature, Prof. Jacobi undertook to compute tables for the verification of Hindu dates, which up to that time required most wearisome calculations. He solved the problem, and published two sets of tables, the first in *The Indian Antiquary*, the second in the *Epigraphia Indica*. His principal works are *De Astrologiæ Indicæ, Horâ appellatæ originibus* (Bonn, 1872); *The Kalpasûtra of Bhadrabâhu* (Leipzig, 1879); *Gaina Sûtras* (sacred books of the East, part i., Oxford, 1884; part ii. in preparation); *The Âyâramga Sutta of the Çvetâmbara Jains* (Pali Text Society, London, 1882); *The Parisishṭaparvan by Hemachandra* (*Bibliotheca Indica*, Calcutta, 1891); *Ausgewählte Erzählungen in Mâhârâshṭrî. Zur Einführung in das Studium des Prâkṛit* (Leipzig, 1886); *Das Râmâyaṇa. Geschichte und Inhalt, nebst Concordanz der gedruckten Recensionen* (Bonn, 1893); *The Computation of Hindu Dates in Inscriptions*, etc. (in *Epigraphia Indica*, vol. i., 1892).

Jacobi, Karl Gustav Jakob: mathematician; b. at Potsdam, Dec. 10, 1804; studied mathematics and philosophy in Berlin; was appointed assistant professor in 1825 and full professor in Mathematics at Königsberg in 1827; afterward lived some time in Italy and then in Berlin, where he died Feb. 18, 1851. His principal field of study was the theory of elliptic functions, in which his work paralleled that of Abel. His works were mostly published in *Crelles Journal*. He published separately *Fundamenta nova theoriæ functionum ellipticarum* (1829), and after his death appeared *Vorlesungen über Dynamik* (1866), a great work made up from his lectures. A complete edition of his works in seven volumes 4to has been published under the auspices of the Berlin Academy of Sciences. Revised by S. Newcomb.

Jacobi, Mary Putnam, M. D.: daughter of George P. Putnam, of New York; b. in London, Aug. 31, 1842; graduated at the Woman's Medical College in Philadelphia, and was the first woman who graduated from the College of Pharmacy in New York. In 1868 she went to Paris, and was the first woman admitted to the Paris École de Médecine, from which she graduated in 1871, receiving the second prize, a bronze medal, for her graduating thesis; returned to New York, began practice, and was made Professor of Materia Medica in the New York Infirmary for Women and Children, established by Elizabeth Blackwell, M. D. In 1873 she was married to Dr. Abraham Jacobi. Since 1873 many of her papers have been published in *The Medical Record* and *The Journal of Obstetrics*. In the spring of 1876 she was awarded the Boylston prize, offered by Harvard College for the best essay on the subject *Do Women require Rest during Menstruation?* She is the author of *The Value of Life* (New York, 1879); *Cold Pack and Anæmia* (1880); *Hysteria and other Essays* (1888).

Jac'obin: a breed of domestic pigeons having the feathers of the neck turned forward so as to form a ruff which encircles the neck and covers the head like a hood, whence the name. The color may be either black or yellow.

Jacobins [Lat. *Jacobus*, James]: members of a French political society founded 1789 by some deputies from Brittany during the session of the States General at Versailles. This society was at first called the Breton Club, which name, being regarded as too exclusive, was soon changed to Société des Amis de la Constitution. The king and the Assembly went to Paris Oct., 1789; the club followed, and established itself in an old Dominican monastery in the Rue Saint-Honoré. The French Dominicans were commonly called Jacobins, from the fact that a church dedicated to St. James (*Jacobus*) had been given to them shortly after their settlement in Paris in the thirteenth century; and before long the name was adopted by the new club. Many distinguished persons were among its members; for instance, La Fayette, Talleyrand, Mirabeau, Robespierre, the Duke of Orleans, the poet Chenier, the actor Talma. Its power increased rapidly, and soon dominated the Commune of Paris. As its influence spread, its principles became more democratic, so that in Apr., 1790, Talleyrand, La Fayette, and many other moderate members withdrew and founded the Club of 1789, afterward styled les Feuillants. The *Journal des Amis de la Constitution* spread the opinions of the Jacobins throughout the country. Revolutionary societies on the Jacobin model were established in nearly every town and village of France, and affiliated to the original

club, whose orders they implicitly obeyed. The Jacobins dictated every Government measure, "They are 'Lords of the Articles,'" says Carlyle; "they originate debates for the legislative; discuss peace and war; settle beforehand what the legislative is to do." Robespierre was their most influential member; through him they ruled during the Reign of Terror, and after his downfall in 1794 they also were overthrown. In Oct., 1794, the affiliation of societies was forbidden by the Convention; in November the Jacobin club was suspended, and the hall where it had met was closed. Some of its members joined the Electoral Club; others, the section des Quinze-Vingts, in the Faubourg Saint-Antoine. Soon afterward the monastery was destroyed, and upon its site was built the Marché Saint-Honoré.

Much Jacobin and anti-Jacobin literature exists in the form of plays, poems, and pamphlets, most of which are rather curious than edifying; for example, *Le Secret des Jacobins*, *La Jacobiniade*, *Les Crimes des Jacobins*, published in Paris between 1790 and 1795. The poetry of the *Anti-Jacobin*, a journal edited by George Canning, is, however, one of the best works of humor in the English language. In this collection are to be found the well-known *Knife-grinder* and the burlesque of *The Rovers*. The term *Jacobin* is still sometimes applied to persons of extreme revolutionary principles. Revised by C. K. Adams.

Jac'obites: (1) An Oriental Christian sect, monophysitic in doctrine, deriving their name ostensibly from James (same as Jacob), the apostle, but really from Jacob Baradai, "the ragged," originally a monk and presbyter near Nisibis in Mesopotamia, who became Bishop of Edessa 541 A. D., died 578. He took upon himself the general superintendence of Monophysites in the East, and brought their number up to about 100,000, mainly in Mesopotamia and Syria. In the time of Gregory XIII. (1572–85) they numbered only 50,000 in Syria, Mesopotamia, and Babylonia. They are now still more reduced. In Syria they are a mere handful in a few villages, and very poor. They are under a patriarch who resides in a monastery at Diarbekir, on the right bank of the Tigris. In public worship use is made of the ancient Syriac language, which the people do not understand. There are said to be 200,000 Jacobites in India (Malabar and Travancore). Of the United or Roman Catholic Jacobites in Syria there are no statistics. They are the results of attempts made to Romanize the Jacobites as early as the fourteenth century, but with no considerable success till the seventeenth. About 96,000 Roman Catholic Jacobites are claimed in India. Revised by S. M. Jackson.

(2) In Great Britain, partisans of King James II., dethroned in 1688. Many of his supporters followed him to France, but those who remained in Great Britain formed a party that continued to plot till late in the following century for the restoration of his dynasty. The Jacobites in England, true to the doctrine of passive obedience, were unwilling to go to the length of armed resistance, but in Scotland they had no such scruples. There Highland Jacobites fought with bravery for the Chevalier St. George (see James Francis Edward Stuart) in 1715, and for Charles Edward (*q. v.*) in 1745, but without success. Neither of the Pretenders had the qualities of a great leader, and both exemplified in their lives the failings of the Stuart character. As the ruling dynasty became more closely identified with the country, Jacobitism seemed unpatriotic, and the discreditable intrigues of some of its leaders brought it into disrepute. After the failure of the rebellion of 1745 the party was of slight importance, but it was not wholly extinct till after the death of Charles Edward, the Pretender, in 1788. The Jacobite movement gave rise to an extensive literature which is especially rich in spirited ballads, dealing with the events of the wars and the loyalty of the Scots to "Prince Charlie." See *Jacobite Relics* (1819–21), and Lacroix de Marles, *Histoire du Chevalier de Saint-Georges et du Prince Charles Édouard* (1868 and 1876). F. M. Colby.

Jacob of Edessa: theologian and writer; one of the ablest and most learned men of his age; b. near Antioch. He was educated at Alexandria. In 651 A. D. he became Bishop of Edessa, but retired in 654 on account of the insubordinations of some of his clergy and devoted himself to sacred and classical studies. His annotations upon the Syriac version of the Old Testament, of which some fragments are extant (edited with Eng. trans. by G. Phillips, London, 1864), are considered valuable, while his translations of Greek works into Syriac procured him the honorable title of "interpreter of books." Four months prior to his death he was by popular request reinstated in his see. D. June 5, 708, or 710. Revised by S. M. Jackson.

Jacob of Hungary: called The Master; a religious fanatic who played an important part in French history in the time of the seventh crusade. When the news of the surrender of St. Louis to the Mussulmans of Egypt became known in Europe, the "Master of Hungary" went through the provinces of France preaching a crusade for the liberation of the king. He laid claim to divine inspiration, and, appealing only to the poor and lowly, soon gathered about him in Flanders some 30,000 shepherds and peasants, called *Pastourels* or *Pastoureaux*, at whose head he started for Paris. At Amiens the mob obtained arms and recruits, and it numbered 100,000 when it presented itself before the walls of Paris. The Pastourels when admitted into Paris began to commit depredations and to murder monks, while Jacob assumed priestly faculties and officiated publicly in the Church of St. Eustache. He divided his followers into several bands, and sent them by different routes toward the Holy Land. At Orleans they massacred the priests, at Bourges the Jews. These excesses caused the Shepherds, who had at first been favored by the queen and the magistrates, to be excommunicated, and Jacob was killed by the queen's order while preaching in the midst of his followers, who were then easily annihilated or dispersed. See the *Chronicles* of Matthew of Paris and Matthew of Westminster, and Milman's *Latin Christianity*. Revised by C. H. Thurber.

Jacob of Vitry: preacher of crusades, writer, bishop, and cardinal; b. at Argenteuil, in France, in the second half of the twelfth century; was first a parish priest at Argenteuil, then became a zealous apostle of Maria of Oignies, who was supposed to possess supernatural gifts. Led by his enthusiasm, he undertook to preach a crusade against the Albigenses, and finally devoted himself to the interest of the Holy Sepulchre at Jerusalem, traveling through France to collect alms. He was appointed by Pope Honorius III. (1217) Bishop of Acre in Palestine, where he effected great conversions of Saracen children. He resigned that bishopric in 1225; was appointed by Pope Gregory IX., in 1229, Cardinal-Bishop of Tusculum, and papal legate of France, Brabant, and the Holy Land, and died in Rome, Apr. 30 (or May 1), 1240. He was the most elegant preacher of the time, but his fame rests upon his *Historia Orientalis*, generally called *History of Jerusalem*, a valuable source of information upon the crusades. He wrote a *Historia Occidentalis*, a *Life of the Blessed Mary of Oignies*, and left an interesting collection of letters. See Wetzer and Welte's *Kirchenlexicon*. See Exempla-books. Revised by J. J. Keane.

Jacobs, yaa'kŭps, Christian Friedrich Wilhelm: classical scholar and educator; b. in Gotha, Germany, Oct. 6, 1764; died in the same city as head librarian and director of the Art Museums, Mar. 30, 1847. He edited the *Carmina Iliaca* of Joh. Tzetzes with valuable commentary, the *Imagines* of the Philostrati, *Ælian*, *Achilles Tatius*, but his masterpiece is the monumental commentary to the *Greek Anthology* (vols. i.–iv. text, v. indices, vi.–xiii. notes, 1794–1814), to which must be added his masterly metrical translations of 700 poems of the *Anthology*, published in vol. ii. of his *Vermischte Schriften*. His translations of the *Philippics* and of the *De Corona* of Demosthenes are among the best in German literature. His numerous miscellaneous contributions to Greek and Roman literature, art, and ethics are collected in his *Vermischte Schriften* (8 vols., 1823–44); the *Beiträge zur Geschichte des weiblichen Geschlechts* (vol. iv., pp. 157–554), being perhaps the most noteworthy among these. See Schmid's *Encyclopädie der Pädagogik* (iii., pp. 725–731); Bursian, *Gesch. der class. Philologie in Deutschland* (pp. 635–640). Alfred Gudeman.

Jacobs, jā'kŭbz, Henry Eyster, D. D., LL. D.: educator; son of Michael Jacobs (1808–71), Lutheran theologian; b. at Gettysburg, Pa., Nov. 10, 1844; was educated in Pennsylvania College and Theological Seminary of his native place. He served three years as tutor in Pennsylvania College, and three years were spent in home missionary work and teaching in Western Pennsylvania, part of this time being devoted to assistance in laying the foundation of Thiel College. He returned to Gettysburg in 1870 as Professor of the Latin Language and of History, and was transferred ten years later to the Greek chair. In 1883 he was called to the professorship of Systematic Theology in the Theological Seminary in Philadelphia. He has translated Hutter's *Compendium of Lutheran Theology* (with Dr. G. F. Spieker, 1867); Schmidt's *Doctrinal Theology of the Evangelical*

Lutheran Church (with Dr. C. A. Hay, 1875, 1888); *Book of Concord* (with historical introductions, appendices, annotations; vol. i. 1882, vol. ii. 1883); and Düsterdieck's *Commentary on the Revelation of St. John* (with additional notes, 1887). He is author of *The Lutheran Movement in England* (1890); *The Lutherans* (1893); and editor of the American edition of Meyer's *Commentary on Galatians and Ephesians* (1885). Since 1882 he has been editor of *The Lutheran Church Review*, and since 1883 a weekly contributor to the editorial columns of *The Lutheran*.

Jacobs, Michael, D. D.: b. near Waynesboro, Franklin co., Pa., Jan. 18, 1808; graduated at Jefferson College, Canonsburg, Pa., in 1828; one of the founders of Pennsylvania College at Gettysburg; Professor of Mathematics and of the Physical and Natural Sciences from 1832 until 1871. He published *Notes on the Rebel Invasion of Maryland and Pennsylvania and the Battle of Gettysburg* (Philadelphia, 1863). D. at Gettysburg, July 22, 1871.

Jacobsen, Jens Peter: novelist; b. in Denmark, Apr. 7, 1847. His earliest studies were directed toward natural history, his first appearance in print being in a scientific article. In 1872 he received the gold medal of the university for a dissertation on a botanical subject, and soon after began to translate Darwin. In the same year he published his first tale, *Mogens*, which shows the influence of Brandes, and is of special interest as being the first specimen of realistic fiction in Danish literature. It was followed by *Fru Marie Grubbe* (1876), an historical novel or rather study of the seventeenth century, in striking contrast to Ingemann's romances. *Niels Lyhne* (1880) is a story of modern life of the most pronounced realistic type. In 1882 appeared *Mogens og andre Fortællinger* (Mogens and other Tales). Jacobsen's constant aim is to show the relation between psychological sensations and physiological conditions, his subject being man. He combines the method of the scientist with the insight and imagination of the poet. His influence on modern Danish fiction is greater than that of any other writer save Georg M. C. Brandes. D. Apr. 30, 1885. D. K. Dodge.

Jacobson, John Christian: Moravian bishop; b. in Burkall, Denmark, Apr. 8, 1795; emigrated to the U. S. in 1816; as principal of the female academy at Salem, N. C., achieved great success; was principal of a boys' boarding-school, Nazareth, Pa.; was consecrated bishop Sept. 20, 1854; retired 1867. D. at Bethlehem, Pa., Nov. 24, 1870.

Jacobson, William, D. D.: bishop; b. in Norfolk, England, July 18, 1803; graduated with high honors at Lincoln College, Oxford, in 1827; obtained a fellowship at Exeter College in 1829; was vice-principal at Magdalen Hall 1832–48, when he became regius professor of divinity. In 1865 Dr. Jacobson was appointed Bishop of Chester. While at Oxford he edited for the University Press the *Remains of the Apostolic Fathers* (2 vols., 1838; 4th ed. 1863); Nowell's *Catechism* (1835; 2d ed. 1844); the *Collected Works of Bishop Sanderson* (6 vols., 1854), and other works, besides publishing two volumes of his own sermons (1840–46). Bishop Jacobson was one of the most eminent scholars of his day. D. in Chester, July 13, 1884. Revised by W. S. Perry.

Jacobson's Organ: a term applied to a pair of cavities connected with and beneath the nasal cavities of terrestrial vertebrates. The organ is innervated by branches of the olfactory and trigeminal nerves, and in many forms is connected with the mouth by a separate opening. Its function seems to be to connect the food in the mouth with the olfactory nerve, and through its existence we perceive the "taste" of many substances which are tasteless when the nostrils are closed. J. S. K.

Jaco'bus, Melancthon Williams, D. D., LL. D.: clergyman and author; b. at Newark, N. J., Sept. 19, 1816; graduated at the College of New Jersey in 1834, and in 1838 at Princeton Theological Seminary, where he was assistant teacher in Hebrew 1838–39. From 1839 till 1851 he was pastor of the First Presbyterian church, Brooklyn, N. Y.; in 1850–51 traveled in Europe and the East; and from 1851 till his death was Professor of Oriental and Biblical Literature in the Theological Seminary at Allegheny, Pa. He received the degree of D. D. from Jefferson College in 1852, and of LL. D. from the College of New Jersey in 1867. In 1869 he was moderator of the General Assembly. He published *Notes on the New Testament—Matthew* (New York, 1848); *Mark and Luke* (1853); *John* (1856); *Acts* (1859); also two volumes on *Genesis* (1864–65). D. at Allegheny City, Pa., Oct. 28, 1876. Samuel Macauley Jackson.

Jacobus de Voragine: Dominican writer, and Archbishop of Genoa; b. at Varaggio, near Savona, Italy, about 1230; became a Dominican friar in 1244, and preached in various parts of Italy. In 1267 he was made provincial of his order for all Lombardy; but in 1286 he was removed from his place by the assembly of Dominicans at Paris. He represented his province, however, at the Council of Lucca (1288); and again at that of Ferrara (1290). In 1292 he was consecrated Archbishop of Genoa. He died July 14, 1298. Of his works two are worthy of particular mention. The first, entitled *Chronicon Januense*, is a history of Genoa from its founding by a mythical Janus down to the year 1296 or 1297. (See Muratori, *Script. rer. ital.*, ix., 6.) The book has no critical value. The second work is a very famous one, called by the author *Legendæ Sanctorum*, but known also as the *Hystoria lombardica*, or more universally through the great popular admiration for it, *Legenda Aurea* (*Golden Legend*). It is a collection of the legendary lives of the greater saints of the mediæval church, and was one of the earliest books printed in Italy, the first edition appearing in 1469 or 1470. The titles of several other works are given by the archbishop himself in his *Chronicon Januense*. Among these are two collections of *Sermones*, and a *Mariale* (*qui totus est de B. Maria compositus*), containing 160 discourses about the Virgin, her attributes, miracles, etc. All these works were printed during the fifteenth century. See Th. Graesse, *Legenda Aurea vulgo Historia Lombardica dicta* (2d ed. Leipzig, 1850); Échard and Quetif, *Script. ord. Prædicatorum*; Tiraboschi, *Storia della letter. ital.*, (iv., p. 156). A modern French version of *The Golden Legend* is that of Gustave Brunet (with introduction, 2 vols., Paris, 1843). A. R. Marsh.

Jacoby, yaă-kō'bĕĕ, Johann: political writer; b. at Königsberg, Germany, May 1, 1805; studied medicine at Berlin and Heidelberg, and settled in 1830 in his native city as a physician. It was his political activity, however, which made him famous. He was accused of high treason in 1841 on account of his *Vier Fragen*, but the case was dismissed on appeal. He was a member of the German Parliament in 1848, one of the organizers of the *Rumpf Parlament* at Stuttgart in the following year, and at different periods a member of the Prussian Diet. Throughout his political career he showed himself fearless of the consequences of his expressions. As a member of the deputation from the Frankfort Parliament to the king at Potsdam, he replied on the latter's refusal to hear an address, "It is the misfortune of kings that they are never willing to hear the truth," and after the forcible dissolution of the Parliament at Stuttgart he was tried a second time for high treason. He was acquitted, but in 1866 and again in 1870 he suffered imprisonment for political offenses. He steadily opposed the annexation of Alsace-Lorraine. He also wrote *Die Grundsätze der preussischen Demokratie* (1859). D. at Königsberg, Mar. 6, 1877. F. M. Colby.

Jacoby, Ludwig Sigismund, D. D.: b. at Alt-Strelitz, Mecklenburg, Germany, Oct. 21, 1811, of Jewish parents. He was converted to Christianity when about twenty-one years of age, and first joined the Lutheran Church and studied medicine; in 1839 he emigrated to the U. S. and settled as a physician in Cincinnati. In 1841 he joined the Methodist Episcopal Church, in which he became a preacher. After being for several years presiding elder of German districts in the Western States, he returned to Germany in 1849 to introduce Methodism into that country. Through his labors missions were established in many places, as well as a publishing-house and a theological seminary at Bremen under his own superintendence. In 1871 he returned to the U. S., and became pastor of a church in St. Louis, Mo., and presiding elder again in 1873. He died at St. Louis, June 21, 1874. He issued in German a *History of Universal Methodism* (2d ed. Bremen, 1855).

Revised by J. F. Hurst.

Jacopo dei Barbari, yaa'kō-pō-dā'ĕĕ-baar'bāă-rĕĕ, or **de Barbaris**: painter and engraver; b. in Venice about 1450. His plates are often signed by a caduceus, and the unknown author of these was called "The Master of the Caduceus" until it was ascertained that they were the work of Jacopo. He also was called Walch, probably the German term for a foreigner of Latin race. He was one of the earliest engravers on metal for printing, and it is chiefly as an engraver that he is known, but pictures ascribed to him and probably his are in the galleries of Dresden and Weimar and in private collections. His chief engravings

are a set of classical mythology subjects. His prints are all rare, but many have been reproduced. D. before 1516.
RUSSELL STURGIS.

Jacopo della Quercia, -del kŭă-kwer chăă : sculptor; b. at Siena, Italy, in 1350; a son of Maestro Pietro, also a sculptor. His work is to be seen in Siena, Lucca, and other parts of Tuscany and Bologna. He is supposed to have learned his art from Goro, as he approaches him in style. His first work was the fountain of Siena called Fonte Gaja, which is replaced by a modern structure, the sculptures of Jacopo being preserved in the Opera del Duomo. The bas-reliefs of the door of St. Petronius at Bologna and two prophets for the same church are noteworthy. There are also fine examples of his work at Lucca, where he remained from 1416 to 1422. D. at Siena in 1438.
W. J. STILLMAN.

Jacopone da Todi, zhăă-kō-pō nă-daa-tō-dēe, JACOMO BENEDETTI: mystic; b. of good family, at Todi, in Umbria, Italy, about the year 1230. He studied law, later became a doctor, practiced his profession, but led a dissipated life. In 1265 or 1267 he married a highborn Ghibelline lady, Vanna di M. Bernadino di Guidone; but in 1268 she died through an accident at a wedding festival. When her body was taken home her husband found that beneath her gay robe she had worn a haircloth shirt. He at once abandoned his profession, distributed his goods among the poor, and for ten years lived in bitter penitence as a Tertiary. (See FRANCIS OF ASSISI.) Then he became a Minorite lay friar, refusing to the end of his life to take orders. He also became a poet, a "jongleur of God" (*giullare di Dio*), as he loved to be called. His extraordinary verse, in which there is much that can only be called insane, for which reason his fellow townsmen nicknamed him Jacopone, praised madness rather than wisdom, poverty rather than riches, and annihilation rather than existence; but it had an irresistible attraction for the poor and lowly. It was not long before he became a real power in Italy, and was engaged in the highest and most dangerous matters. Toward the end of the thirteenth century a struggle occurred in the Church between the ambitious, the worldly, the lovers of splendor and power, on the one hand, and the advocates of humble, earth-renouncing piety on the other. When Pope Celestine V. in 1294 made what Dante scornfully called *il gran rifiuto* (*Inferno*, iii., 60), gave up his office, and was succeeded by the unscrupulous Boniface VIII., it was clear that the worldly party had won. Jacopone joined himself with the leaders of the pope's enemies, the Colonna, at Palestrina, and fought on their side both with spiritual weapons and with the sword, until Palestrina fell (1298), when he was captured and held in prison till Boniface died, and Benedict XI. relieved the Colonna and their adherents from further penalties (Dec. 23, 1303). Then, broken in health, Jacopone withdrew to the Franciscan monastery of Collazzone, where, on Christmas night, 1306, he died. In 1596 his remains were transferred to the Church of S. Fortunato at Todi. Though Jacopone is everywhere the poet of the people, using their rough style and direct speech, he also owes much to the courtly poets, from whom come most of the forms his imagination employs. His *laudi* were for many years in the mouths of the lowly, especially of those who, filled with mystic enthusiasms, cut loose from society, and wandered in poverty over the face of the earth. And, strangely enough, it was from these *laudi*, thrown more and more into dialogue form, that the Italian drama was to spring. (Cf. d'Ancona, *Origini del Teatro in Italia*, i., p. 117, *seq.*) There are several editions of Jacopone's poems, all of them incomplete and uncritical: Florence (1490), Brescia (1495), Rome (1558), Venice (1613). The best modern edition is that of B. Sorio, *Poesie scelte di Fra Jacopone da Todi* (Verona, 1859). The Latin hymns *Stabat mater dolorosa* and *Stabat mater speciosa*, often attributed to Jacopone, probably are not his. See A. d'Ancona, *Jacopone da Todi* (in *Studj sulla letteratura italiana*, Ancona, 1884); É. Gebhart, *L'Italie mystique* (Paris, 1890); A. F. Ozanam, *Les Poètes franciscains en Italie au treizième siècle* (Paris, 1859); also E. Böhmer, in *Rom. Stud.*, i., 137. LUCY ALLEN PATON.

Jacotot, zhăă'kō'to', JEAN JOSEPH: educator and originator of the system of "universal instruction"; b. of rather humble parentage at Dijon, France, Mar. 4, 1770. He taught himself nearly everything he knew, and so successfully that at the age of nineteen he was appointed Professor of the Humanities in the college in his native town. He afterward studied law; at the age of twenty-five he was subdirector of the Polytechnic School, and shortly after again professor at Dijon. He entered the army in 1792 and served in the campaign in Belgium; on the return of the Bourbons in 1815 he was obliged to leave France and take refuge in Belgium, where for a time he taught privately, but in 1818 was appointed Professor of French Literature in the University of Louvain; he returned to France in 1830, and lived for seven years quietly at Valenciennes, and afterward went to Paris, where he died July 30, 1840. At Louvain, where his pupils were mainly Flemish and he French, he hit on the idea of teaching them the *Télémaque* by books having Flemish and French in parallel columns. He observed that the pupils learned, although he did not teach them, for the obvious reason that he himself did not know what they were studying. He followed out this idea in other lines. The teacher, he said, should be the guide and friend of the pupil, but the pupil must do his own thinking, and so teach himself. "Pupils must learn *something* and *refer* to that all the rest." Four steps that he insisted on were: first, learn; second, repeat; third, reflect; fourth, verify. His famous maxim, "All is in all," must be interpreted, according to the experience and writings of the author, as meaning that all things in nature are linked together and form a great whole. In this sense it is related to Herbart's idea of concentration. His plan as applied to languages is very similar to that of James Hamilton, and also to the Ollendorff method. His principal works are *Enseignement universelle : Langue maternelle* (Louvain, 1822); *Musique, dessin et peinture* (1824); *Mathématiques* (1828); and various articles in the *Journal de l'émancipation intellectuelle*. For an account of his life and works, see Quick's *Essays on Educational Reformers*; Joseph Payne's *Lectures on the History of Education* (1892).
C. H. THURBER.

Jacquard, zhăă'kaar', JOSEPH MARIE: inventor; b. at Lyons, France, July 7, 1752; was first brought up as a weaver, and then was successively apprenticed to a bookbinder, a cutler, and a typefounder. At the age of twenty he inherited from his father a workshop containing two weavers' looms, but was obliged to sell all his property to meet the expenses he contracted in experiments for improving looms. After a long period of poverty and obscurity, during which he took part in some of the campaigns of the Revolution, he succeeded in inventing the loom which has made his name a household word in both continents. In 1804 he was mobbed by the operatives of Lyons, who feared that the new loom would be ruinous to their class. This circumstance led to the purchase of the invention by the imperial Government, and Napoleon, by a decree dated Berlin Oct. 27, 1806, declared it public property. The subsequent prosperity of Lyons was largely attributable to the genius of Jacquard, who received during his lifetime the cross of the Legion of Honor. In 1840 his statue was erected in his native city. D. at Oullins, near Lyons, Aug. 7, 1834.

Jacquard Loom: See LOOM.

Jacque, zhăăk, CHARLES ÉMILE: animal and landscape painter; b. in Paris, May 23, 1813. He received medals at the Salons of 1861, 1863, and 1864, the order of the Legion of Honor in 1867, and a first-class medal at the Paris Exposition of 1889. His pictures of sheep are notably good, and his landscape work is robust and virile in style. He was an etcher of marked ability. Among his works are *Flock of Sheep and Landscape*, Luxembourg Gallery, Paris; several pictures in the collection of W. T. Walters, Baltimore; and *Sheepfold*, collection of Mrs. W. H. Vanderbilt, New York. D. in Paris, May 7, 1894. WILLIAM A. COFFIN.

Jacqueline, zhăăk'leen': Princess of Bavaria; b. in 1400; the only daughter and heir of William VI. of Bavaria, Count of Holland and Hainault, and of his wife, Margaret of Burgundy. In childhood she was betrothed to Prince John of France, who, however, died by poison in 1417, in which year Jacqueline succeeded to her father's estates. The hand of the heiress was a prize destined to be fiercely disputed by the princes of that rude age. After refusing to marry the Duke of Bedford, brother of Henry V. of England, Jacqueline wedded her cousin, John IV., Duke of Brabant, but soon abandoned him, and in 1420 went to England, where Humphrey, Duke of Gloucester, another brother of the king, sought her hand, treating her former marriage as null. After the death of Henry, the antipope, Benedict XIII., annulled Jacqueline's first marriage, and in 1423 Gloucester obtained the coveted prize. He thereupon sailed for Hainault with 5,000 troops to reconquer his wife's estates, which had been seized by the Dukes of Burgundy and Brabant. After many

vicissitudes of fortune Jacqueline was imprisoned at Ghent, but escaped to Holland. The Duke of Brabant having died she resumed the title of Duchess of Gloucester, and renewed the war for the recovery of her lands, but receiving little aid from her husband, she finally made a treaty with the Duke of Burgundy, appointing him her heir, repudiating her marriage with Gloucester, and promising not to marry again without Philip's consent. Contrary to this treaty, she married Francis of Borselen, who was imprisoned by the Duke of Burgundy, and to secure his release she was forced to cede her estates to his captor. D. in 1436 without issue.

Jacquemart, *zhaăk'maar'*, Jules Ferdinand: painter and etcher; b. in Paris in 1837. He was the son of Albert Jacquemart (1808–75), author of the *History of Porcelain* (1861–62), *The History of Ceramics* (1873), *The History of Furniture and Decorative Objects* (*Mobilier*, 1876), and other works on industrial art. He illustrated the *Porcelain* by etchings of great beauty, the *Ceramics* by etchings and small woodcuts, and the *Mobilier* by many process-engravings from his drawings. His most remarkable work is a series of large etchings of the beautiful agate, jasper, crystal, and porphyry vases, the ancient goldsmith work and fine enamels, in the Louvre, the *gemmes et joyaux de la couronne*. All these drawings and engravings are remarkable for extraordinary fidelity to the essential peculiarities of the original. He had great skill as a technical etcher, and was an original artist of merit, as shown in both water-color and in engraving. D. at Nice, Sept. 28, 1880. Russell Sturgis.

Jacquemont, *zhaăk'mōñ'*, Victor: traveler; b. in Paris, Aug. 8, 1801; studied botany under Adrien de Jussieu, and after visiting the U. S. and the West Indies was appointed by the Museum of Natural History in Paris to conduct a scientific expedition in Eastern Asia. He arrived at Calcutta in 1829, traveled in British India, studying the native languages, crossed the Himalayas into Tibet, and reached Chinese Tartary, returning by Lahore, where Runjeet Singh showed him great favor. Jacquemont died prematurely in Bombay, Dec. 7, 1832. His correspondence and travels have been published, and are very entertaining, as well as valuable for their wealth of scientific observation.
Revised by F. A. Lucas.

Jacquerie', Insurrection of the: a war of the French peasantry against the nobles which broke out in May, 1358, during the imprisonment of John II. the Good in England. The oppressions of Charles the Bad of Navarre and the tyranny of the nobles were the causes. The insurrection broke out in the neighborhood of Paris, but rapidly extended to the banks of the Marne and the Oise, and at one time threatened to spread still farther. For about three weeks the peasants were rapidly successful, and were guilty of every enormity, but early in June they were defeated near Meaux with great slaughter. This ended the insurrection, and a period of cruel persecution followed. The name "Jacquerie" signifies the "Jacques" or clowns, from the Christian name Jacques, always supposed to be the most common name among French peasants.

Jacquin, *zhaă'kăñ'*, Nicolas Joseph, Baron von: botanist; b. at Leyden, Holland, Feb. 16, 1727; studied botany under Jussieu at Paris, and settled at Vienna, where in 1753 he was engaged to superintend the planting of the garden at Schönbrunn. Soon afterward he spent several years in botanical researches in tropical America. The remainder of his life was devoted to the publication of his numerous researches, and in lecturing upon botany and chemistry at the University of Vienna. D. in Vienna, Oct. 24, 1817. His more important works are *Hortus botanicus Vindobonensis* (3 vols., 1770–76); *Floræ Austriacæ* (5 vols., 1773–78); *Icones plantarum rariorum* (3 vols., 1781–93); *Plantarum rariorum horti cæsarei Schönbrunensis* (4 vols., 1797–1804). His son, Joseph Franz (1767–1839), succeeded him in his professional posts. Revised by Charles E. Bessey.

Jacuhy, *zhaă-koo-ee'*: a river of Southern Brazil; in the state of Rio Grande do Sul. It rises in the northern part of the state, flowing first S. and then E. and S. E., and entering the northern end of the Lagoa dos Patos (*q. v.*), through which it finds its way to the Atlantic. The lower end of the river, near the lake, is expanded into a broad sheet, which bears the special name Guahyba. The lake itself, with its outlet, the Rio Grande, may be regarded as a continuation of the river. The total length of the river to the lake is about 310 miles; or, including the lake and the Rio Grande, about 470 miles. Ocean steamers ascend to Porto Alegre, 170 miles from the sea, and small steamboats to Cachoeira, 120 miles farther. Some of the tributaries are navigable. The Jacuhy is the outlet of the most important agricultural district in Southern Brazil.
Herbert H. Smith.

Jadassohn, Salomon: musician; b. at Breslau, Germany, Sept. 15, 1831; studied at Leipzig and Weimar. Since 1853 he has resided in Leipzig as a teacher and composer. He has composed several symphonies, much orchestral music in the smaller forms, some concertos for solo instruments, songs, etc. He has also set Psalm cl. in cantata form for alto solo, double chorus, and orchestra. D. E. H.

Jade: a name under which may be grouped three minerals, namely: (1) nephrite, a silicate of magnesia, with a hardness of 6·5, a specific gravity of 2·9 to 3, and a great degree of toughness, the general color being green or white, sometimes yellowish, brownish, or black; (2) jadeite, a silicate of alumina, with a hardness of 7, a specific gravity of 3·3, and a crystalline granular structure, not quite so tough as nephrite; (3) chloromelanite, a silicate of alumina and iron, with a hardness of 7, and a specific gravity of 3·6 to 3·9, referred to jadeite by some authorities. The green variety of jade was used by the aborigines of New Zealand, New Caledonia, the South Sea islands, and Alaska, and is found in Switzerland, in the lake dwellings, and in other parts of Europe. Jadeite implements of prehistoric age are found in Central America, Mexico, Peru, Switzerland, Spain, and France; chloromelanite in the Swiss lake dwellings. Jadeite has never been found in place on the North American continent, though worked articles have been found, the presence being due, according to Dr. Heinrich Fischer, to Asiatic migration; but this view has been ably controverted by Dr. A. B. Meyer, of Dresden, and others, and it is believed that it will be found in Mexico and Central America *in situ*. Nephrite, the *yu* of the Chinese, is mined in Siberia, Turkestan, and New Zealand. Jadeite, the green called imperial jade—*fetsui* of the Chinese—is found at Monghoung, in Burma. Since early times jade has been considered a sacred stone in China, and has been finished with great labor and care into bracelets, thumb-rings, etc., and into carved vases, coupes, and other ornaments. In India jade has been used for amulets, sword-handles, dagger-hilts, and other objects, and sometimes inlaid with designs made in pure unalloyed gold, in which there are generally set rubies, emeralds, diamonds, and other gems. Many of the jade and jadeite objects found in Persia are believed to be remnants of the spoils from the loot of India by the conqueror Nadir Shah.

The largest collections of archæological jade objects are in the American Museum of Natural History in New York, in the U. S. National Museum in Washington, and the McGill University, Montreal; fine collections of Chinese and Oriental jade are in the India and South Kensington Museums in London, the Louvre, Paris, and at Fontainebleau, Paris. The largest known object of archæological jadeite is the Kunz votive adze from Oaxaca, Mexico, in the American Museum of Natural History in New York city.
George F. Kunz.

Jade, yaa'de, or **Jahde**: a small river and also a bay in Germany, S. W. of the mouth of the Weser (see map of German Empire, ref. 2–D). It was purchased from the grand duchy of Oldenburg by Prussia in 1853, for the purpose of forming a war-port on the German Ocean. The Bay of Jade covers an area of 74 sq. miles, which was formerly dry land, but was inundated in 1511.

Jaen, *chaă-en'*: in the times of the Moors an independent kingdom. In 1246 it was added by Ferdinand III. to the kingdom of Castile. Now it forms a separate province of Spain. Area, 5,184 sq. miles. Pop. (1887) 437,842. It is rich in metals and fertile.

Jaen: the capital of the province of Jaen, Spain; on the Jaen, a tributary of the Guadalquivir; 50 miles N. by W. of Granada (see map of Spain, ref. 18–F). Its walls, surmounted by turrets and pinnacles, and its castle, which still is used as a fortress, were built by the Moors. The town has two cathedrals of the sixteenth century, and beautiful promenades, but its silk manufactures, which once made it famous, are now entirely lost. Pop. 25,706.

Jaeger [Germ. *jäger*, a hunter]: a name given to the skuas, or gulls, of the sub-family *Stercorariinæ*, on account of their habit of pursuing smaller gulls and forcing them to give up their food. They also eat eggs and prey upon small or young birds. The jaegers are readily distinguished by

the horny hood, or cere, at the base of the bill, beneath which the nostrils open. The smaller species in adult plumage are furthermore characterized by the length of the central two tail-feathers, which project, according to the species, from 3 to 10 inches beyond the others, whence these birds are sometimes called boatswain-birds from the fancied resemblance of the pointed feathers to a marlinespike. This name, however, is more commonly applied to the tropic birds (PHAËTHON, *q. v.*). From four to six species are recognized, the largest being the great Antarctic skua (*Megalestris antarcticus*), the only one peculiar to the southern hemisphere, the others being most abundant in high northern latitudes, and breeding in Arctic regions. The large northern species, *Megalestris skua*, is about 2 feet in length, powerfully built, and of a dusky-brown plumage. It is an uncommon bird, and in Great Britain has, through persecution, become so rare that it is now protected by law. Three other and much smaller species occur along the more northern shores of the U. S., and are locally known as gull-catchers or gull-chasers. F. A. LUCAS.

Jaffa, jăf'fa, or yaa'fă, **Yaffa**, or **Joppa**: town of Asiatic Turkey, in Palestine; on the Mediterranean; 33 miles N. W. of Jerusalem, of which it has always been the port (see map of Palestine, ref. 9–B). "The wood out of Lebanon" for Solomon's temple was brought "in flotes by sea to Joppa." It was the scene of Jonah's embarkation, of the raising of Dorcas from the dead, and of the revelation to Peter that the Gentiles were partakers of Christ's kingdom. According to Strabo and Josephus a haunt of pirates, it was destroyed by Vespasian in the Jewish war. It was captured by Saladin (1187), by Richard I. of England (1191), by Malek el Adil (1196), and by Bonaparte (1799). The harbor is exceedingly bad and precarious, approached by two passages through a reef, but inaccessible in very stormy weather. Often steamers can land neither their passengers nor cargo. The town is connected with Jerusalem by a carriage-road frequently in bad condition, and since 1892 by a railway. Pop., chiefly Mussulmans, 17,500. EDWIN A. GROSVENOR.

Jaff'na, or **Jaffnapatam'** [liter., Jaffna City; cf. Sanskr. *pattana*, city]: a flourishing town of Ceylon; situated on the northern extremity of the island (see map of S. India, ref. 7–F). It was originally a Dutch settlement, and the European part of the city has still a Dutch aspect. Several of the churches, however, were built by the Portuguese. Pop. (1891) 43,092.

Jaganâtha: See JAGGERNAUT.

Jagellons, yăa-gel lonz: the name of a dynasty which reigned from the fourteenth to the seventeenth century in Poland, and during much of the time in Lithuania, Hungary, and Bohemia. The founder of the family was Jagellon or Jagiello, b. about 1354, Grand Duke of Lithuania, who was a pagan until his marriage (Feb. 17, 1386) with Hedwig, daughter of Louis the Great, King of Poland and Hungary. To this alliance Jagellon owed his election to the throne of Poland as successor to his father-in-law, under the name of Ladislas II. (Uladislas or Wladislas). The sovereigns of this dynasty were the most illustrious of Polish rulers. Sigismund Augustus, who died in 1572, was the last Jagellon King of Poland in direct succession, but through the female line the family retained the throne until the abdication of John Casimir, in 1668.

Jäger: See JAEGER.

Jag'gar, THOMAS AUGUSTUS, D. D.: bishop; b. in New York city, June 2, 1839; was educated by a private tutor; graduated at the General Theological Seminary of the Episcopal Church; was ordained deacon in 1860 and presbyter in 1863; became rector of Trinity, Bergen Point, in 1862, of Anthon Memorial church, New York, in 1864, of St. John's, Yonkers, in 1868 (founding there the St. John's Riverside Hospital), and of Holy Trinity in Philadelphia in 1870. He was made a doctor of divinity by the University of Pennsylvania in 1874; was elected Bishop of Southern Ohio Jan. 14, 1875, and was consecrated to that office in May, 1875. In consequence of Bishop Jaggar's failing health the Rev. Dr. Boyd Vincent was consecrated in 1889 bishop-coadjutor of Southern Ohio. Bishop Jaggar has published several sermons and essays. His latest publication is a *Memorial Sermon on Bishop Phillips Brooks* (1893).

Revised by W. S. PERRY.

Jaggernaut', or **Puri** [*Jaggernaut* is from Sanskr. *jagannātha-*, lord of the world, epithet of *Kṛṣna-*; *jagat*, moving, what moves, universe, deriv. of *gam-*, go: Gr. *βαίνω*: Lat. *venio*: Eng. *come* + *nātha-*, help, protector, lord; cf. Goth. *nipan*, to help; O. H. Germ. *ginâda* > Mod. Germ. *gnade*, mercy]: town of Orissa; on the Bay of Bengal, in lat. 19° 48′ N. and lon. 85° 51′ E (see map of N. India, ref. 9–H). It is an agreeable and healthful place, as the air is kept fresh by the southwestern monsoon. Its name it received from an idol of Krishna, the lord of the universe, which it possesses—a wooden block in the shape of a cucumber, whose upper extremity represents a human face of utter hideousness. This idol is in a great and magnificent pagoda, within an inclosure 652 feet long and 630 broad, containing 120 temples. Hundreds of thousands of pilgrims visit the place every year, and support the place, as it has neither commerce nor manufactures. On great days of festival the idol is placed on a huge chariot, to which the faithful harness themselves in order to draw the idol from the temple to his country-house, only a mile distant, yet the journey takes several days. There is no truth in the current story that devotees threw themselves under the wheels of the chariot and were crushed to death. The story originated probably in the accidental deaths which occur. See the evidence sifted by Sir W. W. Hunter, *Orissa* (London, 1872). The gorgeousness and the peculiar beauty of this temple of Jagannatha are described as unique. In 1893 the ceremonies were peculiarly impressive, because it was the year of the reincarnation of the gods. They are described in the *Bulletin of the American Geographical Society* for Dec. 31, 1893. Attendance upon the festival is believed by the Hindus to insure their eternal salvation. It is considered a meritorious act to pull the ropes or to fan the god. Pop. 22,000, nearly all Hindus.

Jag'gery [Anglo-Indian, from Hind. *shakkar* < Sanskr. *çarkara*, whence Gr. *σάκχαρον*, sugar, and (viâ Arab.) Eng. *sugar*]: the sugar obtained in India from various palm-trees, notably the cocoanut-palm (*Cocos nucifera*), the toddy-palm (*Phœnix sylvestris*), and the jaggery-palm (*Caryota urens*). The tapping of the trees and the boiling of the sap are carried on by a special caste. The quality of the sugar is very poor, but its quantity is becoming very great, and it is now exported to England, and there refined more easily and cheaply than ordinary sugar. After refining the sugar is identical with cane and beet-root sugar. The *Nipa fruticans* is another valuable sugar-palm.

Jaghire, The: See CHINGLEPUT.

Jagić, yaag'itch, VATROSLAV (*Ignatij Vikentievitch*): literary historian and Slavonic philologist; b. at Varazdin, Croatia, July 6, 1838; studied in Vienna under Miklošić, and in 1860 was appointed teacher at the gymnasium of Zagreb (Agram). His philological works won him well-merited fame and the bestowal of many honors; the University of St. Petersburg conferred upon him the degree of Doctor of Slavonic Philology, and in 1870 he became a member of the South Slavonic Academy. In that same year he lost his place as teacher, being discharged under a false pretense; but through the intervention of his Russian friends he was appointed Professor of Comparative Philology at the University of Odessa. He preferred Slavonic to Sanskrit, however, and consequently resigned in 1874 in order to accept the chair of Slavonic Languages at the University of Berlin. There he established in 1876 the *Archiv für slavische Philologie*, a journal of great importance for Slavonic philology. Of his works, written mostly in Croatian, the most important are *Grammatika hrvatskoga jezika* (Croatian Grammar, Zagreb, 1864); *Naš pravopis* (Our Orthography, 1864); *Historija književnosti hrvatskoga naroda* (History of Croatian Literature, 1867); *Komparativna mitologia* (Comparative Mythology, 1870); *Quatuor evangelicorum codex glagoliticus* (The Glagolian Version of the Four Evangelists, Berlin, 1879); *Codex Marianus* (St. Petersburg, 1883); *Carminum Christianorum versio palæoslovenico-rossica* (1886). Many of his essays appeared in the *Rad*, the organ of the South Slavonic Academy; and one of these, *Gradja za istoriju slovinske narodne poesie* (Contributions to the History of Slovenic Popular Poetry, 1875), has been translated into nearly all the Slavonic languages. Jagić also republished many ancient Serbian, Croatian, and Bulgarian literary works. J. J. KRÁL.

Jaguar, jag-waar' [from Braz. *jagua'ra*, jaguar]: a member of the cat family, or *Felidæ* (*Felis onca*), the largest representative in America, found from Texas to Patagonia, inhabiting forests by preference, and somewhat arboreal in its habits. It is exceeded in size by the lion and tiger, but is more massively built than the leopard, which it resembles

in color, being of a rich yellow with black spots arranged in the form of rosettes. The rosettes of the jaguar differ from those of the leopard, however, in having one or two black points in the center. The skins are of considerable commercial value. F. A. Lucas.

Jahn, yaan, Friedrich Ludwig: popularly known as "Turnvater Jahn": b. at Lanz, in the Prussian province of Brandenburg, Aug. 11, 1778; studied theology at Halle and Göttingen; was teacher in Berlin in 1809; opened a turn establishment in 1811 on the Hasenheide, by Berlin: served in the army in the campaign of 1813–14, and commanded a corps of volunteers, at the head of which he entered Paris in 1815; from 1817 he lectured in Berlin on the German Volkstum; in 1819 he was seized by the Government as a demagogue, and was kept under guard as a prisoner of war in Colberg until 1824, when he was sentenced to two years' imprisonment in the fortress; liberated in 1825, he lived in Freiburg and Kölleda, being limited by the Government as to his place of abode. In 1848 he was chosen to the National Assembly, where, however, he did not meet the expectations of his friends. Jahn had fantastic ideas about bringing about a return to the old German civilization of the times of Hermann through perfect physical training, and his language, costume, and behavior were eccentric. The gymnastics which he introduced and made universally popular in Germany were and are a national blessing. He published *Das deutsche Volkstum* (1810); *Runenblätter* (1814); *Neue Runenblätter* (1828); *Merke zum deutschen Volkstum* (1833); *Denknisse eines Deutschen* (1835); and with Eiselen edited *Die deutsche Turnkunst*. D. at Freiburg, Oct. 15, 1852. The Jahn Stiftung was founded in his honor in Leipzig in 1863, and a statue of Jahn was erected in the Hasenheide, near Berlin, in 1872. His *Works* were edited by Euler (2 vols., Hof, 1883–87). See the *Life* by Pröhle (Berlin, 1855), and that by Euler (Stuttgart, 1881). C. H. Thurber.

Jahn, Johann: theologian; b. at Taswitz, Moravia, June 18, 1750; studied at Znaim and at Olmutz, and in 1772 entered a convent at Bruck, where he soon became Professor of Oriental Languages and of Biblical Criticism. When (in 1784) this convent was suppressed, Jahn obtained a professorship first at Olmutz, and afterward at Vienna, where he also gave instruction in dogmatic theology. Jahn in his time was the most distinguished representative of Roman Catholic learning and criticism, and his numerous works enjoyed a well-merited reputation. He nevertheless incurred the disfavor of the ecclesiastical authorities for the boldness of some of his opinions, and in 1803 was separated from his professorial chair under pretext of a promotion to a canonry of St. Stephen's. Jahn published grammars, lexicons, and elementary works on the Hebrew, Syriac, Chaldaic, and Arabic languages; an *Introduction to the Old Testament* (1792); *Biblical Archæology* (5 vols., 1797–1805); a *Manual of General Hermeneutics* (1812); an edition of the Hebrew Bible (1806); and other works. His *Archæology* has been translated into English and reprinted in the U. S. D. in Vienna, Aug. 16, 1816.

Jahn, Otto: classical scholar and archæologist; b. at Kiel, Germany, June 16, 1813; privat docent in 1839; professor extraordinarius in Greifswald in 1842; professor ordinarius 1845; was called to Leipzig in 1847, dismissed in 1851 for political reasons; became professor in Bonn in 1855. D. in Göttingen, Sept. 9, 1869. His most famous works are his commentaries to *Persius* (1843), Cicero's *Brutus* (1849), *Juvenal* (1851), *Florus* (1852), Sophocles's *Electra* (1861), Plato's *Symposium* (1864), and Pseudo Longinus, *On the Sublime* (1867); Pausanias, *Descriptio arcis Athen.* (1860; 2d ed. 1880); *Beschreibung der Vasensammlung der Pinakothek in München* (1861, 1868); and numerous dissertations on Greek archæology and literature, among which those *On the Subscriptions in Latin MSS.* and *Ueber den Aberglauben des bösen Blicks* may be specially mentioned. He also wrote a biography of Mozart (1856–60) which is highly valued. Cf. Joh. Vahlen, *Otto Jahn* (Vienna, 1870); Bursian, *Geschichte der class. Philologie in Deutschland*, pp. 1070–1080. Alfred Gudeman.

Jail, or **Gaol**, jāl [M. Eng. *jayle, gail, gayhol*, from O. Fr. *jaiole, gaiole* > Fr. *geôle*, jail, from Lat. **cave'ola*, dimin. of *ca'vea*, hollow, cage, coop]: a place of confinement for criminal offenders, suspects held for trial, debtors, etc.; a prison. In legal literature the word jail is used not only in this general sense, with little or no distinction from prison, but also specifically in a narrower sense. In England it is specifically used of the local or county jails which are used for the confinement of persons arrested for debt or for the commission of minor offenses, or for the temporary confinement of persons awaiting trial, or of witnesses, and which are the subject of periodic jail-delivery by judges traveling circuit under commission for that purpose. (See Courts.) In the U. S. the word is similarly used for the local places of imprisonment as distinguished from the State prison or penitentiary. In this narrower meaning the word jail is distinguished from prison, which, besides its general sense of any place of confinement, has the special meaning of a place of permanent confinement and of punishment for crime. At common law the jailer, or gaoler, was the servant or deputy of the sheriff of the county, and the sheriff was responsible for any wrongful act of the jailer in the performance of his duty, as for his allowing a prisoner to escape, but this responsibility is now abolished in England by statute, and in the U. S. is governed by the provisions of the statutes of the various States, where the common law has been changed. The form *gaol* is the one used in Great Britain in the technical sense, but is seldom used in the U. S. The term *gaoler* is defined by statute to be the governor of any prison. See Prison. F. Sturges Allen.

Jail Delivery: See Courts.

Jail Fever: a form of Typhus (*q. v.*).

Jains, or **Jainas**: adherents of Jainism, a religious system that originated in India about the same time as Buddhism, to which it has some resemblance, and like it was a protest against Brahmanical Hinduism. The Jains, who number about 1,500,000, are found over all Hindustan, but are most numerous in Mewar, Guzerat, and the upper Malabar coast. Their prophet was Vardhamana, better known by his epithet of Maha-vira, and they have a considerable religious literature in Prakrit. The Jains believe in a series of religious teachers (called in their case Jinas or "conquerors," of whom Vardhamana was the twenty-fourth), in reincarnation, in the attainment of Nirvana, in the practice of the four virtues of liberality, gentleness, piety, and magnanimity, in goodness in thought, word, and deed, in especial kindness to animals and consideration even of plants (because they all have souls), and in numerous angels and demons. In general Jainism is more metaphysical and less ethical than Buddhism. Mark W. Harrington.

Jaintia (jīn'ti-a) **Hills**: the name of a district of British India, beyond the Brahmaputra, in Assam; situated between lat. 25° and 26° N., lon. 92° E., N. of Sylhet, with which it was incorporated during the Burmese war (1826). The district is mountainous, and rich in iron and coal.

Jaipur, jī-poor', or **Jeypore**: a native state of Rajputana, India, tributary to the British; between the parallels 25° 41′ and 28° 27′ N. lat., and the meridians of 74° 55′ and 77° 15′ E. lon. Area, 14,465 sq. miles. It is a large plain, intersected toward the E. and N. E. by ranges of hills which are outliers of the Vindhya Mountains, the plain being the eastern extension of the Thar or Indian Desert. It is sandy in the W. and unsuitable for cultivation, especially about the salt lake of Sambhur on the western boundary, but the Jats there find suitable pasturage for cattle. The moving sand is arrested by the hills, and beyond these the country is fairly well watered, fertile, and thickly populated. Wheat, barley, sorghum, the opium poppy, tobacco, and cotton are extensively cultivated. The climate is of the desert type. The winters are cold, with the temperature sometimes falling to freezing point. May brings insufferable hot winds from the W., which are often preceded by violent local storms; these are followed in June by violent rains, which come on at intervals until September. The people number 2,600,000, comprising Rajputs (the ruling race, but forming only 10 or 12 per cent. of the population), Hindus (60 per cent.), Mohammedan Jats (20 per cent.), and others, among them the aboriginal Minas. The Rajputs established themselves here in 967. Then followed Mohammedan supremacy, after which came such great disunion that the intervention of the British was invited and welcomed in 1818. The Maharajah of Jaipur stood by the British in the insurrection of 1857. The state is in a flourishing condition. A railway passes through it from Bombay to Delhi. The commerce of the state is large, and education has made great progress. Mark W. Harrington.

Jaipur, or **Jeypore**: a city of Rajputana, India, and capital of the state of the same name; 155 miles S. W. of Delhi, 135 W. of Agra (see map of N. India, ref. 6–D). It is on an undulating plain, well fortified, and surrounded by a wall. It is at the edge of the desert, which extends toward

the W. and S., but is itself filled with gardens and trees, and presents to the traveler a very attractive aspect. The hot winds from the W. pile up the sand against the walls and fill the city with a suffocating dust. The streets are broad, the buildings generally fine, and there is less of an air of poverty than is usual in the cities of India. The city was founded in 1728, and has been celebrated as a center of Brahmanic studies. The first complete copy of the Vedas which reached Europe (1789) came from Jaipur. Jaipur is the center of a large and growing commerce. Pop. (1891) 158,905. MARK W. HARRINGTON.

Jaisalmir: a native state and town of India. See JESULMIR.

Jakutsk: See YAKUTSK.

Jal, AUGUSTE: author; b. at Lyons, France, Apr. 12, 1795; studied at the marine school at Brest, and formed at Lyons in Mar., 1815, a company of cadets who hastened to the defense of Paris against Napoleon on his return from Elba. He afterward devoted himself to literary and artistic criticism, accompanied as newspaper correspondent the army which in 1830 conquered Algeria, and on his return was placed in charge of the archives of the ministry of marine. Jal made several journeys for the purpose of discovering manuscripts in Italy, Greece, and Turkey, and wrote numerous works of art-criticism, naval and general history, archæology (esp. *Archéologie Navale*, Paris, 1840, 2 vols.), and biography, of which the most important was the *Dictionnaire Critique de Biographie et d'Histoire* (1864), a vast repertory of documents and biographical materials intended to rectify and supplement all previous works of the kind. D. 1873.

Jalalabad': fortified town of Afghanistan; situated near the Cabul, on a fertile plain 1,824 feet above the sea; 90 miles E. of Cabul. It is poorly built; its trade is entirely in the hands of the Hindus; its population varies from 3,000 to 10,000 according to the season. A single British brigade under Sir Robert Sale defeated here a large Afghan force in Mar., 1842.

Jal'andar, or **Jullundur**: a province, district, and city of the Punjaub, British India. The province comprises the triangular piece between the Sutlej and Bias rivers, and extends N. E. to the Himalayas. It is divided into three districts which correspond to the natural divisions: Jalandar district, comprising the plain between the two rivers, called the Jalandar Doab; the foot-hill or Outer Hills district, called Hushiarpur; and the high mountain district called Kangra. The climate of the first is hot, that of the second cool and delightful, that of the third distinctly alpine. The area of the province is 18,816 sq. miles, the population (1891) 4,207,570; of the district, area 1,322 sq. miles, population 790,000. The city of Jalandar is capital of the province and district, 80 miles E. S. E. of Lahore (see map of North India, ref. 4–D), and a railway station on the road from Lahore to Delhi, in the center of the Jalandar Doab. It is a large and flourishing city. Pop. (1891) 66,202.
MARK W. HARRINGTON.

Jal'ap [=Fr. *jalap*, from Span. *jalapa*, named from Jalapa, the Mexican city, whence it is imported]: a cathartic drug, the dried root of *Ipomœa purga*, natural order *Convolvulaceæ*. This is a climbing plant, with large lilac-purple flowers, growing in the mountains above the city of Jalapa, state of Vera Cruz, Mexico. The root is turnip-shaped or radish-shaped, blackish without, gray within, varying in size from that of a walnut to that of a good-sized pear. Dries into a hard, brittle mass, and is exported from Vera Cruz in large bags, either whole or cut into slices or pieces. Its active principle is a resin jalapin, consisting of hard and soft portions, both apparently equally effective medicinally. The percentage amount of the resin varies in different specimens, and since the worms that are apt to attack jalap do not touch this ingredient, worm-eaten roots contain more of it in proportion than the sound. Jalap is one of the milder of the drastic or actively irritating cathartics. It produces watery discharges, gripes, and in overdose may cause dangerous inflammation of the bowels. It is one of the most frequently used of this class of purgatives, but, like other drastics, is generally given in combination to reduce its harshness. The compound jalap powder is a mixture of jalap and cream tartar. Jalap is an ingredient of the compound cathartic pill of the U. S. pharmacopœia. Revised by H. A. HARE.

Jalapa, hăă-laa'păă: a city and the official capital of the state of Vera Cruz, Mexico; on the eastern slope of the Mexican plateau, at the base of the Macultepetl peak, 4,315 feet above the sea (see map of Mexico, ref. 7–I). It is on the line of the Mexican Interoceanic Railroad, which connects it with Vera Cruz (60 miles) and Puebla, and will eventually run to Acapulco. The climate of Jalapa is proverbially fine, equally removed from the extremes of heat and cold, and varying only slightly through the year. The city and its neighborhood command a magnificent range of scenery, including the Peroti Mountains and the snow-capped peak of Orizaba. Owing to these advantages it is much frequented by winter visitors to Mexico. Regular fairs are held, and the place has an active trade. It was founded soon after the conquest, on the site of an Indian village, and Cortés had extensive estates in the vicinity. During the colonial period it was important as a station on the road from Vera Cruz to Puebla and Mexico. It was occupied by the U. S. troops 1847–48. Though this is the official capital of the state, the government often sits at Vera Cruz or Orizaba. Pop. (1892) 18,000.
HERBERT H. SMITH.

Jalapa: a department of Guatemala; S. of Jutiapa, and W. of Guatemala. Area, 1,150 sq. miles. Pop. (1889) 35,020, about half of Indian blood. The surface is much broken, with mountains of considerable height and deep valleys. Agriculture is almost the only industry, the principal products being maize and beans. There are extensive forests abounding in fine woods, which are little used. Jalapa, the capital, is on a plain or wide valley, 5,525 feet above the sea. The climate is temperate and healthful, and the place has a considerable local trade. Pop. about 4,500.
HERBERT H. SMITH.

Jalaun, ja-lown': a district and town of Jhansi division, Northwestern Provinces, British India. The district lies along the right bank of the Jamna river between its affluents, the Sind and the Betwa. The country is flat, hot, and fertile, and produces large quantities of cotton. Principal towns, Jalaun and Kalpi. Area, 1,469 sq. miles. Pop. about 420,000. The town of Jalaun is 115 miles S. E. of Agra and 15 miles from the Jamna. Pop. 10,000. M. W. H.

Jalisco, hăă-lees'kō (rarely Xalisco): a western state of Mexico; bounded N. by Durango, Zacatecas, and Aguas Calientes, E. by Guanajuato and Michoacan, S. by Michoacan and Colima, and W. by the Pacific and Tepic territory. Area (excluding the territory of Tepic, lately separated from it), 27,264 sq. miles. It is traversed from north to south, through the center, by a complicated mountainous belt, a continuation of the Sierra Madre del Pacifico; this includes, on the southern border, the volcano of Colima (12,743 feet), the Ceboruco volcano, and other summits above 10,000 feet high. Partly included in the mountain region is the fertile plain of Ameca, 4,100 feet high; E. of the mountains is the plateau of Guadalajara, averaging 5,000 feet, with the beautiful lake of Chapala at its southern end; and to the W. there is a succession of volcanic hills and plateaus falling to the low region of the coast. The Rio Grande de Santiago flows from Lake Chapala northwestward to the Pacific; this and other rivers have cut deep cañons or *barrancas* with perpendicular walls often 1,000 feet high. The state is subject to frequent earthquakes, some of which have been very destructive. The climate varies from tropical on the coast to temperate on the plateaus and cool among the mountains. A large portion of the soil is fitted for agriculture, only the northwestern part being somewhat arid; the valleys near the coast and the regions about Ameca, Guadalajara, and Lake Chapala are especially fertile. On the high plateaus cereals are extensively cultivated, and large quantities of corn and wheat are exported; cotton, sugar-cane, rice, etc., are planted at lower elevations; and the grazing industry is very important. Portions of the coast region and mountains are well wooded, yielding excellent timbers. Jalisco is rich in minerals, especially silver, and formerly the output was enormous; the annual production still averages in value $1,500,000. Gold and copper are also mined. The manufacture of cotton and woolen cloths and saddlery is quite extensive. The Spaniards entered Jalisco about 1526, and it was conquered soon after by Nuño de Guzman. The kingdom of Nueva Galicia, then formed, included very nearly the present states of Jalisco, Aguas Calientes, and Zacatecas; the governors, who were also presidents of the audience of Guadalajara, were only nominally subject to the viceroys of New Spain. The population, estimated (1893) at 1,280,500, exceeds that of any other state, and is still largely of Indian blood, partly of the Nahuatl, partly of

other races. See Barcena, *Ensáyo estadístico del Estado de Jalisco* (official, 1891). HERBERT H. SMITH.

Jalna, jăl-naa : town of Haidarabad, Deccan, British India (see map of South India, ref. 3-D). It is gloomy and badly built; has manufactures of silk, and produces large quantities of excellent vegetables. Two miles N. is an important cantonment of British soldiers. Pop. 17,000, mostly Mohammedans.

Jaluit : a group of islands in the Ralik chain, Marshall islands, Oceanica; lat. 6° 8′ S., lon. 169° 40′ E., forming the edge of a lagoon 40 miles long by 10 broad. There are about forty islets around and four in the lagoon; they are generally very fertile. They were discovered in 1809 by Capt. Patterson, and are also called Bonham islands, Îles de la Coquille, and Elizabeth group. Pop. from 500 to 1,000. M. W. H.

Jamaica, ja-mā′ka, Sp. pron. hăă-mī′kăă (corrupted from the Indian name *Xaymaca*, said to mean "well-watered"): an island of the West Indies, one of the Great Antilles, belonging to Great Britain; in the Caribbean Sea, between 17° 43′ and 18° 32′ N. lat., and 76° 11′ and 78° 20′ 50″ W. lon.; 90 miles S. of Eastern Cuba and 310 miles N. E. of Cape Gracias á Dios, the nearest land of the American continent. Extreme length from E. to W., 144 miles; greatest width, 49 miles. Area, 4,207 sq. miles. Political dependencies are Caicos and Turks islands in the Bahamas, and Grand and Little Cayman islands to the N. W., having together about 285 sq. miles of area and 9,067 inhabitants. Pedro Cays to the S. and Morant Cays to the S. E. are uninhabited rocks, leased by Jamaica to guano-collectors. Belize, or British Honduras, formerly a dependency of Jamaica, is now a separate colony.

Jamaica is mountainous throughout, but higher toward the eastern end. A central east and west ridge can be traced, and this gives off numerous branches, falling toward the northern and southern coasts and inclosing fertile and well-watered valleys. The eastern portion of the central ridge, called the Blue Mountains, has several summits above 5,000 feet, and one, the Blue Mountain Peak, 7,360 feet above the sea. Springs and streams are numerous, though there are extensive districts in the midland and eastern parts of the island almost without water. Nearly all the little rivers run N. or S., many of them forming beautiful cascades; none of them is navigable. The basal rocks of the island are granites, overlaid with shales and extensive beds of limestone, some of them cretaceous; in these limestones numerous fine caves have been found. Extensive trappean deposits exist, and near the east end of the island there are true volcanic rocks, but evidently ancient, as there is no clearly defined crater. There are many mineral springs (sulphur, chalybeate, etc.), some of them hot; several of these are much used by invalids. The climate is mild and equable; mean temperature at Kingston (sea-level), 78·1° F., with a maximum during ten years of 87·8° and a minimum of 70·7°. Ascending the mountains the temperature decreases about 1° for every 300 feet of elevation. The mean total rainfall for the whole island is 66·30 inches yearly; there is no strictly dry season, but rains are less abundant from December to April and heaviest in May. Destructive hurricanes are rare as they generally pass to the E. and N. Jamaica may be regarded as a healthful island, the old scourges of yellow fever and dysentery having disappeared in great part, owing to better sanitary regulations. The climate of the Blue Mountains, combining comparative dryness with the coolness due to the elevation, is especially adapted to certain classes of invalids. Originally the island was covered in great part with forest, and large tracts of woodland still remain, yielding various cabinet and dye woods. The flora is very rich; the native fauna, though poor as compared with South America, has, like other West Indian islands, many peculiar forms, especially of birds, insects, and land-shells. There are no mines, and with the exception of building-stone and limestone, no mineral products of importance have been discovered. Much of the mountain land is unavailable except for pasturage, but the soil of the valleys is very rich. Agriculture is the principal industry, and, with timber-cutting, employs all the rural population; the manufactures are unimportant. The number of acres in cultivation or used (1891) was given at 640,249, but a large portion of this was taken up by guinea-grass for pasturage and by the poorly tilled provision-grounds of the peasant classes; 32,487 acres were in sugar-cane, and 22,476 acres in coffee; tropical fruits are extensively cultivated. Owing to the tariff laws of the U. S. the production of sugar and rum has fallen off, but in 1891–92 they still constituted 31 per cent. of the value of exports; during the same year coffee formed 20·7 per cent. of the exports, dyewoods 18·7 per cent., fruits 17·7 per cent., and pimento 3·1 per cent. In the Blue Mountains there is a cinchona plantation which promises to be of great importance. In 1892 the island had 793 miles of Government roads, and 89 miles of railway in traffic. Total value of exports of colony products (year ending Mar. 31, 1892), $7,891,425, of which about half went to the U. S.; total value of imports, $8,526,667, about a third being from the U. S.

Jamaica was discovered by Columbus May 3 or 4, 1494, and was colonized by the Spaniards in 1509. Its history was unimportant until 1655, when it surrendered (May 11) to an English expedition sent by Cromwell and commanded by Penn and Venables. The English soldiers devastated the plantations, and in consequence the garrison itself suffered greatly until 1656, when new settlers put affairs on a better footing. An attempt by the Spaniards to recover the island (1658) failed, and since then it has remained under Great Britain. It soon became one of the chief centers of the sugar industry, and thousands of slaves were imported. Some of them escaped to the mountains, where they formed large settlements; under their leader, Cudjoe, they harassed the white settlements, and a bloody war was waged against them (1715–38). At length, in 1738, a treaty was made with these "maroons" by which they were permitted to live undisturbed on reservations. They revolted in 1795, but were conquered, and ultimately some hundreds were sent to colonize Sierra Leone in Africa. In 1834 the slaves, to the number of 311,070, were freed, the British Government paying an indemnity of $28,362,000 to the masters. Port Royal, the old capital, was destroyed by a disastrous earthquake June 7, 1692; this led to the settlement of Kingston, the present capital. In another earthquake (Oct., 1740) great damage was inflicted, and the town of Savanna-la-Mar was swept away by an earthquake wave. Jamaica, with its dependencies, forms a colony of Great Britain, ruled by a crown governor assisted by an elected council. There is no established church, but most of the people belong to various Protestant denominations; English, more or less corrupted among the Negroes, is the common language. In 1892 there were 877 Government and many private schools. The public debt in 1892 was $7,364,360. The financial year ending Mar. 31, 1892, began with a large surplus; the revenue was $2,861,510; expenditure, $3,100,053. The population by the census of 1891 was 639,431, including 14,692 whites, 121,955 mulattoes, 488,624 Negroes, 10,116 East Indians (coolies), and 481 Chinese. Estimated total population Mar. 30, 1892, 649,524. Kingston, the capital (population 46,542), is also the principal port. Other towns are Spanish Town 5,019; Montego Bay, 4,803; Savanna-la-Mar, 2,952; Falmouth, 2,517. The island is divided into three counties.

See *Handbook of Jamaica* (annual, official); Bryan Edwards, *History of the West Indies*; Sawkins, *Geology of Jamaica*; Eden, *The Island of Jamaica* (1880); Gosse, *A Naturalist in Jamaica* (1851). HERBERT H. SMITH.

Jamaica : village; capital of Queens co., N. Y. (for location of county, see map of New York, ref. 8–K); on the Long Island Railroad; 4 miles S. of Flushing, 10 miles E. of New York. It is in a region widely known for its farming and market-gardening interests; has gas and electric-light plants, Union Hall Academy, public library, and three weekly newspapers; and contains the residences of many New York and Brooklyn business men. An appropriation of $100,000 has been made by the Legislature for the erection of a normal school in the village. The township contains the villages of Jamaica, Ozone Park, and Richmond Hill, and has ten churches and manufactures of carriages and other articles. Pop. village (1880) 3,922; (1890) 5,361; township (1880) 10,088; (1890) 14,441. See LONG ISLAND CITY. EDITOR OF "LONG ISLAND FARMER."

Jamalte'sa, or **Espino** : an ancient city of Honduras, 20 miles N. of Comayagua, now consisting of ruins similar in character to those of Copan. Many rectangular mounds, like the Mexican *teocallis*, are surmounted by the remains of edifices, and throughout the adjacent valley of Jamaltesa fragments of sculpture and well-painted vases are found. The name of the ruins is properly Espino.

Jambudwī'pa, or **Jambudvī'pa** : in Hindu mythology, one of the seven continents or islands which surround Mt. Meru and make up this universe. With the Buddhists it is

that one of the four great continents which lies S. of Mt. Meru, and is identified with India. With the Jains it is confined to one of the five divisions of India. It receives its name from its shape, which is said to resemble the leaf of a tree abundant there, called *jambu*, and supposed to be the *Eugenia jambolana*, or some other species of Eugenia.

James, the son of Zebedee [from Lat. *Jacobus* = Gr. Ἰάκωβος, a Hellenized form of Ἰακώβ, Jacob]: called THE GREATER; one of the twelve apostles, and brother of John. He was a fisherman on the Lake of Galilee when in the year 27 A. D. he was called to follow Jesus. With Peter and John he was distinguished from the other apostles by being the chosen witnesses of several of the chief incidents in the ministry of Christ, such as the transfiguration, the restoration to life of Jaïrus's daughter, and the agony in Gethsemane. James and John, with their mother Salome, appear at one time to have entertained false views of the nature of Christ's kingdom, and to have aspired to a sort of primacy, but were rebuked by Jesus (Matt. xx. 20–23; Mark x. 35–40). When Jesus ordained the brothers he gave them the appellation of Boanerges (sons of thunder), a name both descriptive and prophetic; and they gave proof of possessing the character when they rashly invoked fire from heaven upon a Samaritan village (Luke ix. 54) because it would not receive their Master. James was the first martyr among the twelve, having been killed by the sword of King Herod Agrippa I., 44 A. D. (Acts xii. 2). He is commemorated in the calendar of saints by the Roman Catholic Church on July 25, and by the Eastern Church on Oct. 23. Under the name of Santiago (St. Jago) de Compostella he was venerated from an early day in Spain as the patron of the kingdom; and in the Roman Breviary the statement is made that "he went to Spain and there made some converts to Christ, of whom seven were subsequently ordained bishops by the blessed Peter, and were the first to be sent to Spain; then he returned to Jerusalem." At Compostella there is a cathedral in which in 1879 there was found a stone chest full of broken bones; out of these three skeletons were formed, and on Nov. 1, 1880, Pope Leo in an apostolic letter pronounced them to be the skeletons of St. James, Theodore, and Athanasius.

James: the son of Alphæus; called THE LITTLE (or the LESS); one of the twelve apostles. His mother's name was Mary (Matt. xxvii. 56; Mark xv. 40), who is called (John xix. 25) "the wife of Cleophas," and is referred to in the same verse as a "sister" of Mary, the mother of Jesus. Whether this James is the same as "James, the Lord's brother" spoken of by Paul in Gal. i. 19 has been much discussed, but it is generally decided that he is. Assuming the affirmative answer, the most consistent solution of the apparent discrepancies in the New Testament references seems to be that the two Marys, the mothers of Jesus and of James, are called *sisters* in John xix. 25 by virtue of their marriage with two brothers, Joseph and Cleophas (otherwise Alphæus—the names are really the same). He is first heard of in 28 A. D., when with his younger brother Jude he is called to the apostolate (Matt. x. 3). To him Jesus made a separate appearance (1 Cor. xv. 7). When next we hear of him, ten years later, 30 A. D., it is as head of the Church at Jerusalem, and (according to the above theory) he wrote the epistle known by his name. Early Christian writers (as Hegesippus) give him the name of James the Just, and a well-known passage of Josephus (*Antiquities*, xx., 9, 1) describes his martyrdom, to which he attributes the downfall of the Jewish power; but most critics reject this account as an interpolation. Nothing therefore can be affirmed of the life of James posterior to the scriptural references. The apocryphal writing attributed to James is the *Protevangelium*, which derives some importance from having been early known in the Church. It is plainly based upon the first two chapters of Luke, but contains an account of the nativity and early life of Mary, and much other unhistorical matter.

James, Epistle of: one of the canonical books of the New Testament, the first of the so-called Catholic epistles. It is ascribed to "James, the Lord's brother," who is generally identified with JAMES THE LITTLE or the LESS (*q. v.*), though many commentators contend that he was distinct from both the apostles bearing the same name. The epistle is believed by the majority of critics to have been written several years before the destruction of Jerusalem by the head of the Jewish Church, and addressed to the Jewish Christians of Asia Minor. The thought is vigorous and the Greek pure. Its "doctrine of justification by works" (ii. 14–26) has occasioned more controversy upon this epistle than upon almost any other book of the canon, it being regarded by some as irreconcilable with Paul's doctrine of justification by faith. Though Luther calls it "a right strawy epistle," and denied it apostolic origin, he yet admired it, held it as good, and forbade no one to place and elevate it as he pleases. (Cf. Westcott, *Bible in the Church*, chap. x.) Most modern Protestants think it represents faithfully the practical teaching of Christ, and find many analogies with the Sermon on the Mount. The distinctive doctrines of Christianity are not alluded to except by implication. See the commentaries by R. Johnstone (Edinburgh, 1871; 2d ed. 1888); C. F. Deems (New York, 1890); J. B. Mayer (London, 1892).

James I. of Great Britain (**VI.** of Scotland): b. at Edinburgh Castle, June 19, 1566; was the only son of Mary, Queen of Scots, by her second husband, Henry Stuart, Lord Darnley. In the following year, soon after Darnley was assassinated, Mary was abducted by Bothwell, whom she married May 15; was imprisoned at Lochleven Castle in June by her insurgent nobles, and forced to resign the crown (July 24) to the infant James, who was accordingly crowned at Stirling on July 29. During the stormy years of James's childhood, passed at Stirling Castle, the regency was successively in the hands of the powerful nobles the Earls of Murray, Lennox, Mar, and Morton until, on the overthrow of the latter, in 1577, James nominally took the government into his own hands, which was confirmed by Parliament in 1578. His early education had been carefully directed by the famous historian and classical scholar George Buchanan, from whom he probably derived a taste for learning, which degenerated into a ridiculous pedantry. Earl Morton regained power for a short time, but was beheaded in 1581 on a charge of complicity in the murder of Darnley, after which Arran and the French favorite whom James had created Duke of Lennox ruled until Aug., 1582, when a party of the nobles seized the king at Ruthven Castle, and compelled him to issue a proclamation against Lennox and Arran. The civil war and court intrigues went on with a wearying iteration of similar events for several years, during which James made a treaty with Elizabeth, receiving from her a pension (1585), unsuccessfully interceded for his mother's life (1587), co-operated with England in preparations against the Spanish Armada (1588), went to Denmark, where he married the Princess Anne (Nov. 24, 1589), carried on war with varying success against several Catholic lords from 1590 to 1597, and by the death of Elizabeth in 1603 succeeded to the throne of England, being proclaimed Mar. 24 and crowned at Westminster July 25. He presided at the Hampton Court Conferences in Jan., 1604; exiled Jesuits and seminary priests; assumed the title of King of Great Britain, France, and Ireland Oct. 24, 1604; claimed the discovery of the Gunpowder Plot Nov. 5, 1605; instituted the order of baronets in 1611; and lavished honors upon the unworthy favorites by whom he was directed, such as Carr, made Earl of Somerset in 1613, and Villiers, raised through all the stages of the peerage, from baron in 1616 to Duke of Buckingham in 1623. His son Henry, Prince of Wales, died in 1612; his daughter Elizabeth, from whom the house of Hanover descended, was married in 1613 to the elector palatine, who became King of Bohemia, but lost his estates in 1620, at the outbreak of the Thirty Years' war. Great efforts were made by James to obtain the alliance of Spain through the marriage of Prince Charles with a Spanish princess, and on the failure of negotiations in 1624 declared war against that power, but died shortly after at the palace of Theobalds, Mar. 27, 1625. The reign of James in England was distinguished by many memorable events; it witnessed the literary and political careers of Bacon and Raleigh, the disgrace of both, and execution of the latter; the dramatic activity of Shakspeare and Ben Jonson; the translation of the English Bible; the colonization of Virginia and New England; the formation of two well-defined schools of English Protestantism; and the genesis of the struggle between king and commons which brought the head of his successor to the block. James was despicable in his personal qualities; was weak, cowardly, passionate, vindictive, cruel, superstitious, fanatical, and prone to fall under the influence of worthless favorites. Though absurdly lacking in kingly qualities, he thoroughly believed in his divine right to rule, setting forth his views on that subject in *Basilikon Doron* (1599). His learning was varied, though not scholarly; he published several other books,

which were much praised by his flatterers, but have now only an historical interest: *Essays of a 'Prentice in the Divine Art of Poesy* (1584); *Dæmonologie* (1597); *True Law of Free Monarchies* (1598); *Triplici Nodo Triplex Cuneus* (1605); *Remonstrance for the Right of Kings* (1615); and *Counterblast to Tobacco* (1616). See S. R. Gardiner's able histories of this reign, 1875. Revised by C. K. Adams.

James II.: of Great Britain; a son of Charles I.; b. in London, Oct. 14, 1633; became Duke of York; escaped in 1648 from the Parliamentarians and fled to the Low Countries; served with distinction under Turenne and Condé; was appointed by Mazarin captain-general in Italy 1656, in which year he entered the Spanish service and fought against Turenne; was appointed in 1660 lord high admiral of England and lord warden of the Cinque Ports; married Anne Hyde, daughter of Lord Clarendon, 1660; commanded against the Dutch 1665–72; avowed himself a Roman Catholic 1669; married Mary of Este (Modena) 1673, the first duchess having died in 1671; retired to the Low Countries during the unsuccessful agitation for excluding him from the throne; as lord high commissioner for Scotland persecuted the Covenanters 1679, and succeeded Charles II. 1685. The great events of his reign were the insurrection of Argyle in Scotland (1685) and that of Monmouth in the west of England in the same year; the bloody assizes, in which those suspected of taking part in the rebellion were exposed to the unjust sentences of the brutal Jeffries; the persistent attempts of the king to overthrow constitutional government and to establish arbitrary royal power and the Roman Catholic religion; the proclamation of the Declaration of Indulgence (*q. v.*) as a means to that end; the violation of the privileges of the universities; the imprisonment of the bishops for petitioning to be excused from reading the declaration; the establishment of new and illegal tribunals; and the maintenance of a standing army without legal warrant. These grievances brought on the revolution of 1688, sometimes called the "bloodless revolution," which completely changed the constitutional basis of the state, breaking forever with the divine-right theory and introducing the period of parliamentary government. William, Prince of Orange, a cousin of the king, and Mary, Princess of Orange, the king's eldest daughter, were called by common consent to the throne; but before they were crowned they were obliged to sign the Declaration of Rights (*q. v.*) as a guarantee of constitutional government. James in the meanwhile had fled to France, but in 1689 invaded Ireland, besieged Londonderry without success, and July 1, 1690, was defeated at the Boyne; retired to France, and spent the rest of his life in futile schemes for restoration to the throne. D. at St. Germain-en-Laye, Sept. 6, 1701. See William III. Revised by C. K. Adams.

James I.: of Scotland; son of Robert III.; b. in 1394 at Dunfermline; was captured by the English while on his way to France 1406, and imprisoned in the Tower and in Nottingham Castle, Evesham, and Windsor Castle, and wrote the *King's Quhair* and other poems while in confinement; he was well treated during his imprisonment by both Henry IV. and Henry V., and accompanied the latter in his French campaigns; married Joanna Beaufort, granddaughter of John of Gaunt, 1424; was liberated, proclaimed king, and crowned at Scone 1424; restored order to Scotland, and used so much rigor toward the turbulent nobles that he was murdered by their emissaries at Perth Feb. 21, 1437. James was celebrated for his courtly graces, his literary accomplishments, and his excellence in athletic exercises.

James II.: of Scotland; son of James I. and Queen Joanna Beaufort; b. in 1430; was crowned at Edinburgh when but six years of age (1437). During his minority the kingdom was distracted by struggles for power between his tutors Crichton and Livingston and the house of Douglas, represented by three successive earls of that title. James assumed the government in 1449; married Mary of Gueldres the same year; murdered William, eighth Earl of Douglas, with his own hand 1452; defeated a powerful insurrection headed by the ninth earl; made a treaty with Henry VI. of England in 1459, by which he acquired the counties of Durham and Northumberland, in consideration of supporting the house of Lancaster in the war of the Roses, and was killed by the bursting of a gun at the siege of Roxburgh, Aug. 3, 1460.

James III.: of Scotland; son of James II. and Queen Mary of Gueldres; b. July 10, 1451; was crowned at Kelso monastery on his father's death (1460). The government, after the death of the queen-mother (1463) and of Bishop Kennedy (1466), fell into the hands of the Boyd family, one of whom married the king's sister in 1467, and was at the same time created Earl of Arran. Henry VI. of England had taken refuge in Scotland in 1461, and involved the Scotch in the war of the Roses, which led to a league between Edward IV., the new Yorkist king, and the Earls of Douglas and Ross and the Lord of the Isles for the partition of Scotland; but the plan proved abortive, and in 1464 a fifteen years' truce was concluded. James married the Princess Margaret of Denmark in 1469, thereby acquiring the Orkney and Shetland islands, dismissed the Boyds from power the same year, and came under the influence of the Hamiltons; experienced several insurrections; imprisoned on a charge of witchcraft his brother, the Earl of Mar, who soon died (1480); maintained a war with another brother, the Earl of Albany, who laid claim to the crown and was supported by Edward IV.; was besieged in Edinburgh Castle, and reconciled to his brother (1482); had to wage another war against the nobles, who had placed at their head his son, Prince James (1487), and was either killed in battle or murdered thereafter at Sanchie, near Bannockburn, in June, 1488.

James IV.: of Scotland; son of James III. and Margaret of Denmark; b. in 1473; joined the rebellious nobles against his father in 1487; was crowned at Scone in June, 1488; suppressed an insurrection headed by Lords Forbes and Lyle and the Earl of Lennox in 1489; favored the impostor Perkin Warbeck, whom he received at his court as King of England (1495), on whose behalf he made war upon England (1496–97), but finally concluded a truce for seven years, and in 1503 married Margaret, daughter of the English king, Henry VII. In 1513 he took offense at a supposed insult from his brother-in-law, Henry VIII., invaded England, and was defeated and slain at Flodden Field, Sept. 9, 1513.

James V.: of Scotland; son of James IV. and Margaret of England; b. at Linlithgow, Apr. 10, 1512; succeeded to the throne under his mother's regency in 1513; assumed the government 1528; married Madeleine of France 1537, and on her death Mary of Lorraine, daughter of the Duke of Guise, 1538; met with signal defeat from the English at Solway Moss Nov. 25, 1542; died at Falkland Palace in Dec., 1542, and was succeeded by his infant daughter, Mary, Queen of Scots.

James Francis Edward Stuart: son of King James II. of England by Queen Mary of Modena, and natural heir to the throne; b. in London, June 10, 1688. In the year of his son's birth James II. was driven from power, and the rights of the infant prince were ignored by his sisters Mary and Anne, who successively occupied the throne. The exiled family found hospitable asylum at the court of Louis XIV., who, on the death of the ex-king, immediately recognized the prince as King of Great Britain under the title of James III. In 1708 Prince James sailed from Dunkirk in a French fleet, intending to effect a landing in Scotland, but did not execute that intention. Under the *nom de guerre* of the Chevalier of St. George the youthful Pretender (as he was called in England) took part in the French campaigns of 1708–09 against the English in Flanders, for which reason Parliament set a price of 100,000 crowns upon his head. The prince's sister, Anne, designed to restore him to the order of succession, and numerous statesmen of England, among whom were Bolingbroke and Bishop Atterbury, favored his cause, but his refusal to renounce Catholicism was fatal to his prospects. In 1715 the Pretender was invited to Scotland by the Earl of Mar, landed at Peterhead in December, passed through Aberdeen, made a public entry into Dundee, and occupied the royal palace at Scone. The enterprise, however, failed ignominiously, and the next month the Pretender retreated to France. The remainder of his life was passed chiefly in Italy, he having married in 1719 a Princess Sobieski of Poland, by whom he had a son, Charles Edward, b. 1720, the Young Pretender of 1745. Prince James, after his second failure, declined to make any further armed attempt upon the throne of Britain, ceding his rights to his son when the latter reached maturity. He passed his closing years in pious retirement at Rome, where he died Jan. 2, 1766. See the histories of Macaulay and Lecky.

James, Edmund Janes, A. M., Ph. D.: political economist and educator; b. at Jacksonville, Ill., May 21, 1855; was educated at Northwestern University, Evanston, Ill., Har-

vard University, and the Universities of Halle, Leipzig, and Berlin. He held the positions of principal of the public high school, Evanston, Ill., and of the Illinois State Model School, Normal, Ill.; since 1883 has been Professor of Public Finance and Administration in the Wharton School of Finance and Economy, University of Pennsylvania. He was vice-president of the American Economic Association in 1885, and is now (1894) president of the American Academy of Political and Social Science, and of the American Society for the Extension of University Teaching. Commissioned by the American Bankers' Association, he visited Europe in 1892 for the purpose of studying the business methods employed in other countries. Besides articles in Lalor's *Cyclopædia of Political Economy*, he has published *Studien über den amerikanischen Zolltarif* (Jena, 1877); *Outline of a Proposed School of Political and Social Science* (Philadelphia, 1885); *Chairs of Pedagogics in our Universities* (Philadelphia, 1887); *Our Legal Tender Decisions* (Baltimore, 1888); *The Federal Constitution of Germany* (trans., Philadelphia, 1890); *The Federal Constitution of Switzerland* (trans., Philadelphia, 1890); *The Education of Business Men* (New York, 1890); various papers, addresses, etc., on university extension; and other works.

James, George Payne Rainsford: novelist; b. in London, England, in 1801. He became in early life, partly through the advice of Washington Irving, a writer of romances; was historiographer of England under William IV.; became British consul at Norfolk, Va., in 1852; British consul for the Austrian ports 1856. D. at Venice, June 9, 1860. Of his many novels and other works, which once had great popularity, the best are *Richelieu* (1825); *Darnley* (1830); *Memoirs of Great Commanders* (1832); *Life and Times of Louis XIV.* (1838).

James, Sir Henry, F. R. S.: general; b. at Rose-in-Vale, near St. Agnes, Cornwall, England, in 1803; was educated at the Royal Military Academy at Woolwich; entered the army as lieutenant of engineers; became colonel in 1857, and lieutenant-general in 1874. After directing the geological survey of Ireland (1844), and the admiralty engineering works at Portsmouth (1846), he was appointed in 1852 superintendent of the ordnance survey of the United Kingdom, and in 1857 chief of the topographical and statistical departments of the war office. He was knighted in 1860. As early as 1855 he reduced the ordnance maps by photography; in 1860 he applied the new processes of photo-lithography to the reproduction of improved ordnance surveys. Gen. James invented a modification of this process, known as photo-zincography, and by its means made a complete facsimile in thirty-two volumes of the celebrated *Domesday Book*, as well as of other ancient manuscripts. He published *Ordnance Trigonometrical Survey of Ireland* (1858), *of Scotland* (1861), *of England and Wales* (1861); *Account of the Principal Triangulation of the United Kingdom* (1864); and other works. D. at Southampton, June 15, 1877.

James, Henry: theologian; born at Albany, N. Y., June 3, 1811. He studied in Union College and Princeton Theological Seminary; went to Europe, where he acquired Sandemanian and afterward Swedenborgian views. He resided for many years in New York city, at Newport, R. I., and at Cambridge, Mass. He published *What is the State?* (1845); *Letter to a Swedenborgian* (1847); *Moralism and Christianity* (1852); *Lectures and Miscellanies* (1852); *The Church of Christ* (1854); *The Nature of Evil* (1855); *Christianity the Logic of Creation* (1857); *Substance and Shadow* (1863); *The Secret of Swedenborg* (1869); and other works. D. at Cambridge, Dec. 18, 1882.

James, Henry, Jr.: novelist; a son of Henry James, theologian; b. in New York, Apr. 15, 1843; was educated partly in Europe. After studying law at Harvard for two years he devoted himself to literature, being a frequent contributor to magazines and periodicals, and becoming a recognized master in the modern school of realistic fiction and analytic character study. Among his novels and stories are *Watch and Ward* (1871); *Roderick Hudson* (1875); *A Passionate Pilgrim* (1875); *The American* (1877); *Daisy Miller* (1878); *An International Episode* (1878); *The Europeans* (1878); *Diary of a Man of Fifty* (1880); *The Portrait of a Lady* (1881); *The Bostonians*, *The Princess Casamassima* (1886); *The Tragic Muse* (1890); *The Lesson of the Master, and other Stories* (1892); and *The Real Thing, and other Tales* (1893). Since 1869 Mr. James has mostly resided in Europe. Among his critical and miscellaneous writings are *Transatlantic Sketches* (1875); *French Poets and Novelists* (1878); *Hawthorne* (1880); *Portraits of Places* (1884); *Partial Portraits* (1888); and *Terminations* (1895).

Revised by H. A. Beers.

James, John Angell: clergyman; b. at Blandford Forum, Dorset, England, June 6, 1785; was educated at Gosport Academy; entered the ministry in 1803, and was (1805–59) pastor of the Congregational chapel, Carr's Lane, Birmingham; was an able preacher and writer, and exercised a wide influence in Europe and the U. S. by his numerous religious works, of which the best known are *The Anxious Inquirer* (Birmingham, 1834; 14th ed. London, 1884); *Christian Fellowship* (1829; 11th ed. 1859); and *Christian Professor* (1837). His writings, composed of sermons, addresses, etc., are in seventeen volumes (1860–62). He declined the title of D. D. offered by Glasgow, the College of New Jersey, and Jefferson College. D. at Birmingham, Oct. 1, 1859. See his *Life and Letters*, by Rev. R. W. Dale (London, 1861).

James, Robert, M. D.: b. at Kinverston, Staffordshire, England, in 1703; was educated at Oxford; practiced as a physician at Sheffield, Lichfield, Birmingham, and London; published, with the aid of Dr. Samuel Johnson, a *Medical Dictionary* (3 vols. fol., London, 1743–45), and invented the celebrated fever-powder known by his name, now called antimonial powder, composed of oxide of antimony and phosphate of lime. James's powder was one of the earliest and most successful prototypes of the so-called patent medicines now so common. D. in 1776.

James, Thomas: an English navigator who in 1631 was sent by a company of merchants of Bristol to search for a northwest passage. He explored Hudson's Bay, and from him the southern portion is still called James's Bay. Capt. James reached lat. 65° 30′ N., and then, his further progress being stopped by ice, returned to England. In 1633 he published a quarto volume entitled *The Strange and Dangerous Voyage of Capt. Thomas James for the Discovery of a Northwest Passage to the South Sea.*

James, William, M. D., Ph. and Litt. D. (Padua): son of Henry James, theologian; Professor of Psychology in Harvard University; b. in New York city Jan. 11, 1842; was educated at schools in New York and in Europe, and at Harvard University. He has been since 1872 Instructor and Professor, first of Anatomy and Physiology, then of Philosophy, and finally of Psychology at Harvard. His published works, besides articles in various medical and philosophical journals and in the proceedings of societies, are *Principles of Psychology* (2 vols., New York and London, 1890); *Psychology, Briefer Course* (New York and London, 1892). He has also edited the *Literary Remains of Henry James* (Boston, 1884). W. T. Harris.

James Island: one of the sea islands of Charleston co., S. C., having Charleston harbor and Ashley river on the N. The battle of Secessionville (June 16, 1862) and several other spirited engagements occurred upon this island during the civil war. Pop. of township of James island (1890) 2,915.

Ja'meson, Anna (*Murphy*): author; b. in Dublin, Ireland, May 19, 1797; was the daughter of Brownell Murphy, an artist of merit; was married in 1823 to Robert Jameson, a barrister, from whom she soon separated. D. at Ealing, England, Mar. 19, 1860. Her writings upon Christian art and archæology are of a high order. Her principal works are the different books under the general title *Sacred and Legendary Art*, viz. *Legends of the Saints* (1848); *Legends of the Monastic Orders* (1850); *Legends of the Madonna* (1852); and the *History of Our Lord*, which she left unfinished, was completed by Lady Eastlake. Besides these she published *Diary of an Ennuyée* (1826); *Lives of Female Sovereigns* (1831); *Characteristics of Women* (1832); a translation of Waagen's *Rubens* (1840); *Handbook to the Public Galleries of Art* (1842); *Companion to Private Galleries* (1844); *Memoirs of Early Italian Painters* (1845).

Jameson, John Alexander, LL. D.: jurist; b. at Irasburg, Vt., Jan. 25, 1824; graduated at the University of Vermont in 1846; was tutor there 1850–53, after which he removed to Illinois; practiced law, became in 1865 judge of superior court in Chicago, and remained on the bench until 1883; was Professor of Law in the University of Chicago 1867–68; and for years assistant editor of the *American Law Register*. Author of *The Constitutional Convention* (4th ed. 1887). D. in Hyde Park, Ill., June 16, 1890.

Jameson, Robert: naturalist and geologist; b. at Leith, Scotland, July 11, 1772; was educated for the medical pro-

fession at the University of Edinburgh, but, devoting himself entirely to natural history, explored the Scottish islands as a mineralogist, and published his discoveries in two volumes in 1798 and 1800. Dr. Jameson then studied for two years at Freiberg, under the celebrated Werner, and taught for many years from the chair of Natural History in Edinburgh University, to which he was elected in 1804, having even founded a Wernerian Society. Later in life he abandoned his favorite dogmas as untenable, and adopted instead those of Hutton. He wrote a *System of Mineralogy* (3 vols., 1804–08), which has passed through many editions; a *Manual of Mineralogy* (1821); edited the geological department of the *Encyclopædia Britannica* (4th ed. 1819 *seq.*); founded in 1819, and conducted through life, the *Edinburgh New Philosophical Journal*; and assisted Sir D. Brewster and Hugh Murray in the preparation of many scientific treatises of a popular character. D. at Edinburgh, Apr. 19, 1854.

James River: a river of Virginia; formed in Alleghany County by the union of the Jackson and the Cowpasture rivers. It passes through the Blue Ridge, and pursues a devious course as far as Scottsville, whence its direction is about E. S. E. At Richmond it falls 100 feet in 6 miles, affording a grand water-power. The tide comes up to the Rocketts just below Richmond. This is the head of navigation for steamboats and schooners of 130 tons. Shipping of the first class comes up to City Point, 40 miles below, at the mouth of the Appomattox. Below City Point the river is a broad, deep, and never-failing tidal estuary, 66 miles long, and inferior to the lower Columbia and the Potomac only among the rivers of the U. S. in the majesty of its flow. The James river, with the Elizabeth and the Nansemond, flows into Chesapeake Bay through Hampton Roads. The entire length from Covington, Va., to Old Point Comfort is some 450 miles.

James River and Kanawha Canal: a projected route contemplating, besides the existing canal, a continuous line of water-communication from the waters of the Ohio river, at the mouth of the Kanawha river, West Va., to the waters of the Chesapeake Bay and the Atlantic Ocean at the mouth of the James river. The idea of a water-communication between the valley of the Ohio river and the valley of the James river is generally supposed to have originated with Gen. Spotswood, when on Aug. 20, 1716, he set out from Williamsburg on his expedition over the Blue Ridge. Gen. Washington was so impressed with the importance of a water-line across the Alleghanies that during the year 1784 he made a personal exploration of the country. It was largely owing to his influence and instrumentality that the Legislature of Virginia, on Jan. 5, 1785, passed "an act for clearing and improving the navigation of the James river." By this act the first or old James River Company was incorporated. This company was organized Aug. 25, 1785, and Gen. Washington was elected its first president. Several amendatory acts have since been passed; and the present company was incorporated in May, 1832, and organized in 1835. This company began the construction of the canal from Richmond to Lynchburg in 1836, and the work was completed about Dec. 1, 1840. The part known as the second division of the canal, extending from Lynchburg to Buchanan, was begun in the meantime, and completed in Nov., 1851. An extension of 47 miles to Covington on Jackson river, a few miles above the junction of Cowpasture river, was begun in 1853, but remains yet incomplete. As the "central water-line," this route is one of the four or five great lines of transportation by which the products of the interior States may reach the sea. The creation by this route of a central water-line involved, besides the mere connection with the great fluvial navigation system of the Mississippi Valley, an enlargement of the actually constructed portions of this line. Hence the project involves—1, the enlargement of the existing canal from Richmond to Buchanan; 2, the construction of the projected and definitely located portion of the canal from Buchanan to the mouth of Fork Run; 3, the construction of the canal up Fork Run to the summit-level, 1,700 feet above tide, under the Tuckahoe and Katis Mountains, by a tunnel 7 miles long, and thence down the valley of Howard's Creek to the Greenbrier river; 4, the slack-water improvement of the Greenbrier, New, and Kanawha rivers to Paint Creek Shoals (with occasional short canals to avoid expensive location of dams); 5, the open sluice-dam improvement of the Kanawha river from the Paint Creek Shoals to its junction with the Ohio river.

This project was submitted Jan., 1874, by the Secretary of War to a board of engineers, and the cost was estimated at $60,000,000. No further steps have been taken with regard to this project. Revised by J. J. R. Croes.

James's Bay: the southern part of Hudson's Bay; lat. 51°–55° N., lon. 79°–82° 30′ W. It was named from Capt. Thomas James, who wintered here in 1631–32 while attempting to find the northwest passage. It abounds in shoals and islands. On its south shores there are extensive marshy plains.

Jamestown: city; Chautauqua co., N. Y. (for location of county, see map of New York, ref. 6–B); on the navigable outlet of Chautauqua Lake, and the Chautauqua Lake and Erie railways; 69 miles S. by W. of Buffalo. It is in an agricultural region; obtains power for manufacturing from the lake outlet and natural-gas for fuel and illumination from wells 26 miles distant, and has long been a popular summer-resort. During the summer season numerous steamboats ply between Jamestown and various resorts and points on the lake. The city contains 22 churches and chapels, 10 public-school buildings, 3 libraries (the James Prendergast Free, opened 1891, the Y. M. C. A., and the High School), hospital, orphan asylum, Holly system of water-works, electric-lighting and street-railway plants, and a monthly, 3 daily, and 5 weekly periodicals. The manufactories employ 5,000 persons, and produce furniture, woolen and worsted goods, plush-goods, boilers and engines, boots and shoes, and metallic goods. Pop. (1880) 9,357; (1890) 16,038. Editor of "Journal."

Jamestown: city; capital of Stutsman co., N. D. (for location of county, see map of North Dakota, ref. 3–E); on the N. Pac. Railroad; 93 miles W. of Fargo. It is in an agricultural and stock-raising region, is the seat of the State; Insane Asylum, and has a daily and two weekly newspapers. Pop. (1880) 393; (1890) 2,296.

Jamestown: magisterial district (founded in 1607); James City co., Va. (for location of county, see map of Virginia, ref. 6–I). It was the first permanent English settlement within the limits of the U. S., and when settled was on a peninsula 32 miles from the mouth of the James river; but the action of the current has changed the peninsula to an island, and carried away part of the site of the original settlement. Only the ruins of the church, the fort, and two or three houses mark the spot which was first occupied by the band of 107 colonists under Wingfield, Christopher Newport, and Bartholomew Gosnold. Great privations were suffered during the first season, and the settlers were largely indebted for their preservation to Capt. John Smith. A second company of colonists arrived in 1608; a still larger number under Sir Thomas Gates and Sir George Somers in 1609; the charter Governor, Lord Delaware, arrived with reinforcements in 1610; Sir Thomas Dale brought 300 settlers and some cattle in the same year; and in 1611 Sir Thomas Gates brought still another company of 350. Jamestown soon became the capital of an extensive colony, and in 1619 (June 29) a house of burgesses, the first legislative assembly ever convened in British America, met here. After the seat of government was removed to Williamsburg, Jamestown began to decline; it was burned by Nathaniel Bacon during the rebellion of 1676, and never rebuilt. It was the scene of an engagement between the forces of Wayne and Lord Cornwallis in 1781. Pop. of district (1880) 1,235; (1890) 1,254.

Jāmī, jaa′mēē, Nūrrudīn Abdurrahman Jāmī: a renowned Persian poet; the last of the great mystic Sūfīs; b. in 1414 (A. H. 817), in the little town of Jām, near Herāt, in Khorasān, whence he took his name Jāmī, which he used as a poetic pseudonym. The name Nūrrudīn (light of faith) was given him in boyhood, and his brilliant talents were already evinced while still at school. His studies in Sūfī mysticism were conducted under the guidance of the great master, Shaikh Mohammad Saaduddīn Kāshgarī, of Herāt. In his devotion to philosophy he is said to have withdrawn into solitude, and to have been buried in meditation so profound that he almost lost the power of speech. It was not until later in life that he succeeded his departed master as teacher in the great mosque of Herāt, and he acquired widespread fame for his doctrines and poetical philosophy.

When nearly sixty years of age (A. D. 1472, A. H. 877) he went on a pilgrimage to Mecca, returning, after a year's absence, again to Herāt. There he continued to live, re-

nowned and in favor with the new Sultan, Husein Mirza Baikara, until his eighty-first year, when he died, A. D. 1492 (A. H. 898), and was buried with great pomp, in accordance with the sultan's command, in the city of Herāt. It is said that he was married, his wife being the granddaughter of his Sūfī teacher and master, and that he had four sons; all of his children, however, died in youth. For the youngest son, born in his old age, he composed the well-known work *Bahāristān*, or Garden of Spring (A. D. 1487, A. H. 892).

Jāmī was a prolific writer. He was the author of forty-four, or, according to some, of ninety-nine different works in prose and verse, consisting of grammar, poetry, and philosophy. The most famous is his *Yūsuf u Zuleikha*, on the passion of Potiphar's wife for Joseph, a subject already treated by FIRDAUSĪ (*q. v.*). Jāmī's *Bahāristān* has already been mentioned; well known also is his *Salāmān u Absāl*, a mystic fable with a moral. These three are included among the number of his seven best mystical poems, collected under the title *Haft Aurang*, or Seven Thrones. His writings are favorites in Persia, and some of the manuscripts of his works are beautifully illuminated. The philosophic and allegorical element of the Sūfīs abounds in his poetry.

For details regarding Jāmī's life and work, see Sir Gore Ouseley, *Biographical Notes of Persian Poets* (pp. 131–135, London, 1846); E. Fitzgerald, *Poetical Works* (vol. i., pp. 95–162, New York, Boston, and London, 1887: containing sketch drawn from Rosenzweig's *Biographische Notizen*, and a rendering of *Salāmān and Absāl*); S. Robinson, *Persian Poetry for English Readers* (pp. 511–631, Wilmslow, England, 1883; with translations from *Yūsuf and Zuleikha*).

A. V. WILLIAMS JACKSON.

Jamieson, JOHN, D. D.: author; b. in Glasgow, Scotland, Mar. 3, 1759; was educated at the university of that city; became a minister of the Secession Church in Forfar 1781, and was called to Edinburgh in 1797. Besides many theological treatises and several poems, he published a valuable *Etymological Dictionary of the Scottish Language* (1808–09, 2 vols.) and *Supplement* (1825)—in the edition of 1879 the supplement has been incorporated with the text—and other smaller works of philology and *belles-lettres*. The doctorate of divinity was conferred upon him by Princeton College, New Jersey, for his *Vindication of the Doctrine of Scripture, and of the Primitive Faith concerning the Deity of Christ*. D. in Edinburgh, July 12, 1838.

Jam'na, or **Jumna**: a river of Hindustan, and the principal affluent of the Ganges. It rises in lat. 31° N. and lon. 78° 32′ E., at an elevation of 10,849 feet, flows first S., and then S. E., and after a course of 680 miles joins the Ganges at Allahabad. It is shallow and unfit for navigation, but by artificial means it has in many ways been made available both for agriculture and commerce. Delhi and Agra are situated on its banks.

Jamot, ya'mot, R. E. (pseud. of JOSEF THOMAYER): writer; b. at Trhanov, near Taus, Bohemia, in 1853; studied at Klatovy (Klattau) and Prague; is (1894) Professor of Medicine at the University of Prague. His works, *Čtení o pěti smyslech člověka* (On the Five Senses of Man, Prague, 1880) and *Příroda a lidé* (Nature and Men, 1881), are an excellent combination of natural history and novelistic fiction. He has written on medical subjects, and in 1885 became associate editor of the *Slovník zdravotní* (Dictionary of Hygiene). J. J. KRÁL.

Jamyn, AMADIS: poet; b. in France about 1530. He took part in the movement for the revival of classical letters, led by Ronsard, through whose influence he received a secretary's position at the court of Charles IX. He was one of the first French translators of Homer, bringing out in 1574 a version, in Alexandrine lines, of the last twelve books of the *Iliad* and of the first three of the *Odyssey*. In 1575 appeared a collection of his *Œuvres poétiques*, largely erotic. In 1584 a second collection appeared, containing moral and religious poems. D. in 1593. His style lacks brilliancy, and his treatment is coarse. A. G. CANFIELD.

Janauschek, yaa'now-shek, FRANCESKA ROMANA MAGDALENA: actress; b. in Prague, Bohemia, July 20, 1830; was brought up for the stage, and from an early age began to show a talent for tragic *rôles*, which she played first at Cologne, then for many years (1848–60) at Frankfort, and later at Dresden and the principal theaters of Germany. In 1852 she married Frederick Pillot, a captain in the German navy. Mlle. Janauschek came to the U. S. in 1867, and acquired great popularity, though performing in German only. She first appeared in an English play in Oct., 1870, at the Academy of Music, New York. Returning to Germany in 1871, she devoted herself to the study of English, and in 1873 returned to the U. S., where she successfully represented in English the most difficult *rôles* of Shakspearian tragedy. She visited Australia in 1884. Her dual *rôles* of Hortense, the French maid, and Lady Dedlock, in a dramatic version of Dickens's *Bleak House*, are marvelously contrasted impersonations. B. B. VALLENTINE.

Janda, yaan da, BOHUMIL (*Cidlinský*): poet and novelist; b. at Patek, Bohemia, May 1, 1831; studied law and Slavonic philology at Prague. In 1863 he obtained a position with the Bohemian land committee and afterward became secretary of that body. After 1851 he was a regular contributor to Bohemian magazines (notedly the *Lumír*), being obliged, on account of his official position, to publish his poems and novels under assumed names or anonymously. His best epic poem, *Jan Talafús z Ostrova* (1864), sings the heroic deeds of a Bohemian warrior of the fifteenth century. His poems and novels show a thorough knowledge of the periods of Bohemian history which form their basis. The fifteenth century and the era of the family of Podiebrad are ably depicted in the novels *Pod Vyšehradem*, *Anna Městecká Boček*, etc. D. Sept. 29, 1875. J. J. KRÁL.

Janes, EDMUND STORER, D. D.: bishop of the Methodist Episcopal Church; b. in Sheffield, Mass., Apr. 27, 1807. Having received the usual common-school education, he taught school in New Jersey from 1824 till 1830; studied law, but abandoned the profession for that of the ministry. He joined the Philadelphia Conference in 1830, and occupied important pulpits in the Philadelphia and New York conferences till 1840, when he was elected financial secretary of the American Bible Society. In 1844 he was elected bishop of the Methodist Episcopal Church. He was pre-eminent for his episcopal labors and travels, and contributed much to the remarkable success of his denomination. He resided in New York. D. in New York city, Sept. 18, 1876. See his *Life*, by H. B. Ridgaway (New York, 1882).

Revised by J. F. HURST.

Janesville: city; founded in 1836; capital of Rock co., Wis. (for location of county, see map of Wisconsin, ref. 7–E); on both sides of Rock river, partly on the river plain and partly on a high bluff overlooking it; on the Chi. and N. W., and the Chi., Mil. and St. P. railways; 45 miles S. S. E. of Madison, 70 miles W. S. W. of Milwaukee. It is in an agricultural region; manufactures agricultural implements, boots and shoes, carriages, furniture, and cotton goods, and has large horse-breeding interests. It is the seat of the Wisconsin School for the Blind, and has public-school property valued at about $170,000, public library, several musical schools, and 2 daily, 5 weekly, and 2 monthly periodicals. Pop. (1880) 9,018; (1890) 10,836; (1895) 12,971.

EDITOR OF "RECORDER."

Janet, zhaa'nā': the name of a family of painters. See CLOUET.

Janet, PAUL: b. in Paris, Apr. 30, 1823; educated at the École Normale; graduated as doctor in letters in 1848; taught philosophy at Bourges and Strassburg; was appointed Professor of Logic in 1857 at the Lyceum of Louis-le-Grand, of History of Philosophy at the Sorbonne in 1864; and was chosen member of the Institute in the same year. M. Janet is a leading representative of modern French philosophy, his doctrine being a reconciliation of the official system of Cousin with that entire liberty of research demanded by the most recent scientific school of psychology. His best-known works are *Final Causes* (English transl., New York, 1876); *Theory of Morals* (English transl., New York, 1884); *Le cerveau et la pensée* (Paris, 1867); *La matérialisme contemporaine en allemagne* (Paris, 1864); *La crise philosophique* (Paris, 1865); *Études sur la dialectique dans Platon et dans Hegel* (Paris, 1861); *La philosophie contemporaine* (Paris, 1879).

Janeway, JACOB JONES, D. D.: b. in New York city, Nov. 20, 1774; graduated at Columbia College in 1794; was a minister of the second Presbyterian church in Philadelphia in 1799–1828; Professor of Theology in Western Theological Seminary, Allegheny City, Pa., 1828; pastor of first Reformed Dutch church, New Brunswick, N. J., 1839–41; vice-president of Rutgers College, New Brunswick, N. J., and Professor of Belles-lettres, Evidences of Christianity, and Political Economy 1833–39; returned to the Presbyterian

Church in 1839, and did much work in behalf of religious education. Dr. Janeway was one of the early promoters of Princeton Theological Seminary, of which he was for forty years a director. He wrote several esteemed theological works, among which are *The Apostolic Age, Exposition of the Acts and of the Epistles to the Romans and the Hebrews* (Philadelphia, 1866, 3 vols.); *Internal Evidence of the Bible*; *Unlawful Marriage* (New York, 1844); *Review of Dr. Schaff on Protestantism*; and *The Abrahamic Covenant* (1812). D. at New Brunswick, N. J., June 27, 1858. See his *Memoirs* by his son, Thomas L. Janeway (Philadelphia, 1861).

Revised by S. M. Jackson.

Janin, zhăă'năń', Jules Gabriel: critic; b. at St.-Étienne, Loire, France, Dec. 4, 1804; educated at the College of Louis-le-Grand, Paris; became a private tutor in the Quartier Latin; then turned to literature, becoming journalist, feuilletonist, editor, novelist, and critic. He first connected himself with the liberal opposition journal *Le Figaro*; later with the government paper *La Quotidienne*; and finally in 1836 with the *Journal des Débats*, in whose pages for nearly forty years he poured out a steady stream of brilliant and witty, but superficial, dramatic and literary criticism. There was little in his literary character to admire, and serious people felt greater and greater aversion for him; yet he was in his way able, and he exercised a considerable influence upon letters, at least in Paris. In 1870 he was elected to the Academy. D. June 20, 1874. Of his novels may be mentioned *La Confession*; *Barnave*; *Contes fantastiques* (new ed., 4 vols., 1863); *Contes nouveaux*; *Le chemin de traverse*; *Un cœur pour deux amours*; *Les oiseaux bleus* (1864); *L'Interne* (1869). A collection of his *critiques* appeared in 1858, with the title *Histoire de la littérature dramatique* (6 vols.). Other critical works are *La poésie et l'éloquence au temps des Césars* (2d ed. 1864); *Béranger et son temps* (1864); *Lamartine* (1869). He translated Horace into French (6th ed. 1885). After his death appeared *Œuvres choisies de Jules Janin* (12 vols., 1875–78), and his *Correspondance* (1877). See Piedagnel, *Jules Janin* (1876). A. G. Canfield.

Janina, yaa'nĕĕ-năă, or **Joannina**: town of European Turkey; capital of the eyalet of Janina, the ancient province of Epirus (see map of Turkey, ref. 4–B). It has important manufactures of morocco, leather, silk goods, and gold lace. It has greatly declined, however, since the days when it was the residence of Ali Pasha, who fell before the power of the sultan in 1822. Its strong castle and magnificent harem, built on promontories jutting out into the lake, are now in ruins. Pop. about 20,000, mostly Greeks and Jews. On the opposite shore of the Lake of Janina lay the ancient *Dodona* with its famous temple.

Jan'issaries, or **Janizaries** [plur. of *janizary*, from O. Fr. *janissaire*: Ital. *giannizzero*, from Turk. *yeñicheri*; *yeñi*, new + *asker*, soldier, army]: a corps of Ottoman foot-soldiers; first organized in 1329 by Alaeddin, brother and vizier of Sultan Orkhan, and consecrated to the service of Islam with solemn ceremonies by Sheik Hadji Beghtash. At first they were recruited solely from children of Christian parents, captured when young and brought up as Mussulmans. Deprived of family connections, forbidden to marry, allowed no other habitation than their quarters, they were always destitute of sympathy with the people; but they possessed many special privileges, were obliged to take the field only when the sultan commanded in person, and their every regulation was designed to attach them to the sovereign, of whom they were considered the special favorites and *protégés*. No more unnatural and formidable military organization ever existed. During more than two centuries the Ottoman victories were mainly due to their ferocity and courage. They were always arrogant and haughty, and their lawlessness and insubordination knew no control after the reign of Souleïman I. (1520–66), who essentially modified their constitution. They put to death more than one sultan, they deposed several, and they became cowardly and treacherous in battle. In 1826 Mahmoud II., obtaining a fetva from the Sheik-ul-islam which declared them outlaws, and displaying the sacred flag of the Prophet, staked his life on their destruction. They made desperate resistance, but 16,000 of them were killed in the streets, 7,000 were burned in their barracks, 25,000 were exiled—together with the Beghtash dervishes, their religious allies—and the corps was annihilated. The Imperial Museum of the Janissaries (El bicéi Atika) at Constantinople contains over 150 life-size figures representing the attire and appearance of this ferocious corps. The janissaries were replaced by an army organized upon European models by Mahmoud, and after his death by Abd-ul-Medjid, and the system of organization then instituted forms the basis of the present military institutions of Turkey. See Army and Turkey.

Edwin A. Grosvenor.

Jan Mayen's Land, jaan'mī'enz-länd': a volcanic island in the Arctic Ocean. It is situated between Iceland and Spitzbergen, in lat. 70° 29′ N. and lon. 7° 31′ W. Area, 159 sq. miles. Its highest mountains are Beerenberg, 6,640 feet high, and Esk, 1,500 feet high, both of which are volcanic and are occasionally active, and their slopes and valleys are largely covered with ice-fields and glaciers. In 1882–83 this island was made the Austrian station for the taking of simultaneous atmospheric and magnetic phenomena at various points around the pole by the co-operation of different governments. It was discovered in 1611 by a Dutch navigator, after whom it is named.

Janney, Samuel M.: historian and biographer; b. in Loudoun co., Va., Jan. 11, 1801. He was a preacher belonging to the Society of Friends (Hicksite) and published *The Country Schoolhouse* (poem, 1825); *Conversations on Religious Subjects* (1835); *Historical Sketch of the Christian Church* (1847); *Life of Penn* (1852); *Life of Fox* (1855); *History of the Religious Society of Friends* (1867); and other works. D. in Loudoun co., Va., Apr. 30, 1880.

Jan'sen (Dan. pron. yaan'sen), or **Jansenius**, Cornelius: founder of the sect of Jansenists; b. at Acquoi, near Leerdam, Holland, Oct. 28, 1585, of humble parentage; received a classical education at the University of Utrecht; studied Catholic theology at Louvain in Flanders; went to Paris in 1604 or 1605, where he formed a close intimacy with Jean Duvergier de Hauranne, afterward Abbot of St. Cyran, whom he accompanied to Bayonne, becoming the head of a college recently founded there. In 1617, Jansen returned to Louvain; was made principal of a college, and subsequently, in 1630, professor of scriptural interpretation. At Louvain, Jansen speedily became (1621) the chief exponent of a system of doctrine which, after his death, received the name of Jansenism (*q. v.*), and became famous in the religious annals of Christendom; but during his life he was chiefly remarkable for polemics and contests, not altogether devoid of worldly rivalry, with the Jesuits, whom he succeeded in expelling from their position as teachers of philosophy in the university. In connection with this quarrel Jansen twice went to Spain (in 1624 and 1625), where he obtained the favor of the Spanish monarch, then the sovereign of Flanders. In 1635 he published a work entitled *Mars Gallicus*, in defense of the rights of Spain against France in the then impending war; was rewarded with the bishopric of Ypres, West Flanders, now Belgium, at which place he died of the plague, May 6, 1638. The last ten years of his life were devoted to the preparation of the work by which he is best known to posterity—an exposition of the doctrine of St. Augustine upon grace, free will, and predestination—which was published at Louvain as a posthumous production in 1640 in three vols. folio under the title *Augustinus, seu Doctrina Augustini de Humanæ Naturæ Sanitate Ægritudine et Medicina, adversus Pelagianos et Massilienses*, and was reprinted at Paris (1641) and at Rouen (1643) and again in 1652.

Jansen, Olaüs: naturalist; b. in Christianstadt, Sweden, in 1714; studied in Germany, and was for several years professor at the University of Tübingen; was elected rector of the University of Copenhagen in 1761, and a member of the Academy of Sciences in 1762. He was sent by the Danish Government to South America in 1764 to collect information respecting the natural productions of that continent, and during his travels visited Central America, Louisiana, and Florida, and reached Boston in 1772. He published a number of volumes after his return to Denmark, including *Den Geist in den Naturvidenskaben og naturens almindelige laere* (Copenhagen, 1773); *Neue Reisen durch Brazil und Peru* (1775); *Neue Reisen durch Louisiana und Nueva España* (1776); *Anmarkningar ons Historia Naturalis och climated af Nye England og Nye Spanien* (2 vols., Copenhagen and Stockholm, 1778). D. at Copenhagen in 1778.

Jansenism: a heresy which consisted in denying the freedom of the will and the possibility on the part of man of resisting grace. The leaders in this heresy had also from the beginning for their object to restore ancient doctrines and discipline from which they considered that the Church of their day had lapsed. They were to do this reforming not by separating from the Church, but by remaining within her. They appealed more to tradition, especially St. Au-

gustine, than to scripture. They called themselves Catholics and rejected the name Jansenist, protesting that Jansenism was a bugbear invented by their foes to trouble consciences and calumniate pious Catholics.

The famous book of Jansen, called the *Augustinus* (see JANSEN) was the sensation of the day. In 1641 it was condemned by the Roman Inquisition, and in the following year by Urban VIII., as renewing the errors of Baius. Some Flemish bishops and the University of Louvain questioned the authenticity of the bull of Urban VIII., and resisted its publication. The Sorbonne of Paris and the King of France stood out for its authenticity and took sides with the papal authority. The Disciples of St. Augustine, as the friends of Jansen styled themselves, were numerous and strong; they had brilliant leaders, chief among them Antoine Arnauld.

In 1649 five propositions were culled from the *Augustinus* by a Jesuit, as containing the gist of the doctrine of Jansen, and were submitted to the Sorbonne for examination. The Parliament forbade that body of doctors to give judgment on the propositions and referred them to the general assembly of the French bishops. In Apr., 1651, eighty-five of the bishops voted to refer the propositions to the pope, Innocent X., begging him to pronounce judgment on them. Eleven of the bishops protested against this recurring to Rome as being against the liberties of the Gallican Church. A commission of five cardinals and thirteen theologians, specially appointed by the pope for the purpose, gave two years to the work, examined the propositions in themselves, heard the Jansenist leaders in their defense, and brought in a report unfavorable. The result was that in May, 1653, a bull of condemnation was issued. Meanwhile Jansenist writers and sympathizers, such as Jean Duvergier Hauranne, abbot of the monastery of St. Cyran, Antoine Arnauld, Singlin, Mother Angélique, Abbess of Port-Royal, were attacking in their writings and reforming in their practice the prevailing discipline of the Church as to confession, penance, and frequent communion. Some sixteen bishops of France and twenty doctors of the Sorbonne sympathized with their innovations. The condemnation of May, 1653, forced the Jansenists, if they would remain within the Church without rejecting their favorite tenets, to a harmless interpretation of the bull. Arnauld devised the following scheme: Reject the five propositions as justly condemned, but contend that they were not contained in the *Augustinus*, or if found in the book they did not bear there the sense attributed to them by the bull. This distinction of Arnauld was reprobated by the pope, Sept. 29, 1654. Notwithstanding, the scheme was kept alive and put into scientific form. There were two questions, said the Jansenists: one of law, one of fact. Whether the five propositions condemned were in truth false was a question of law. Whether they were really in the *Augustinus* in the sense in which they were condemned was a question of fact. Now the Church, they admitted, was infallible in the question of law, but not in the question of fact; and therefore as to the latter point, it was enough to receive the Church's condemnation with "respectful silence," and was not necessary to give it interior intellectual assent. The Sorbonne condemned the distinction and expelled Arnauld from its corporation. Alexander VII., Oct. 16, 1656, declared that the five propositions were condemned in the objective sense of the author of the *Augustinus*, and, moreover, imposed on all ecclesiastics the subscription of a formulary whereby they professed to accept sincerely and honestly the papal condemnation of the five propositions. This did not end the matter. Some French bishops refused to give up the distinction, which now became the badge of Jansenism, and refused to sign the formulary pure and simple. Years of strife and wordy war followed. In 1669 Clement IX., innocently believing that the recalcitrant bishops had finally given in an unqualified submission, restored them to his favor. This incident, known as the Clementine Peace, was hailed by the Jansenists as a triumph for their cause. They were mistaken, for in 1694 Rome again insisted that the original formulary should be subscribed by ecclesiastics with profession that they believed the five propositions to be condemned in the obvious sense that they bear on their face.

The whole difficulty was renewed in 1701. At that time a Jansenist consulted the Sorbonne on the lawfulness of absolving a dying priest who held that the five propositions were not to be found in the book of Jansen. Some forty doctors decided that absolution might be given. Thereupon the pope, at the request of the King of France, issued a fresh decision known as *Vineam Domini*. In it he renewed the constitutions of his predecessors against Jansenism, and insisted that "respectful silence" even as to the question of fact did not suffice, but that the condemnation must be accepted with full, undoubting interior assent.

But the heresy was by no means extinguished by all those pronouncements. Jansenistic works, notably the *Moral Reflections* of Quesnel, were having a large circulation in France in spite of papal prescriptions against the book. Information having been given to Rome that the heresy was still strong and spreading rapidly, the bull *Unigenitus* was issued (1713) condemning 101 propositions from the works of Quesnel. A few years later some French bishops gave notice that they appealed against the *Unigenitus* to a future council. These Appellants, as they were called, were supported by some minor universities, some members of the hierarchy, and the regent of the kingdom during the minority of Louis XV. When Louis came to the throne, he took sides against the Jansenistic sect and enforced the papal decisions. This action of the young king ended the existence of Jansenism as a sect in France, though scattered adherents to its doctrines may have been found even in the beginning of the nineteenth century. In Holland it remains as a schismatic church. The Archbishop of Utrecht is the head of it and rules over some twenty-five congregations. Since 1870 he has received as recruits the Old Catholics of Germany and Mr. Hyacinthe Loyson, of France.

JOHN J. KEANE.

Janson, yaan'sŭn, KRISTOFER: novelist, educator, and clergyman; b. at Bergen, Norway, May 5, 1841. He prepared himself for the ministry at the theological faculty of the University of Christiana; later joined the educational movement started by Grundtvig in Denmark, and established a "Popular High School," first in Sel, a district of Gudbrandsdalen, Norway, and afterward in Gausdal, same county. He spent a year in Italy at two different occasions, 1866–67 and 1880–81; visited the U. S. on a lecturing tour in 1879 and settled three years later as a Unitarian minister in Minneapolis, where he has gathered a congregation of his countrymen. He returned to Norway in 1893. Janson had for several years a poet's pension (*Digtergage*) from the Norwegian Storthing, and he holds a high position among Norwegian novelists. His earlier novels are all written in the so-called *Landsmaal*, a kind of standard of the several country dialects as grammatically established by Aasen. (See AASEN, IVAR ANDREAS.) Among his novels are *Fraa Bygdom* (From the Up-country Districts); *Han og Ho* (He and She); *Thorgrim*; *Marit Skjölte*; *Fraa Dansketudi* (From the Times of Danish Rule); *Den Bergtekne* (also translated into English under the title *The Spell-bound Fiddler*). In the common Dano-Norwegian language he has written *Vore Bedsteforældre* (Our Grandparents); *Paa begge Sider Havet* (On Both Sides of the Ocean); *Præriens Saga* (The Tale of the Prairie); *Sara* (1891). He has also written a collection of poetry, *Norske Dikt* (1867), and of religious songs, *Jesus Sangene* (1893), and a drama, *Jon Arason*, dealing with the tragic fate of the last Roman Catholic bishop in Iceland. He has for several years been the editor of a Unitarian periodical in the Norwegian language, *Saamanden* (The Sower), published at Minneapolis, Minn. P. GROTH.

Janssen, JOHANNES, D. D.: Roman Catholic historian; b. at Xanten, Rhenish Prussia, Apr. 10, 1829; studied at Bonn 1851–53; became Professor of History in the gymnasium at Frankfurt-on-the-Main 1854, and by his history, in six volumes, of the German people from the close of the Middle Ages to the beginning of the Thirty Years' war, 1618 (*Geschichte des deutschen Volkes seit dem Ausgang des Mittelalters*, Freiburg im Br., 1876–88), attained instant and great popularity among German Roman Catholics. His history was accepted on both sides as the Ultramontane answer to the Protestant attacks upon the Roman Church of the sixteenth century. Its learning, skill, finish, and attractiveness were unquestioned, but its fairness and impartiality were vigorously challenged. It drew aside the veil with which loyal Germans cover the pitiful condition of their country after the first flush of Luther's success was over, and showed the confusion, immorality, and wretchedness of the time and the broken-heartedness of the Protestant leaders. It ventilated most thoroughly all the scandals on the Protestant side, and utilized materials derived from the Vatican and other sources not open to Protestants. How acceptable Janssen's efforts were is proved by the record of the sales of his successive volumes—viz., vol. i., 15th ed. 1890; vol. ii., 16th ed. 1893; vol. iii., 15th ed. 1891; vol. iv., 14th ed. 1892;

KURILE ISLANDS
Scale of Miles
Longitude E. 150 from Greenwich
Paramushiru I.
Onekotan I.
Shashkotan I.
Shimushiru I.
Urup I.
Iturup I.
Kunashiri I.
SAGHALIN I.
Soya Str.
SEA OF OKHOTSK
YEZO
Kunashiri I.
Nemuro
Otaru
Poronai
Sapporo
Mororan
Hakodate
Volcano B.
Fukuyama
Matsumae
Tsugaru Str.
To Vladivostock 430 m.
Awomori
Hirosaki
Hachinohe
Kuji
Funakoshi
Morioka
Miyako
Kubota
Akita
Toh I.
Sakata
Awa I.
Sendai
Shiogama
Sendai B.
Sado
Matsushima
Niigata
Fukushima
Wajima
Naoetsu
Toyama B.
Fushiki
Toyama
Nikko
Onahama
Kanazawa
Tsuruga B.
Mayebashi
Kito
Sakai
Fuku.
HONDO
Nakanmato
Oki
Wakasa B.
Tsuruga
Kofu
TOKIO
Kashima
Fusan
Matsue
Tsushima
Broughton Chan.
Nagoya
Mt. FUJI
Yokohama
Yokosuka
To Vancouver 4550 m.
To San Francisco 4560 m.
To Honolulu 3440 m.
KIOTO
Kobé
Osaka
Hiogo
Iwo
Hirashima
Shimonoseki
Matsuyama
SHIKOKU
Kochi
Fukuoka
Nagasaki
Nagasu
Kumamoto
KIUSHIU
Sajiki
Kagoshima
Tanegashima
Yakushima
Van Diemen Str.
Krusenstern Str.
Korea Str.
Japan Sea
Pacific Ocean
Seven Isles of Izu
Hachijo I.
Oshima
Shimoda
Myake I.
Shingu
Wakayama
Iwo Shima
Tsushima
Goto Is.
Tanegashima
Fukushima I.
Linshoten Islands
Northern Group
Oshima I.
Tokunoshima I.
Chungsan or Middle Group
Okinawa I.
Naha
Shuri
EASTERN SEA
Fuh Chow
Iamsui
Kelung
Southern Group
Ishaki I.
Miyako I.
Irihmote I.
Tropic of Cancer
FORMOSA
Pescadores
Kagi
Taiwan-fu
Takow
LOOCHOO ISLANDS
FORMOSA AND LOOCHOO ISLANDS
Scale of Miles
Longitude 125 E. from Greenwich
JAPAN
Scale of Miles
Longitude E. from Greenwich

vol. v., 14th ed. 1893; vol. vi., 12th ed. 1888. A French translation of the first two volumes appeared in Paris 1887–88. He roused a cloud of apologetic pamphlets, mostly ephemeral productions, to which he replied with two, *An meine Kritiker* (1884); *Ein Zweites Wort an meine Kritiker* (1884; many editions of each). He died in Frankfurt-on-the-Main, Dec. 24, 1891. See his *Life* by Pastor (Freiburg im Breisgau, 1892). SAMUEL MACAULEY JACKSON.

Janssen, zhaăn'saăn', PIERRE JULES CÉSAR: astronomer; b. in Paris, Feb. 22, 1824; graduated in 1852 as licentiate in the mathematical sciences and in 1860 as doctor of physical sciences. In 1853 he served temporarily as professor in the Lycée Charlemagne, and from 1865 till 1871 was Professor of General Physics in the Special School of Architecture. He was placed in charge of several astronomical expeditions, and visited Peru, Italy, and the Azores during the period 1857–67. He went to India in 1868 to observe the total eclipse of the sun of that year, especially by making spectroscopic observations on the protuberances. He found that with his powerful spectroscope he could continue to follow the protuberances after the eclipse was over, a discovery which was made independently by J. N. Lockyer in England. A new field of research was thus opened. In 1875 M. Janssen was appointed director of a physical observatory at Meudon, near Paris, of which he was himself the founder and organizer. In 1892–93, after several visits to the top of Mt. Blanc, he succeeded in founding an observatory there for meteorological and physical observations.

S. NEWCOMB.

Janssens, yaan'sens, ABRAHAM: painter; b. at Antwerp about 1569. He showed marvelous aptitude for painting in early youth, but wasted his life in jealousies and rivalries with Rubens. Janssens was a great colorist. His two principal works, the *Virgin and Child* and the *Deposition from the Cross*, are to be seen in the Carmelite church at Antwerp. The *Resurrection of Lazarus*, in the elector palatine's gallery, is also remarkable. D. about 1631. W. J. S.

Janua'rius, SAINT: b. at Naples or Benevento, Apr. 21, 272; was made Bishop of Benevento about 303, and during the persecution by Diocletian was beheaded as a martyr at Pozzuoli Sept. 19, 305. Two phials filled with his blood were preserved, and the body was ultimately taken to Naples, where these relics are still shown in the Church of Santa Chiara. St. Januarius is the patron saint of Naples. On his anniversary (Sept. 19) the relics are brought out, when the blood in the phials suddenly becomes liquid and bubbles up. This is, of course, esteemed a miracle by the populace, and claimed as such by the clergy, though it has never been formally sanctioned by the Church. Much speculation has been exercised in devising scientific hypotheses to account for the phenomena in question.

January [: Germ. *Januar*: Fr. *janvier*, from Lat. *Janua'rius* (sc. *men'sis*, month), belonging to Janus. See JANUS]: the first month of the year in the Gregorian calendar; according to Roman tradition, first added to the calendar by Numa, together with February. It had originally twenty-nine days, to which two more were added by Julius Cæsar when he reformed the computation of time. It corresponded in the Greek calendar to the latter half of Poseideon and the first half of Gamelion; was known by the Scandinavians as the month of Thor, and in the French Revolutionary calendar it formed part of Nivose and Pluviose. In England, January was made the first month of the year by act of Parliament of 1751.

Janus: one of the most ancient gods of the Italic peoples, whose worship is said to have been a local cult before the founding of Rome, and to have been recognized and given a place in the Roman religion by Romulus. The various functions of Janus, as a god of all entrances, of beginnings, of war, and of springs, have been interpreted most commonly as indicating a sun-god, who at his rising opens the day and closes it again at sunset. According to this view the name is connected etymologically with Diana (the moon-goddess) and dies. There are serious difficulties, however, in the way of this explanation, and Roscher, who has most recently discussed the question, abandons it and holds that Janus was originally conceived of simply as a god of the doorway (*ianua*), and hence as a patron of all entrances, beginnings, etc., from which his other functions are then derived. He is most commonly represented, on coins and elsewhere, with two bearded faces, making but a single head, looking in opposite directions. In other representations he appears as a porter or gate-keeper, with staff and key. As a god of war he occupied a temple on the north side of the Forum, near the curia, the double doors of which were kept open in time of war and closed again in time of peace. It is significant that the doors were closed only four times from the founding of the temple by Numa to the beginning of our era. See article *Janus*, by Roscher, in Roscher's *Ausführliches Lexikon der Mythologie* (Lieferung 18, Leipzig, 1890).

G. L. HENDRICKSON.

Janvier, THOMAS ALLIBONE: author; b. at Philadelphia, Pa., July 16, 1849. He was for some years a merchant and afterward a journalist in Philadelphia, whence he removed to New York in 1887. His books, some of which are written over the pseudonym of *Ivory Black*, were suggested largely by travels in Mexico and Spain in 1881–82, 1885–87, and subsequently. They include *The Mexican Guide* (4th ed. 1889); *The Aztec Treasure-house* (1890); *Stories of Old and New Spain* (1891); and *An Embassy to Provence* (1893).—His sister, MARGARET THOMSON JANVIER, over the pseudonym of *Margaret Vandegrift*, has published much juvenile literature. H. A. BEERS.

Japan': a populous and important country of Eastern Asia, with an area of 146,640 sq. miles (exclusive of FORMOSA, *q. v.*), or about the same as the State of California. It consists of four large islands and a great number of smaller ones, stretching along the eastern seaboard of the Asiatic continent between the parallels 24° and 51° N. lat., and included within 33½° E. lon. (123° to 156½°). The Kurile islands in the north and the Loochoo (Riukiu) and Bonin islands in the south are of recent acquisition, and even the island of Yezo does not enter into the territory of Japan proper, which stretches between 30° and 41½° N. lat. and 128° and 142° E. lon., and consists of three large islands—Hondo or Honshiu (the main island), separated from the continent by the Sea of Japan; Shikoku, and Kiushiu; with Tsushima and other adjacent islands. The main island is long and narrow, and the climate of the country varies from the almost perpetual spring of the Bonin isles to the arctic winters of the north of Yezo. Japan is separated from Korea by the Korea Strait, divided by the Tsushima islands into Broughton Channel and Krusentern Strait, the former about 30 miles in width; and from Russia by the Soya or La Pérouse Strait at the north of Yezo. The southern end of Saghalien belonged to Japan until 1875, when it was ceded to Russia in exchange for the Northern Kuriles.

Name.—The native pronunciation of the Chinese name *Jih-pên* is *Nihon*, or *Nippon*, to which *Dai* (great) is usually prefixed by the Japanese when they speak of their country. In Marco Polo's transliteration of the name, *Xipangu*, the final syllable, *gu*, signifies country. The native name until 700 A. D. was *Yamato*, from the province close to Kioto where the early emperors ruled, hence the term *Yamato-Damashii*, spirit of old Japan, which to-day is used to signify the ideal of the Japanese national spirit. *O mi-kuni*, or Great August Country, and *Kami-no-kuni*, the land of the gods, are also names popular in the native literature.

Physical Features.—Though in part volcanic, Japan must be considered as a constituent outlying portion of the continent of Asia. It is a particularly mountainous country with few plains of any extent, and consists of numerous ranges of high hills, which follow as a rule the general trend of the islands from S. W. to N. E. A long chain of high mountains stretches down the center of the main island, culminating in the magnificent peak of Fuji-san* (*Fuji*, Aino *Huji*, fire-goddess), or Fujiyama (12,365 feet), really a huge cinder-heap with a crater 700 feet deep. Other peaks are Komagatake (10,384 feet), Ontake (9,850 feet), Haku-san (8,920 feet), all situated where the main island is broadest. The most considerable range of mountains is to be found to the N. W. of Fuji-san, in the provinces of Hida and Etchu. Many of the peaks of this grand range, frequently called the Japanese Alps, retain their snow-caps till early autumn; it extends almost due N. and S. for about 65 miles, and forms an almost complete barrier to communication from E. and S. Its highest peaks are Yari-ga-take (10,000 feet), Norikura (9,800 feet), Tateyama (9,500 feet), Goroku-dake (9,100 feet). Close to Nikko is a high range of mountains, of which the principal peaks are Nantai-zan (8,150 feet), Omanago (7,500 feet), and Nio-ho-zan. The highest summit of the Shinshu range is the active volcano Asama-yama (8,282 feet). Bandai-san (5,830 feet), the disastrous eruption of which in

* *San*, *zan*, in composition, mountain, usually of noted sacred mountains; *yama*, hill, mountain, the general term; *take* or *dake*, peak.

1888 attracted so much attention, is the terminal peak of a short range of hills, 80 miles to the E. of Niigata. About 160 miles farther N. rises the graceful cone of Ganju-san (5,600 feet). Still farther N., and close to Awomori, is found a similar peak, Iwaki-san (4,650 feet), known as the Tsugaru Fuji, from its similarity in shape to Fuji-san. On the west coast, between Iwaki-san and Niigata, the most striking objects in the landscape are Gwassan, Yudono-san, and the graceful cone of Cho-kai-zan, whose sides retain, even in midsummer, large patches of snow. For the mountains of Kiushiu, Shikoku, Yezo, see the articles on those islands.

Rivers.—Japan is furnished with an abundant supply of the purest water, but there is no great river system. The streams are swift, requiring a great breadth of bed for their times of overflow when the mountain snows melt. The floods are often serious and sometimes disastrous. The lower courses of many are, however, largely used for purposes of internal communication. The rivers of Japan do not necessarily bear the same name from source to mouth. The three great rivers are the Shinanogawa* entering the Sea of Japan at Niigata, the Tonegawa entering the Bay of Tokio, 10 miles E. of the capital, and the Kisogawa, which passes through the district devastated by the earthquake of 1891 and enters the Bay of Owari; all largely used for inland navigation. Farther N. the rapid Kitakamigawa enters the Bay of Sendai near Ishinomaki, and is navigable for small steamers as far as Ichinoseki. Tokio is situated on the Sumidagawa, and is supplied with water from the Tamagawa, which enters the Bay of Tokio at Kawasaki, half-way between the capital and Yokohama. Osaka lies on the north and south banks of the Yodogawa, an outlet of Lake Biwa. Perhaps the most rapid of all the rivers is the Fujikawa, which rises in Koshiu, skirts the western base of Fuji-san, and enters the Bay of Suruga. The descent of its rapids is a favorite excursion.

Lakes.—There are only two lakes of any extent. Omi or Biwa ko,† close to Kioto, which its waters reach by means of a canal, is 37 miles in length and 12 miles in breadth, and in shape resembles the Chinese guitar or *biwa*, hence the alternate name. Its bottom is supposed to be about sea-level; its own level is 280 feet higher. Near Bandai-san lies the mountain lake Inawashiro, 10 miles long and about equally broad. Situated in a sparsely populated district, it carries but few steam and other craft, while Biwa ko boasts a whole fleet of steamers. A lake much visited for its beauty is Chusenji, near Nikko, 8 miles long by 2½ miles broad, and 4,375 feet above sea-level; also the lake of Hakone (*q. v.*).

Coast-line and Harbors.—The coast is largely a succession of bold promontories, with bays between the capes. Most of these bays are shallow and bounded by alluvial plains which are watered by rivers too swift and uncertain to be much used for navigation, besides having troublesome sand-bars. Along the whole northwestern coast of the main island there is scarcely a good harbor available for commercial purposes, and the same is true of the eastern coast. Where deep inlets do exist the surrounding country is so mountainous as to bar free land transit. Exceptions are the Bay of Sendai half-way up the east coast, and that of Awomori at the extreme N. The Inland Sea, however, lying between the southwestern coast of the main island and the northern coasts of Kiushiu and Shikoku, is completely landlocked, and favors internal navigation, although the bottom is so shallow as to make navigation difficult for ocean steamers. Shikoku has one important harbor, Kochi, although this has a sand-bar; Kiushiu possesses the fine bays, among others, of Omura, Nagasaki, Shimabara, and Kagoshima, affording excellent anchorages. Yezo has two excellent harbors, Hakodate and Mororan.

Islands, Straits, etc.—The four large islands are separated by the following straits: Shimonoseki no Seto, the narrow entrance to the inland sea from the W.; Bungo Nada or channel, the entrance from the S. between Kiushiu and Shikoku; the Kii Channel between the east of Shikoku and the main island; and the Straits of Tsugaru between Yezo and the main island. The Tsushima islands are separated from Korea by Broughton Channel, and from Iki island by Krusenstern Channel. At the southern end of Kiushiu are the islands of Yakushima and Tanegashima, with Van Diemen Strait between; at the mouth of Shimabara Bay is Amakusa island; to the N. are the Goto islands; the eastern end of the inland sea is blocked by Awajima, noted for a peculiar kind of pottery; S. of Tokio are the seven isles of Izu to which criminals were banished, with the smoking cone of Oshima or Vries island at the northern end. In the Japan Sea, about 50 miles N. of the province of Idzumo, are the Oki islands; in the same sea, off Niigata, is the gold-bearing island of Sado; on the eastern coast in the Bay of Sendai lie the 888 islands known as Matsushima, and famed for the exquisite beauty of their scenery. See Formosa.

Geology.—Too much importance is usually ascribed to the volcanic character of the country. A volcanic rock formation is confined to the Kuriles, and to portions of the northern half of the main island and of Kiushiu. Primitive gneiss and schists constitute the backbone of the country. Among the Palæozoic rocks overlying these are slates and other rocks, possibly of the Cambrian or Silurian period. *Fusulina* and other limestones represent the Carboniferous rocks. Mesozoic rocks (though this has been denied by some geologists) are well represented, with slates containing ammonites of Triassic and Liassic age, beds rich in plants of Jurassic age, and others of Cretaceous age containing a variety of fossils. The Tertiary system appears round the coasts at many places in stratified volcanic tuffs rich in coal, lignite, and fossil plants and invertebrate fauna. In the alluvium covering all have been discovered traces of elephants, supposed to be the Sivalik *E. meridionalis*. Andesite is the commonest eruptive rock; porphyry, with and without quartz, and granite are largely developed. Earthquakes are frequent, but generally light and not injurious.

Coal is largely worked on the northern coast of Kiushiu (Nagasaki, Karatsu), and in Yezo (Poronai). There are extensive copper mines, several silver and gold mines, and there is a considerable production of antimony, chiefly in Shikoku, whence come the famous antimonite crystals.

Fauna.—This includes two species of deer and the sheep-faced antelope, two species of squirrel and two flying-squirrels, seven species of *mus* (the true house-mouse of Europe is absent), two species of hare, a monkey, *Macacus speciosus* (*Saru*), with a bright-red face, numerous bats, an inferior species of wolf, a small species of fox which is held in great awe, and is identified with the worship of Inari, the rice-bringer; the badger, which enters, like the monkey, into the popular folk-lore, the weasel, wild-boar, river-otter and sea-otter, and two species of bear, *Ursus japonicus* (or black bear) and *U. arctos*, var. *collaris* (confined to Yezo). The horse, introduced in the third century of our era, is small and scraggy, the domestic dog is large, wolf-headed, and currish. The cat—the type of politeness—has no tail or a mere crumpled stump. Oxen and cows were used in Central Japan for draft purposes only, but during the present era many dairies have sprung into existence. Pork has become a favorite article of diet, and pigs are commonly raised, but not privately. Sheep do not thrive on Japanese grasses; goats and donkeys are not often seen. The Japanese crow, sometimes mistaken for a raven, is a powerful scavenger-bird, everywhere present. Singing birds are comparatively rare, the most noted being the Japanese nightingale (*Cettia cantans*, T. and Schl.), or *uguisu*. Several species of cuckoo are common. Among wild birds are four species of pheasant with singularly beautiful plumage, geese, ducks, the cranes which artists are so fond of depicting, one species of stork, two ibises, herons, golden and white-tailed eagles, several species of falcons used in falconry; kites, owls, cormorants used in fishing, snipe, woodcock, an exquisitely beautiful flycatcher (*Tchitrea princeps*, T.), or *Sankocho*, one lark, thrushes, etc.; 359 species in all.

Japan is peculiarly rich in insect life. The known species of butterfly number 147, and there probably exist from fifteen to twenty times as many moths; the *Coleoptera* are also plentiful. Mosquitoes, gnats, and fleas abound; the bed-bug is absent, and the gad-fly is almost confined to Yezo. Centipedes, cicadas, and ants exist everywhere. Dragon-flies are numerous and splendidly colored. Bees are common, but not honey-bees, wasps, or hornets. The only poisonous snake is the small *mamushi*, confined to a few localities. The fish are numerous, the China and Japan Seas being the richest part of the ocean in this respect. Mackerel, flounders, soles, turbot, salmon, mullet, etc., abound. The mountain streams are full of trout; carp are kept in tanks at hotels and private houses. Different varieties of goldfish, with curious trifid or quadrifid tails, are reared in great numbers. The cuttlefish is highly esteemed as an article of diet; also crayfish and lobsters, the latter typical of prosperous old age. There are numerous oyster-beds. The giant salamander, a type elsewhere extinct, is found in Japanese rivers.

* *Kawa, gawa*, river. † *Ko*, lake.

Flora.—There is a preponderance of evergreen plants in Central Japan, the characteristic tree being the graceful *matsu*, or pine. In the Quaternary age the flora of Southern Kiushiu was essentially palæarctic, and elms, birches, chestnuts, oaks, and beeches were the common forest trees. Semi-tropical vegetation succeeded, and now even in Central Japan the bamboo and camphor-laurel are found flourishing in the valleys, with the older trees in the uplands. The cryptomeria (*sugi*) lines some of the principal roadways and furnishes a soft wood; there are other conifers. More durable timber comes from the *Chamæcyparis pisifera* (*sawara*) and *C. obtusa* (*hinoki*); also from the *Zelkowa keyaki*, or Japanese elm. The *Paulownia imperialis* (*kiri*) furnishes a light wood much in request for boxes and sandals. Gardening is largely the cultivation of shrubs. The gorgeous display of colors in gardens which is so pleasing to Western eyes does not suit Japanese taste. The most brilliant flowers are the azaleas, which are a blaze of glory during the month of April; the tree-peony which flowers about May 1; the blue and white wistaria in the first week of June; the gorgeous lotus which fills the moats and canals in August; and the chrysanthemum in November. The splendid *Lilium auratum*, with its strong perfume, is left to bloom on the hillslopes; the camellia is considered unlucky. Among blossoms the cherry holds the first place, and whole avenues of flowering trees give the country a smiling appearance in April. The plum-blossom flowers in February; the peach-blossom, flowering about the same time, is least esteemed of the three. Hydrangeas flourish on the hillsides, and abound in Yezo.

Fruits.—The fruits are disappointing. The *biwa* (loquat) comes in April, followed by strawberries, a modern importation, but now popular; the *nashi*, a kind of pear, is turnip-like and far from luscious; the apple is now cultivated with some success in the mountains and in Yezo; grapes and figs are fairly good; the best grapes are grown in the provinces of Kai and Kawachi; the stoned fruit is miserably poor; the oranges of Kiushiu are excellent; while the *kaki* (persimmon), large and luscious, must be allowed the first place; they are often dried and packed like figs. Plums and peaches are eaten unripe with salt.

Climate.—Considering the insular position of Japan, its climate is somewhat extreme. The west coast is affected by the proximity of Siberia, and its winters are so harsh that the houses are provided with continuous porticoes to afford a street passage during the snow season. On the whole, the climate is salubrious, though damp and, in the plains, enervating. Foreign children thrive in it. Northerly winds prevail in winter; southerly in summer. The yearly rainfall at Tokio is 58·33 inches, as against 24·76 at Greenwich, but the rainy days are fewer. A rainy season is supposed to begin on June 11 and to last for about a month, returning again in September, but its incidence is very irregular. The late autumn is usually dry, and the atmosphere is then beautifully clear. The best months for travel are April and May, August for the mountains, and October and November.

Soil and Productions.—The soil is not, as a rule, very fertile. There is an admirable system of field irrigation, and all the sewage of the towns and cities is used for fertilizing. Little more than one-tenth of the land is arable. The chief crops raised are rice, barley, beans, millet, wheat, buckwheat, potatoes of various kinds, radishes, tea, and tobacco.

Divisions.—The main island used formerly to be divided by the Hakone Pass, known as the barrier, into the Kwansei, or "West of the Barrier"; and Kwantō, or "East of the Barrier," terms still in use commercially. The old clan feeling still lingers, and political parties are swayed by these local attachments. There were sixty-eight large daimiates, divided into nine groups. These have all native and Chinese names, often differing entirely; e. g. *Yamato* or *Washu*, *Ise* or *Seishu*, *Owari* or *Bishu*, *Awa* or *Boshu*, *Kozuke* or *Joshu*, *Nagato* or *Choshu*, *Osumi* or *Gushu*. In other cases the Chinese form was merely a modification; e. g. *Satsuma* or *Sasshu*, *Chikuzen* or *Chikushu*, *Shinano* or *Shinshu*. See Appert's *Ancien Japon*, pt. ii., map.

Exclusive of the island of Yezo, which is known as Hokkaido, and Formosa (*q. v.*), Japan is now divided for administrative purposes into forty-six prefectures, over each of which is set a governor appointed by the central authority. First come the three city prefectures (*fu*) of Tokio (pop. 1,150,011), Kioto (pop. 882,615), and Osaka (pop. 1,216,670).

The forty-three county prefectures are called *ken*, and are as follows (the areas are given in square *ri*; 1 *ri* = 2·44 English miles, consequently a square *ri* is very nearly 6 sq. miles):

PREFECTURES.	Area in sq. ri.	Population, 1891.
MAIN ISLAND—CENTRAL:		
Tokio	52·17	1,150,011
Kanagawa	229·17	926,602
Saitama	265·84	1,088,233
Gunma	407·25	700,969
Chiba	326·45	1,205,882
Ibaraki	385·16	1,038,156
Tochigi	411·77	706,029
Miye	368·55	940,396
Aichi	312·78	1,488,582
Shidzuoka	503·82	1,108,972
Yamanashi	289·85	464,380
Shiga	258·44	685,491
Gifu	671·45	947,167
Nagano	853·76	1,157,531
Fukui	272·40	760,343
Ishikawa	270·72	773,392
Toyama	266·41	776,467
MAIN ISLAND—NORTHERN:		
Niigata	824·59	1,748,512
Miyagi	540·79	760,343
Fukushima	846·07	954,296
Iwate	899·19	682,482
Awomori	607·03	562,008
Yamagata	600·15	772,503
Akita	754·00	709,904
MAIN ISLAND—WESTERN:		
Kioto	296·55	882,615
Osaka	115·72	1,216,670
Hiogo	556·68	1,554,697
Nara	201·42	505,245
Tottori	224·16	406,503
Shimane	438·82	705,850
Okayama	420·98	1,082,708
Hiroshima	520·78	1,344,170
Yamaguchi	389·99	940,038
Wakayama	310·62	641,344
SHIKOKU:		
Tokushima	271·28	690,295
Kagawa	113·50	679,015
Ehime	341·17	939,543
Kochi	454·72	518,544
KIUSHIU:		
Nagasaki	235·15	154,600
Fukuoka	317·81	1,240,645
Oita	402·73	790,322
Saga	160·08	571,115
Kumamoto	465·47	1,064,903
Miyazaki	487·34	413,937
Kagoshima	602·31	1,019,000
Okinawa (Loo-Choo)	156·91	410,881
HOKKAIDO (YEZO)	6,095·36	314,108
Totals	24,794·36	40,718,677

Ethnology and Sociology.—The Japanese are a mixed race, and several elements are noticeable in the physiognomy of different classes. It is certain that the type is Mongoloid, and that, when they are dressed alike, it is hard to tell a Japanese from a Korean or a Chinaman. The intercourse between Japan and Korea in early times seems to have been close and constant. The Japanese call their emperor "Son of Heaven," and assert that the first of the line came to their country with 80,000 followers. The court has always worn the hair uncut, as in Korea. The shaving of the crown and wearing of a queue, the national mode of wearing the hair until 1868, may possibly be the relic of an early mark of subjection. The people of the south approach more to the Malay type, of the center to the Korean type, while N. of Tokio the common folk have broad faces and large eyes, and are altogether less Mongoloid. Two armies of invaders seem to have entered the islands, and traces of their conflicts with "hairy barbarians" still remain. Until quite modern times the extreme north of the main island was still inhabited by wild Ainos. Serfdom existed in early Japan and lasted into feudal times. One cause of the decline of the imperial power was the custom common among freeholders of handing over their land to the neighboring lord, under agreement that a rent, less in amount than the imperial taxation, should be levied. At the Restoration, in 1868, a pariah class existed, called *eta*, who performed degrading services—as executioners, garbage-haulers, etc.—but this was the only mark of caste in society. Though each rank is definitely defined, a subject may rise from one into the other, and promotion is open to the lowest. After the nobles come the *samurai* or *shizoku* class, the gentlemen-retainers of feudal times, numbering about 400,000 families, brave, spirited, quick to resent insult, and progressive. The mass of the people (*heimin*) are easy-going, indifferent, and submissive. In the country, while the family, as elsewhere, formed the original unit, the next unit was the five-householder guild, which had to act to-

gether on all questions affecting their relations with their superiors. Then followed the village community with its headman, a hereditary office until 1700 A. D., thereafter in many places elective. The trades had also their guilds for mutual action and friendly assistance, and these combinations extend to every department of life; indeed, a Japanese is scarcely ever to be treated with as an individual: he is always in a clique. Adoption, though forbidden by law if executed just before death, is so common that one seldom finds a family of brothers all bearing the same name, and a school class-list is always undergoing change from this cause. By the census of 1891 there were 3,844 nobles, 2,009,396 shizoku, and 38,705,437 heimin.

Education.—Education in Japan is nominally compulsory and certainly widespread. Even among the lowest class of laborers the ability to read and write is generally found; indeed, the people as a whole may be called a literary people, and, in the cities at least, are devoted to their daily newspapers. There is a local system of elementary, middle, and normal schools, crowned by the Imperial University in Tokio, with its five feeders or higher middle schools at Tokio, Kioto, Sendai, Kanazawa (Kaga), and Kumamoto (Kiushiu), and the Higher Normal School at Tokio. There are also agricultural, technical, and commercial colleges in the capital and the provinces, a music conservatory lately annexed to the Higher Normal School, a ladies' institute for the higher learning, and many similar institutions. There are six colleges in the Imperial University: of Law, Literature, Science, Medicine, Engineering, and Agriculture, with a teaching staff of about 100 professors, lecturers, and assistants, and over 1,000 students. A thorough knowledge of English, German, or French is required before entrance, as lectures are delivered in these languages. There are fifteen or more foreign professors, mostly German (medicine and jurisprudence) or English (science and engineering). Originally planned on U. S. models, the university has gradually been Germanized, even to the caps of the students. It is not a popular institution, being considered too expensive and a nursery for a spruce officialdom. There are numerous private schools and colleges in the capital; for instance, the Keio-Gijiku, organized by the journalist Fukuzawa, aiming at a university standing and having on its staff several professors from the U. S.; Count Okuma's College (Semmon-Gakko), and the Presbyterian and Methodist colleges. The best organized, however, of all these private enterprises is the Dōshisha in Kioto, founded by the Congregationalists of the U. S., and developing into the Western University of the empire. In the capital is found a large army of lads, perhaps numbering 100,000, attending private native schools without parental or other control—a great danger and a source of future trouble to the nation. These private schools are notorious for their lack of discipline.

Occupations of the People.—The great mass of the people are engaged in agricultural pursuits, in which the methods are somewhat primitive, the rice being planted out and reaped by hand. Numbers are also engaged in the silk and cotton industry, both in the mills that have recently been started and at handlooms. There is a large fishing population on the coasts.

Mode of Life.—Japanese houses are low wooden structures, the most solid part being the roof. The ground, if necessary, is leveled, and stones are placed at intervals to support the posts, generally 6 feet apart. The roof-structure is then laid on the posts, and the mud and wattle walls are thereafter filled in. One or more, often three, sides are left open, with a narrow veranda. On the inner edge of this veranda are grooves for the paper screens which admit the light; on the outer edge is a groove for the wooden shutters, which are closed at night or in stormy weather. Rooms are in area usually an exact multiple of 18 sq. feet, this being the size of the thick padded mats (6 feet by 3 feet) which cover the rough flooring. The rooms contain practically no furniture, except a charcoal stove, either of bronze, or of stone let into the floor, and a few cushions to squat upon. In a recess hangs a picture suitable to the season, with probably a vase below. The clogs or sandals worn outside are left behind at the entrance, and the inmates move about in cotton socks. A cupboard contains the wadded quilts which, spread out at night, form the only bed. The Japanese are early risers, and the noisy opening of the outer shutters at dawn is sure to startle a stranger. Every well-appointed house has its bath, with furnace, in which the inmates in succession parboil themselves every evening from five o'clock onward, the maid-servants coming last. Privacy is by no means considered essential. The poorer classes go out to public baths, provided at a remarkably low rate—it is their chief, almost sole, luxury, besides affording a rendezvous for gossip. Among well-to-do people the house often contains an extra room in quasi Western style, with chairs, a table, and glass windows—as comfortless as can be imagined. Everywhere the tobacco-box is ready at hand. The men and women are great smokers, using metal pipes with small bowls, into which they thrust a ball of tobacco as large as a small bean. Lighting it at the live charcoal in the tobacco-box, they take a few whiffs and then toss the ashes out.

Clothing.—The Government insists upon its employees wearing European dress during business hours, as being more business-like and associated with regular hours and prompt methods. When the official returns home this dress is mostly discarded for the loose-sleeved gown, open in front, and fastened round the waist by a girdle about 4 inches wide. The woman's dress does not differ essentially, except that the *obi*, or girdle, is much more massive, being at least 8 inches wide. These obi are her glory when she goes outside, as they descend from mother to daughter, and are often exquisite pieces of brocade or embroidery. In cold weather a woman heaps one garment over another and often goes out wearing almost her whole wardrobe. Foreign dress for women is demanded only on formal occasions at court; few Japanese women look well in it, while their own dress, though awkward for free movement, is graceful.

Diseases.—Troubles of the stomach and digestive organs are rife and fatal. Consumption is also common, but all its forms are not fatal, and what seem to foreigners astonishing recoveries are frequent. Skin diseases are prevalent, also bone diseases. The national disease is KAKKÉ (*q. v.*). Leprosy exists and is on the increase.

Food.—While rice may be termed the staple diet, there are many poor districts where the people have to live on millet or other grains. The large white radish, known as *daikon*, is pickled and used as a relish, although as repulsive to the foreign as old cheese is to the native palate. The egg-plant and cabbage, with lily, bamboo, and lotus root, and a variety of vegetables, are served in soup or as pickles. Sweet and other potatoes are also largely used. Dried seaweed is used as a basis for soup, and is also eaten in other ways. Even under the sway of Buddhism fish was allowed as an article of diet. It is served roasted or in soup, or sliced raw with ginger as a spice—a favorite dish. Eggs are also served in soup or raw, with the national sauce, soy (*shoyu*). Beans enter into most of the soups, or are boiled whole with rice, or are made into cakes. A wheaten macaroni is largely used. Barley and buckwheat are also used for cakes or vermicelli. On the whole, the food is mawkish to the foreign palate and is far from nourishing. Meals are served thrice a day, and wooden chopsticks take the place of knives and forks. Every year an increasing amount of sugar is imported for confectionery purposes. The favorite sweetmeats are compositions of rice-flour and sugar, bean-jelly, barley-sugar, prepared as a sirup in soft or hard cakes, peppermint candy, and dried ginger.

Beverages.—Among beverages tea comes first, served without sugar or milk. The Japanese do not roast the leaf, but preserve it green. Roasted barley is also used to make a drink known as *mugi-yu*. A heady liquor, *sake*, made from fermented rice, is the favorite liquor, and is generally served hot. There is also a brandy called *shochu*.

Industries, Manufactures, etc.—The silk industry, for which the climate and people are so well suited, dates back to 399 A. D., when silkworms were introduced from Korea. Up to that time hempen cloth and the bark of the paper-mulberry had been used. There is a constant increase in the manufacture of silk piece-goods, while the establishment of silk-filature factories has brought about an improvement in the quality of the manufactured article. Kioto and the districts immediately to the N. of Tokio are centers for silk-manufacture. The manufacture of cottons flourishes also in the last-named districts, of which Mayebashi is a center. Shikoku is a center for paper industry. Mines are partly in Government, partly in private hands; gold, silver, copper, iron, lead, antimony, tin, coal, sulphur, etc., are produced. The coal industry is mostly confined to Kiushu, the sulphur industry to Yezo. Tea, supposed to have been introduced from China in 805 A. D. by the Buddhist saint, Dengyo Daishi, is a universal beverage, except in the mountains, but its export is decreasing. The finest tea is grown near Kioto at Uji, and at Shidzuoka. The tobacco is a dry species, used abroad in adulterating finer qualities, because

of its capacity of absorbing moisture. The mat industry, centered at Osaka, has a promising future; lucifer matches are also largely manufactured, besides fans, baskets, and cheap bric-a-brac.

Metal-working.—Iron of a fairly good quality exists, but not so conveniently located for fuel as to be used in any quantity. Most of the iron and steel is and has been imported from abroad. The swords have a world-wide reputation for their keenness of temper, the result of the extraordinary care lavished on their forging. They are not composed of pure steel, but of steel combined with soft, elastic, magnetic iron. The most celebrated makers were Masamune, Sadamune, his pupil, and Muramasa. The swordsmith was the only artisan who was granted any social standing. Excellent steel is still made, principally for surgical instruments. The bronze work of Japan has always been admired—its fine temple bells which, being struck by a swinging beam from the outside and not by an interior tongue, emit a peculiarly soft tone; its artistic lanterns, urns, and vases. The inlaid work in the smaller *articles de vertu* is particularly fine. As the women wear no jewelry, and as household plate is unknown, there are comparatively few articles manufactured in gold or silver. The native mirror is of metal, and the back is usually decorated with figures and scenery in bas-relief. In certain mirrors this pattern on the back is reflected by the polished surface—hence the term "magic mirror." The ornamental bronze-work on sword handles and guards is particularly fine.

Porcelain and Pottery.—These industries are modern, and no artistic ware is over two centuries old. The centers are Hizen, near Nagasaki, the Old Japan of collectors; KAGA (*q. v.*) on the west coast, with its red and gold decoration; Kioto, and Owari, and Mino, with its eggshell ware. In Owari is the village of Seto, whence all Japanese ware gets its name—*setomono*. The famous crackled Satsuma was produced at its best between 1800–50. Cloisonné ware of the highest beauty is now produced at Kioto, Nagoya, and Tokio.

Pictorial Art.—Here, as in almost every other department, Japan was a borrower from China or Korea, and has no wholly indigenous art-relics to show. The first native painter of merit was Kanaoka in the ninth century, about a century after whose death the native artists, led by Kasuga Motomitsu, a court noble and painter, founded what is known as the Yamato-Tosa school. This is characterized by exquisite coloring, minuteness of detail, and fondness for court and indoor scenes. Roofs are conventionally removed, bars of clouds softening the abrupt effect, and thus an interior space is obtained. Next came the Kano school, called after its founder, the greatest name in Japanese art (b. 1424; d. 1520). This school had two styles, the first in black and white, aimed at producing effects by a few bold, sweeping strokes, and only suggested detail. The second employed coloring and did not reject minuteness of detail, being the style for screen and panel decoration, rather than for pictures proper. The scenery of this school was foreign, exaggerated, conventional, the figures grotesque. The last or naturalistic school was founded in Tokio in the second half of the eighteenth century and is known as the Shijo school, from the district where Okyo, its founder, lived. Its best-known artist is Hokusai (d. 1849). It is characterized by fidelity to nature, fondness for simple, poetic effects, and depiction of purely Japanese scenery. This is the school that is most attractive to the uninitiated foreign lover of art, though less highly esteemed by native connoisseurs. Japanese art is not in a satisfactory condition at present. Always wanting in ideality, it is apt to become petty and grotesque. Oil-painting, introduced from abroad, has not taken root; the native artists paint in water-colors on silk or paper.

Religion.—The original religion of the country is SHINTO (*q. v.*), gradually supplanted or absorbed by BUDDHISM (*q. v.*), introduced in 623 A. D. from China by way of Korea. In the ninth century Buddhism was the predominant religion, and in consequence cremation prevailed everywhere. From 703 until 1644 A. D. the emperors were cremated; since then a conservative reaction toward Shintoism has set in. In the seventeenth century the country was divided for religious purposes into parochial districts, in each of which was a parish Buddhist temple. The public and literary feeling in favor of Shintoism helped the emperor back to actual power, and Buddhism was disestablished in 1871; it remains, however, the religion of the middle and lower classes. Cremation was abolished in 1873, but for sanitary reasons allowed again in 1875. Japanese priests are largely graveyard custodians, called into requisition at funerals; the percentage of Buddhist funerals to Shinto is 7 to 3. About 22,000 native Christians in the neighborhood of Nagasaki preserved their faith on from the seventeenth century; the Greek Church has converts in the northern half of the island; Protestant missions, mostly American Presbyterians, Congregationalists, and Methodists, claim 30,000 members. The upper classes are mostly pure agnostics. Recent legislation (1893) has been depriving the priests of the custody of graveyards, and handing these over to the civil authorities. Japanese Buddhism follows what is known as *Daijo*, or the Great Vehicle (Sansk. *Mahâyâna*), a sophisticated form. Several of the Japanese sects are of Chinese origin, the Tendai, Shingon, Jodo, Zen; while the Shin, Ikko, or Monto, and the Nichiren or Hokke are of native origin, and date from the thirteenth century. The Shin sect, closely allied to the Jodo (see SHIN-SHIU), is perhaps the richest and most powerful of Japanese sects, and its temples in Kioto, Hongwanji, are the finest in the empire; it has been termed the "Protestantism of Japan." It teaches that morality is of equal importance with faith; that the believer goes immediately under the protection of Amida Buddha, and needs not therefore to be specially conducted by him to paradise; and allows marriage to its priests. Depending entirely on the voluntary contributions of its adherents, it is characterized by missionary enterprise, strives to maintain a high standard of education among its neophytes, and has founded a college on Western models in Kioto. For the tenets of the Nichiren sect, see NICHIREN. There are about 70,000 Buddhist temples in the empire, and 190,000 Shinto shrines.

Government and Administration.—There are ten portfolios of state: Foreign Affairs, Imperial Household, Home Office, Finance, War, Navy, Justice, Education, Commerce and Agricultural, Communications (post and telegraph); Department of Public Works was abolished in 1886. At the head of all is a Minister President. There is also a privy council. Parliament consists of two houses, of Peers and Representatives; in the first sit a certain number of leading men, not hereditary peers, appointed by the crown to serve. The approval of Parliament is necessary for the passing of laws; if the cabinet's budget fails to get this approval, and the budget as amended is unsatisfactory to the cabinet, the previous year's estimates come into force. Members of Parliament are paid. Assemblies were established in 1879 in the different prefectures. There are three city governments: Tokio, Kioto, Osaka. Taxation falls mostly on land, and is rated at 2½ per cent. of the market value. The liquor and tobacco duties are heavy. The estimated revenue for 1893–94 amounted to $88,045,233; expenditure, $81,133,862; debt, 324,780,000 *yen*, of which less than $5,000,000 is foreign. The currency is nominally on a gold basis, but exchanges are all in silver; the *yen* or dollar now (Jan., 1894) stands at 56 cents U. S. currency. There is a state bank, the Nippon Ginko, founded in 1886, whose paper notes, redeemable in silver, have largely taken the place of the former fiat currency; and 138 national banks, which also issue notes. The currency, though no longer fiat, is still practically entirely of paper, except subsidiary silver coins of 20 and 10 cents, 5-cent nickels, and 2, 1, and ½-cent copper coins.

Weights and Measures.—The English pound is now largely used in the cities for the Japanese *kin* (= 1·32507323 lb.). Heavier weights are estimated by the *kwamme* (16 kwamme = 100 *kin*). The Japanese lineal foot (artisans and land) = ·9942119 English feet; dry-goods foot = 1·242765 ft. For long distances, 36 *cho* = 1 *ri* = 2·44034 English miles. Measure of capacity, 10 *go* = 1 *sho* = 108·5 cubic inches, or a little more than 1¼ quarts.

Army and Navy.—The modern army, originally organized under French advice, has since 1888 followed German methods almost entirely. There is a territorial army of over 50,000 men, and a reserve of over 110,000; a gendarmerie of 1,260, and a military colony in Yezo of 1,560. The military centers are Tokio, with an Imperial Guard of 6,000, Sendai, Nagoya, Osaka, and Hiroshima. A mild universal conscription is in force.

Navy.—The largest Government dockyard is at Yokosuka, 20 miles S. of Yokohama; other stations are Kure, in the Inland Sea, Sasebo, near Nagasaki, Maizuru, on the west coast, and Mororan, in Yezo. The fleet consists of 23 seagoing steam-vessels, one an ironclad, several cruisers, and some coast-defense vessels. There are two or three fast dispatch-boats and 19 torpedo-boats. A second-class battleship of 4,160 tons was launched at Yokosuka in 1891. To

these are now (1897) being added several large ironclads, 4 battle-ships, 4 first-class cruisers, 3 second-class and 2 third-class cruisers, 3 torpedo gunboats, 23 first-class and many smaller torpedo-boats, and 11 torpedo-boat destroyers. The navy has a personnel of 120,000 men.

Internal Communications.—The great highways of Japan, the Tokaido (shore) and Nakasendo (mountain) routes between the two capitals, the Oshu-kaido or great northern road, etc., were noble and picturesque thoroughfares. Railways have now largely superseded them. A through line connects Tokio with Kioto and Hiogo, and this trunk line has nearly reached Hiroshima, and will finally extend to Shimonoseki. From Moji, in Kiushiu, a town on the opposite shore of the strait, a line proceeds as far as Kumamoto, about 137 miles distant, and is eventually to extend to Kagoshima, in the extreme south. The line N. from Tokio has reached Awomori (455 miles), the port of communication with Hakodate, on the opposite shore of the Strait of Tsugaru. Another line, proceeding by Takasaki in the cotton-weaving district, strikes through the heart of the Shinano mountains and reaches the Sea of Japan at Naoetsu, whence it will shortly be extended to Niigata. There is another line from the mines of Poronai, in Yezo (40 miles), to its seaport, Otarunai. Various local and branch lines are also in existence, and the grand total of mileages under operation amounts to 1,877, of which the government owns and operates 551 (Mar., 1893). The gauge is narrow—3 feet. The mercantile marine is growing in importance. There is a subsidized mail company, which has finely equipped Clyde-built steamers sailing to coast ports and to Shanghai; communication is shortly to be opened with Australia, Mexico, and India. The postal and telegraph system is singularly complete and efficient, with local and foreign money-order facilities and a savings-bank.

Foreign Trade.—The returns for foreign trade for the year 1892 show a total value of exports and imports amounting to $23,807,232, or almost exactly double the total of 1884, $11,971,010. Japan is yearly developing her manufactures; her import of raw cotton is eleven times as great as in 1887, her export of fabrics manufactured at home 400 times as great. The export of gold was considerable, amounting to nearly $5,000,000 U. S. currency, and the import of silver three times as great. The trade to foreign countries is distributed in the following proportions: out of a total of 238 parts, Great Britain has 83, U. S. 64½, China 28, France 31½, Germany 11, other countries 20. The following gives the percentages of exports and imports:

Exports.		Imports.	
Rice	4	Kerosene	4
Copper	5	Sugar	13
Silk (raw)	43	Cotton (yarn)	18
Silk (piece-goods)	9	Cotton (raw)	2
Tea	8	Shirtings	3
		Metals	9

Foreign trade is carried on through the five treaty-ports of Yokohama, Hiogo, Nagasaki, Niigata (nominal), Hakodate; but several extra ports have recently been opened for direct shipment, Kuchinotsu, Karatsu, Moji, etc.

Population.—The population has already been given under Divisions. Of a total of 40,718,677, 20,563,416 are males, showing a preponderance over females of nearly half a million; 14,924,788 were married. In 1891 occurred 1,086,775 births and 853,139 deaths; and the total increase in population since 1881 is 5,359,683. Only 27,000 went abroad in 1891.

History.—Up to 500 A. D. the history of the country is mythical, and it is only with the introduction of Buddhism in the sixth century that we obtain any trustworthy historical data. The Japanese, however, are fond of using the date of the Emperor Jimmu's accession, 660 B. C., as the starting-point of their history. Religion and patriotism being almost identical in Japan, it is dangerous for native scholars to interfere with the customary belief in the nation's antiquity, and thorough historical research must for long proceed warily. The mythical period of Japanese history is contained in the volume known as *Kojiki*, translated by Chamberlain. To reject the miraculous in these legends and accept the remainder as trustworthy—which Japanese scholars are wont to do—is wholly unsatisfactory. The centuries following 600 A. D. were a period of assimilation of everything Chinese. The emperors now began to abdicate, in order to spend their old age in religious duties, and to die in the odor of sanctity, a custom that tended to loosen their hold on the reins of government. The centralized system of officialdom imported from China, while making the emperor the absolute "Son of Heaven," was never congenial to the members of the Japanese dynasty, who spent their time with women and priests. For four centuries the Fujiuara family held sway, then followed the effacement of court officialdom and the rise of a military caste. For a century and a half, until the thirteenth century, the families of Taira and Minamoto struggled for the mastery. The chief warrior of the latter clan, which proved the stronger, was Yoritomo, who was in 1185 appointed *shogun* or generalissimo, an office that was not to be abolished till 1868. The center of rule now shifted eastward to Kamakura, near the modern port of Yokohama. The shoguns in their turn became puppets, their vassals, the Hojo lords, exercising sway from 1205–1333 A. D. It was at this time that the great Mongol invasion of Japan occurred, under Kublai Khan, and was successfully repulsed, the elements, as with the Spanish Armada, assisting the island defense. For sixty years, until A. D. 1392, there were two rival dynasties of emperors, the Northern dynasty, supported by the Ashikaga family, finally proving successful. The Ashikaga rule continued until 1573, and was a period of high art and culture. Toward its close, in 1542, the Portuguese entered Japan, introducing firearms and an aggressive religion. There followed a wonderful momentary success in conversion under Francis Xavier, but papal pretensions and various imprudences roused the jealous patriotism of the nation. A period of deplorable anarchy ensued, followed by the rise of three able generals and administrators, Nobunaga, his *protégé* Hideyoshi, known as the Taiko (governor), and Iyeyasu. Hideyoshi, having succeeded in restoring unity and order to the state, employed the great army he had organized in an expedition against Korea (1592–98 A. D.). No permanent hold on that country was obtained, and when Hideyoshi died in the year 1598 no one was found to carry on his ambitious schemes, which stretched even further. His work of interior centralization, however, was nobly carried out by Iyeyasu, who is universally honored as having given order and peace to his country. After quelling the turbulent territorial nobles (*Daimio*), he compelled them to live six months of the year in Yedo (Tokio), and to leave their wives and families as hostages, during the next six months. His family, the Tokugawas, became hereditary in the office, and the third Tokugawa, called Iyemitsu, perfected his predecessor's policy. It was during his rule, in 1638, that the policy of isolation was rigidly enforced, the Dutch alone, at Nagasaki, being granted certain very restricted privileges of trading, on conditions that men of higher spirit might well have rejected. Yedo, a mere village before Iyeyasu's time, grew into one of the largest cities in the world. Christianity was rooted out. This is the Japan of romance, of judicial suicide, of elaborate punctilio, of exquisite taste in lacquer, porcelain, and inlaid work. Though to all appearances asleep, as far as the outer world was concerned, Japan was nevertheless receiving the rudiments of foreign science through Dutch works, and was not altogether taken by surprise when in 1854 Commodore Perry demanded admittance. It is remarkable that the Tokugawa dynasty lasted so long as it did, a fact probably due to the personal ability of the successive holders of the shogunate. They were *de facto* rulers of Japan, obtaining in each case their investiture from the emperor, the *de jure* ruler in Kioto. It was only by the most skillful playing off of clan against clan and the preserving of the family influence that they thus continued to hold the reins of power. Their spies and agents were everywhere. In fact, the Tokugawa *régime* was the domination of the North over the South. The advent of foreigners gave the South its opportunity. By forcing the Shogun to act as if he were an independent ruler, foreigners precipitated his fall. The imperial court at Kioto hated barbarians, and was not alive to the pressing need of coming to terms with the powerful West. And now the long-dissatisfied men of the South, of Satsuma, Choshu, and Tosa, approached the court and offered to aid it against foreign aggression if the detested shogunate were abolished. The literary men of the country were also anxious to see a united Japan again in place of a dual court. The situation proved hopeless for the shogunate at Yedo, and it resigned its commission to rule; but some of its followers were less submissive, and held out in the north of the main island. Others even strove to establish a republic in Yezo. Finally the imperialists proved victorious at every point, and then turned against the court, and proved ex-

treme radicals. Two members of the Choshu clan, since become leading statesmen, Ito and Inouye, had stolen away from Japan, visited London, and returned utterly confounded by the conviction of their country's weakness. They saw that in order to be great Japan must have ships, cannon, railways, and all the appliances of this irresistible Western civilization. They convinced their clan, at the imminent risk of their lives, found an able partisan at Kioto in Prince Sanjo Saneyoshi, afterward Prime Minister and Chancellor of the empire, and finally converted even the sluggish court. "Japan strong for defense or aggression" was their watchword; it was no preference of foreign ways, or fickleness, or abstract love of learning, that incited them. Their motives were wholly political, and remain such to this day. Then followed the transference of the court to Yedo, now named Tokio, or Eastern Capital, and the complete abandonment of all the old seclusion and elegant trifling. French officers were invited to organize an army; a British naval mission organized a navy; professors from the U. S. established an education department; British and Dutch engineers attended to railways, harbors, and canals. Envoys were sent to the various foreign courts, and everything was done to give the nation a good political standing. In 1877 the ablest of the Satsuma leaders quarreled with his associates, and set on foot the Satsuma rebellion "against his imperial majesty's evil advisers"; this ended disastrously for him, but helped to exhaust the national treasury. Then followed the dispute with China over the Loochoo islands, terminated by the annexation in 1879 of that kingdom. In 1880 a penal code on Western lines was established (the civil code is still under discussion (1893) and a bone of contention). In the following year, after the lapse of nine years, a Parliament was promised to the people. In 1884 orders of nobility were created after the European fashion, rank being conferred not only on the old territorial nobility, but also on the new men of the Restoration of 1868. This was followed by the foreign fever, which lasted for about three years and found expression in balls, concerts, foreign athletics, efforts to emancipate women, etc. From this time on German influence preponderated. Mr. (now Count) Ito, in a second visit abroad, had become dissatisfied with the unsystematic and expensive administrative methods of Great Britain and the U. S., and thought he saw a better model for imitation in the powerful imperialism of Germany, with its cheap and marvelously efficient military system, its economical civil list, its arrogant court. The army, the university, the foreign office, and every department of state were affected by this new movement, and the German legation, in place of the British, became the focus of foreign influence. In 1889 the first treaty on an equal basis was concluded with Mexico. Other treaties, on a fairly equitable basis, providing for a mixed court of appeal, were ready to be signed with Germany and the U. S., but Great Britain, with a characteristic caution that was justified by the event, held back, a majority of British residents in Japan being averse to the conditions offered. Meanwhile the Japanese public had taken fright, and overturned the ministry, quashing treaty revision and deceiving the foreign governments which had assented to the treaties as drawn out in Japan. This action was accompanied by a bitter anti-foreign spirit, displaying itself in countless rudenesses and petty insults in the streets of the great cities. The U. S. and Russian ministers were publicly insulted, and it became unsafe for foreign ladies to walk unprotected in the streets. The fact became apparent that the mass of the people had not understood the enlightened policy of the able statesmen directing affairs, and had become thoroughly disgusted with foreign ways. The Parliament, convoked in 1891, displayed the same spirit of petty nationality and of desire to embarrass, at any cost, institutions on the foreign model. The spirit of antagonism to the Government proved so keen that the first Parliament was dismissed, and the second suspended for contumacy. Parliament is struggling to have the control of cabinets, while the army and navy, it is well known, would refuse to take orders from a cabinet composed of newspaper editors, lawyer-politicians, and unstable rhetoricians. Meanwhile a class of bravos has sprung up, known as *soshi*, who take upon themselves to inflict personal castigation on those who give them umbrage, and on occasion to assassinate. It is said that members of Parliament make secret use of these bullies. Since the war with CHINA regarding KOREA (*qq. v.*), Japan has entered enthusiastically upon a policy of industrial and commercial expansion which, in view of the cheapness of labor there, is not regarded with equanimity by the manufacturing and commercial nations of the West.

Imperial Family.—While the emperor can have only one consort, there are numerous recognized imperial mistresses; indeed, the present emperor himself is the son of a mistress and not of the empress dowager. The crown prince is also not the son of the empress, who is childless. In ancient times several empresses seem to have reigned in their own right, but modern legislation, probably by reason of the German imperial model so closely followed, restricts the succession to the male line. The emperor and empress have wholly departed from the traditions of seclusion that surrounded the Kioto court, hold garden-parties, attend reviews and horse-races, and visit hospitals and schools. The emperor retains the right of choosing and dismissing his cabinet, and is a constitutional monarch only in a restricted sense; he appears in public in the simple military attire of a general. The term "mikado" is obsolete in Japan.

BIBLIOGRAPHY.—Kaempfer's volumes (London, 1727) always retain their interest. A mine of information is to be found in the *Transactions* of the Asiatic Society of Japan (20 vols., London); also in the *Transactions* of the German Asiatic Society; Rein's *Japan* has been translated into English (2 vols., 1884–88), and is the best scientific compendium; *The Mikado's Empire*, by W. E. Griffis (New York, 1876), is a popular work; Murray's *Handbook for Japan*, Chamberlain and Mason, is invaluable; as also *Things Japanese*, by B. H. Chamberlain (London, 1891), and *Ancien Japon*, by Appert and Kinoshita (Tokio, 1888); F. O. Adams's *History of Japan* (2 vols., London, 1875) gives a good account of the circumstances attending the opening of the country. Other works are: *Unbeaten Tracks in Japan*, by Isabella Bird (2 vols., London, 1880); *Tales of Old Japan*, by A. B. Mitford; *Japanese Girls and Women*, by Alice M. Bacon (Boston, 1891); Mounsey's *Satsuma Rebellion*; Loti's *Madame Chrysanthème* (Paris, 1887); Conder's *Flowers of Japan*; Morse's *Japanese Homes* (Boston, 1886); Anderson's *Pictorial Art of Japan* (London, 1886); Audsley and Bowes's *Keramic Art in Japan* (London, 1876); Chamberlain's *The Classical Poetry of Japan*; Nitobe's *The Intercourse between the United States and Japan*; and *The Japan Weekly Mail*; *Advance Japan*, by Morris (1895); and *Feudal and Modern Japan*, by Knapp (1896). JAMES MAIN DIXON.

Japan Clover: popular name of a species of Lespedeza (*L. striata*), a low annual, growing to the height of little over a foot on the poorest soils. It is a native of China and Japan, was in some unknown manner introduced into the southern parts of the U. S. before 1845, and has spread with wonderful rapidity. It is readily eaten by cattle, and has become popular with stock-raisers.

Japanese Language: the language spoken in Japan. It belongs structurally to the Altaic or agglutinative family, though its position in the family and nearer relationships are yet to be determined. It is not rich in grammatical forms, being without inflections for number and gender in nouns and for number and person in verbs. The relations of case are expressed by postpositive particles answering to our prepositions. The adjective has distinct attributive, predicative, and adverbial forms, though in the colloquial the first two coincide. Besides tense and mode endings (which in the older language are clearly separable, but in the colloquial are contracted and closely united to the stem), the verb has also derivative forms for causative, desiderative, potential, passive, and negative conjugations. The Japanese numerals, except those from one to ten, accompanying Japanese nouns, have been replaced by the Chinese, —a result, no doubt, of the early introduction of the Chinese system of weights and measures. The relative pronoun is wanting, the attributive construction taking its place. A characteristic feature of the language and of the Altaic family in general is the invariable law by which the dependent precedes the governing word, an adjective or other attributive its noun, the object its verb, which must stand at the end of its clause or sentence, whereas in Chinese the verb as invariably precedes its object. This law further requires that every part of the sentence be subordinated to the final verb, which alone receives the tense ending, giving it a conclusive force. The subordinate verbs are put in the indefinite or the gerundial form, and the sense is thereby suspended until the final verb is reached. With the instinct of the language to include as much as possible in one complex proposition, the normal Japanese sentence is both long and involved. The force and directness of the language is

further weakened by the excessive use of honorific forms which the laws of politeness make obligatory when the person addressed or spoken of is of equal or higher rank than the speaker. These distinctions are marked not only by the varying degrees of respect conveyed by the terms which do duty for pronouns, but also by the use of certain auxiliaries, two or three of which are often appended one after the other to the same verb. Phonetically the language is euphonious, abounding in vowels and open syllables, and having no harsh combinations of consonants. There are some dialectic differences in the remoter provinces, but they are not strongly marked. The written form of the language, curiously interwoven as it is with the use of Chinese characters, is far from simple. In the oldest monuments of the language Chinese characters are used, sometimes ideographically to give the meaning of the Japanese word, sometimes phonetically to represent its sound, syllable by syllable, just as foreign proper names are still written. The former use is styled *mana*, real name, the latter *kana* = *kari-na*, borrowed name (signifying that only the sound and not the meaning of the Chinese character is taken). This latter idea is more fully developed in the syllabary now in use, the origin of which is assigned to the ninth century. It consists of two sets of characters, identical in value, the one called *katakana*, forty-eight in number and fashioned out of Chinese characters of the square or book pattern, the other *hiragana*, made from cursive Chinese characters more or less abridged and more numerous than the *katakana*, since each syllable has several variants. Japanese books are, however, seldom printed entirely in *kana*, but usually in Chinese and *kana* mixed in varying proportions. This is partly a matter of necessity, since the Chinese words which in the ordinary Japanese style form so large a part of the vocabulary, would be unintelligible if written in *kana*, and partly a matter of custom, whether arising from convenience or affectation, which leads the author to represent by Chinese ideographs the leading Japanese words also, merely adding in *kana* the terminations and particles which show grammatical relation.

Literature.—Aston, *Grammar of the Japanese Written Language* (2d ed. 1877); Chamberlain, *Handbook of Colloquial Japanese* (1888); Hepburn, *Japanese-English and English-Japanese Dictionary* (4th ed. 1888); Gubbins, *Dictionary of Chinese-Japanese Words* (1889); Lange, *Lehrbuch der japanischen Umgangssprache* (1890).

Addison Van Name.

Japanese Literature: the written or printed expression of the thought of the Japanese. This is extensive and varied enough to furnish a faithful mirror of the life and character of the people, and so must always have value, even though its comparative rank may not be high. The written language has diverged widely from the spoken and the various literary styles also from each other, a result partly of a long period of growth in separate lines, but especially of the disturbing influence of the Chinese language. Introduced in the sixth century, Chinese has been, what Latin was in Europe, the learned tongue. No small part of the literature of Japan is written in Chinese, and another considerable part has been strongly colored by it in vocabulary and style. Before the tenth century little besides poetry and Shinto rituals seems to have been written in the native tongue; Chinese was the medium of all else. From the tenth to the thirteenth century was the classical age both of Japanese prose and poetry. Literature did not thrive during the next three centuries, a period of constant wars, but under the peaceful rule of the Tokugawa dynasty, 1603–1868, Chinese studies especially flourished. During the eighteenth century, under the lead of Mabuchi and his pupil Motoori, a reaction was inaugurated in favor of a pure Japanese style, and with great success so far as their own branches of study, chiefly antiquarian, were concerned. But a purely native vocabulary has proved unequal to the needs of modern Japanese life, and the movement seems to have spent its force. The oldest monument of Japanese literature is the *Kojiki*, an account of Japan, chiefly mythology and legend, to A. D. 628 (translated by Chamberlain in *Transactions* of the Asiatic Society of Japan, vol. x., 1883). This work, written A. D. 712, contains songs of still older date, written phonetically by Chinese characters, and the same method is employed here and there to help out the imperfect Chinese of the prose part. Motoori's famous commentary, the *Kojikiden*, contains a conjectural restoration of an original Japanese text. Another chronicle, the *Nihongi*, written in 720, covers much the same ground, but both the language and the tone of the work have been recast on Chinese models. Among the many later histories two are especially worthy of mention, the *Dai-Nihonshi* in 243 books, prepared in the seventeenth century under the direction of the second Lord of Mito, and the *Nihon-Gwaishi*, 1827, by Rai Sanyo, both written in classical Chinese.

Japanese poetry is mostly of a simple lyric character, breathing a dreamy sentiment enlivened not unfrequently by plays upon words. In the *no* or lyric drama the verse often pivots on a word of double meaning, one of which meanings forms the logical conclusion of the first clause, the other the logical beginning of the second. Such rhythm as it possesses is derived from the alternation of short lines, the most common form of verse consisting of 31 syllables divided into lines of 5, 7, 5, 7, 7. No part of the literature has remained so free from Chinese influence, which has affected the vocabulary of modern poetry but slightly, the earlier not at all. The oldest songs, next to those contained in the *Kojiki* and *Nihongi*, are found in the *Manyoshū* (Collection of Myriad Leaves), completed in the ninth century, though in part of much earlier date. The *Kokinshū*, the first two books of which are translated in Lange's *Altjapanische Frühlingslieder* (1886), belongs to the tenth century. Of the collections which followed, the *Hiakuninshū*, 1235, a hundred poems by a hundred writers, is the most celebrated (translated by Dickins, *Japanese Odes*, 1866).

Of the *Monogatari*, or classical romances, the ancestors of the modern Japanese novel, the most famous is the *Genji-monogatari*, written in 1004 by the poetess Murasaki, not the only woman who has gained a name in Japanese literature. Of modern novelists the most popular and also the most prolific is Bakin (1768–1848). Japan is a paradise of folklore and stories for children, charming specimens of which will be found in Mitford's *Tales of Old Japan* (1871). Passing over other departments of literature and divisions of style, the so-called Sinico-Japanese, which since the revolution of 1868 has become the popular language of the newspapers and of political writers, deserves notice. It is fashioned on the method long in use of the literal reading of the Chinese classics into Japanese, merely transposing the words into the Japanese order, and supplying particles to mark grammatical relations, and consequently it abounds in Chinese idioms. The multitude of new terms which the contact with Western civilization has made necessary have been supplied from the Chinese, just as we go to Latin and Greek for our scientific terminology. New Chinese compounds, of two, three, and four characters, make up the chief part of the vocabulary. This language though expressive to the eye is unintelligible to the ear, on account of the great number of homophonous words. More than fifty Chinese characters in current use in Japan are pronounced *sō*, and more than one hundred *shō*. (See Gubbins's *Dictionary*.) In 1885 a society was formed and a journal established to advocate the use of the Roman alphabet. If the vocabulary were wholly or mainly Japanese, there could be no question of the wisdom or of the ultimate success of the movement. It could only succeed, however, by the exclusion of a great part of the Chinese element, and of this there seems to be little probability; at least the society has abandoned its journal. The Government statistics show the literary activity which the ferment of new ideas and the introduction of the printing-press and movable type have combined to produce. The number of volumes published in 1892 was 20,647, of which number 7,334 were original works, 12,878 compilations, 173 translations, 262 reprints. To these should be added 792 periodicals, of which 228 were political newspapers. The average Japanese volume, it should be remarked, is of small size.

Addison Van Name.

Japanning [deriv. of *Japan*, because introduced from Japan]: varnishing with any of the peculiar hard varnishes called *japan*, *japan varnish*, *black japan*, *japan lacquer*, *japan black*, *Brunswick black*. The name *japanning* is given to the art, to the trade, and to the finished work. Although the term comes from the attempted or supposed imitation of Japanese lacquer (see Lacquer), the work and its processes are wholly different from any which have originated in Japan. The most common and most useful variety of japanning is *black japan*, which gives a hard, lustrous, opaque, black finish, applied commonly to metal-work, such as trays, coffee-mills, canisters, and the like. The chief ingredient of this is asphaltum, but different makers use different mixtures.

Russell Sturgis.

Ja'pheth [Heb. יֶפֶת, *Ye'pheth*, widespreading or fair]: one of the three sons of Noah, mentioned last in order, but held by critics (see Gen. x. 21) to have been the eldest—one of the eight persons preserved in the ark, and the progenitor to whom is ascribed (Gen. x.) the peopling of the northern portion of Asia Minor, and perhaps Thrace. Most of the nations of Europe are usually deduced from Japheth, who is supposed to be identical with the Greek Iapetus, the father of Prometheus. The only specific act of Japheth recorded in the Bible is one of filial piety to his father when drunken (Gen. ix. 20–27), which obtained for him the prophecy, "God shall enlarge Japheth, and he shall dwell in the tents of Shem; and Canaan shall be his servant." Japheth seems to have been born 100 years before the Flood (Gen. v. 32); the length of his life is not mentioned, but his brother Shem lived 502 years after the Flood (Gen. xi. 11), which may be conjectured to have been the average period allotted to the sons of Noah. It is noticeable that the Greek mythology makes Iapetus the ancestor of the human race. Nothing is known as to the locality inhabited by Japheth after the Flood, but genealogical reasons would favor the immediate vicinity of Mt. Ararat.

Japurá, *zhaă-poo-raa'* (also written YAPURÁ, HYAPURÁ, and incorrectly JUPURÁ): the name given by Brazilians to a northern affluent of the Amazon, known in its upper course in Colombia as the Caqueta. It is the first great Amazonian affluent above the Negro. Rising in the Andes, not far from Popayan, it takes a general E. S. E. course through the Colombian department of Cauca and the Brazilian state of Amazonas, and finds its way to the Amazon through a network of channels which stretches over 200 miles. Most of these channels carry water from the Amazon to the Japurá, the united flood being discharged into the main river farther down. The total length of the Japurá is probably not far from 1,500 miles, and river steamers can ascend to the Cupaty Fall, about 620 miles. Above the fall there is another navigable space of several hundred miles. It appears that the channel of the upper Japurá is cut through a table-land, but it is very imperfectly known. The river everywhere is lined with luxuriant forest, and the banks are inhabited only by Indians and transient rubber or sarsaparilla gatherers. From the Cupaty Fall downward the channel has been surveyed by Brazilian engineers. See Spix and Martius, *Reise in Brasilien*, vol. iii., p. 1197, *et seq.* (1831); Silva Coutinho, *Exploração do Rio Hyapurá*, in *Relatorio do Ministro da Agricultura* (Rio de Janeiro, 1865); *Carta Hydrographica do Rio Japurá* (1871).
HERBERT H. SMITH.

Jaraes: See CHARAES.

Jardine, ROBERT, Sc. D.: clergyman; b. in Augusta, Ontario, Canada, June 19, 1840; graduated at the Queen's University, Kingston, in 1860, and at Edinburgh University in 1867. He was Professor of Rhetoric and Philosophy in the University of New Brunswick 1867–69; in 1869 was appointed principal of the Presbyterian institute at Bombay, and after a year removed to Calcutta, to take charge of a similar institution there, of which he had charge for six years; he was examiner for degrees in the University of Calcutta; in 1877 lectured on Comparative Theology in the Scottish universities, and two years later returned to Canada. He was pastor of St. Andrew's church, Chatham, New Brunswick, 1879–81, then was called to St. John's church, Brockville, Ontario; was pastor of the Presbyterian church at Prince Albert, Manitoba, 1886–89; edited *The Saskatchewan* newspaper 1889–92; in 1892 was appointed principal of the Prince Albert high school. Among his works are *The Elements of Psychology and Cognition* (London, 1874); *What to Believe* (Calcutta, 1876).
NEIL MACDONALD.

Jardine, Sir WILLIAM: ornithologist; b. at Applegarth, Dumfriesshire, Scotland, Feb. 23, 1800; succeeded to the baronetcy in 1821; gave his attention chiefly to ornithology, though a voluminous writer upon all the vertebrate animals. He edited White's *Natural History of Selborne* three times; established the *Magazine of Zoölogy and Botany*; assisted in conducting the *Annals of Natural History* and the *Philosophical Journal*, besides publishing a *Calendar of Ornithology* (1849). D. Nov. 21, 1874.

Jargoon: See ZIRCON.

Jarnac, *zhaăr'năăk'*: town; in the department of Charente, France; 16 miles N.W. from Angoulême (see map of France, ref. 6–D). It has a suspension bridge, and an active trade in wine and brandy. A battle was fought here Mar. 13, 1569, between the Huguenots under the Prince of Condé and the Roman Catholics under the Duke of Anjou, afterward Henry III., in which the former were defeated and Condé lost his life. Pop. (1891) 4,482.

Jarochowski, *yar-okh-ov'ski*, KAZIMIR: historian; b. Sept. 12, 1829, at M. Sokolniki, Poland, of a noble family; was educated at Posen and Berlin; took part in the revolt of the Poles of Posen in 1848, and became a Prussian judge there in 1862, but resigned in 1882. His historical works deal chiefly with the period of Saxon rulers in Poland. They are *Teka Gab. J. Podolskiego* (Posen, 1856–61); *Wielkopolska w czasie pierwszej wojny szwedzkiej* (Great Poland at the Time of the first Swedish War, 1864); *Dzieje panowania Augusta II.* (History of the Reign of Augustus II., 2 vols., 1856–74); *Koniec Radziejowskiego* (The End of Radziejowski, 1879); *Literatura Poznańska* (The Literature of Posen, Cracow, 1880, under the pseudonym of *Severin Przerowa*). His smaller historical works will be found collected in his *Opowiadania i studia historyczne* (Historical Essays and Studies, 1860, *et seq.*), and the *Nowe opowiadania* (New Essays).
J. J. KRÁL.

Jaroslav: See YAROSLAV.

Jar'row, or **Yarrow**: town; in the county of Durham, England, on the Tyne; 7 miles E. of Newcastle (see map of England, ref. 3–H). It has extensive ship-building-yards, foundries, blast-furnaces, and marine-engine works, manufactures of chemicals and paper, and, in the neighborhood, large collieries. The Venerable Bede was born in Jarrow, and was buried in St. Paul's church. Pop. (1891) 33,682.

Jar'ves, JAMES JACKSON: art amateur and writer; b. in Boston, Mass., Aug. 20, 1818. He traveled extensively, visiting California, Mexico, and Central America, and resided for some years at Honolulu. In 1848 he was sent as Hawaiian special commissioner to Washington, London, and Paris to negotiate commercial treaties. He remained in Europe, residing chiefly in Paris and Florence, and later in Rome, studying art and forming the gallery of old masters illustrating the history of Italian art, which subsequently became the property of Yale College. The King of Italy made him a chevalier of the Crown of Italy for his services to Italian art. Mr. Jarves wrote several books: *A History of the Hawaiian Islands*; *Scenes and Scenery in the Sandwich Islands and Central America* (1843–44); *Parisian Sights and French Principles* (2 series, 1855–56); *Italian Sights and Papal Principles*; *Confessions of an Inquirer*; *Kiana*, a novel (1857); *Art Hints*; *Art Studies*; *The Art Idea*; *Art Thoughts*; *The Art of Japan*: *Italian Rambles*. D. in Tarasp, Switzerland, June 28, 1888.
Revised by RUSSELL STURGIS.

Jar'vis, or **Jervis**, **Island**: one of the Sporades islands; in the Pacific Ocean, 250 miles S. W. of Christmas island; lat. 0° 22′ S., lon. 159° 55′ W.; claimed by Great Britain; area about 1½ sq. miles. It is a coral island, but the lagoon is dried up and contains guano.

Jarvis, ABRAHAM, D. D.: bishop; b. at Norwalk, Conn., May 5, 1739; graduated at Yale College in 1761; was ordained deacon and priest in the Protestant Episcopal Church in London in 1764, and in that year he became rector of Christ church, Middletown. In 1797 he was consecrated Bishop of Connecticut to succeed the apostolic Seabury, and took up his residence (1803) at New Haven, where he died May 3, 1813.
Revised by W. S. PERRY.

Jarvis, EDWARD, A. B., A. M., M. D.: physician and author; b. at Concord, Mass., Jan. 9, 1803; graduated in 1826 from Harvard University, and from the medical college of the same institution in 1830; practiced in Northfield and Concord, Mass., Louisville, Ky., and Dorchester, Mass.; devoted himself to the study of vital statistics, the laws of life and health, insanity, etc. His principal writings are *Physiology and Health*; *Elementary Physiology*, *Report on the Number and Condition of the Insane and Idiots of Massachusetts*; *Report on the Mortality of the United States in the Census of 1870*; besides essays in journals and magazines, among which many attracted great attention, such as *The Increase of Human Life*, *Infant Mortality*, *Effect of Misdirected Education in the Production of Insanity*, *Political Economy of Health*. In 1852 Dr. Jarvis became president of the American Statistical Association. D. at Dorchester, Mass., Oct. 31, 1884.

Jarvis, SAMUEL FARMER, D. D., LL. D.: clergyman; son of Bishop Abraham Jarvis; b. at Middletown, Conn., Jan. 20, 1786. He graduated at Yale College in 1805; was or-

dained to the ministry in 1810; was Professor of Biblical Criticism (1819) in the General Theological Seminary, New York city; was rector of St. Paul's, Boston, 1820–26, when he went to Europe. He remained abroad nine years, six of which were spent in Italy. Returning to America in 1835, Dr. Jarvis became Professor of Oriental Literature in Trinity College at Hartford, but resigned in 1837 to become rector of Christ church, Middletown, Conn., and so remained till 1842, and in 1838 was appointed historiographer to the American Episcopal Church. In this capacity he published in 1844 in London a *Chronological Introduction to the History of the Church . . . and an Original Harmony of the Four Gospels.* Other works were *A Discourse on the Religion of the Indian Tribes of North America* (New York, 1820); *Sermons on Prophecy* (1843); *No Union with Rome* (Hartford, Conn., 1843); and *The Church of the Redeemed* (New York, 1845; Boston, 1850). Several of these works were republished in England. D. at Middletown, Mar. 26, 1851. Revised by W. S. PERRY.

Ja'sher, Book of [transl. of Heb. *Sepher Hayashar*, Book of the Just]: a Hebrew work twice cited in the Old Testament (Josh. x. 13 and 2 Sam. i. 18), but no longer extant. The former citation is the well known apostrophe of Joshua to the sun and moon, the latter the beautiful elegy of David upon Saul and Jonathan. The nature and contents of the book of Jasher have been a frequent topic for the ingenuity of biblical commentators. Gesenius conjectured that it was a poetical anthology formed or completed in the time of David or Solomon, and containing the favorite national songs, especially those commemorating the exploits of renowned heroes. The Hebrew name, *Sepher Hayashar*, is interpreted to mean "Book of the Just." Many forgeries have been produced purporting to be the lost book of Jasher, the most notable of which was one brought out in Hebrew in Italy and Poland, and also in German, during the seventeenth century, and was published in English by M. M. Noah (New York, 1840). It contained the fabulous history of the Hexateuch, and probably was written by a Spanish Jew in the twelfth century. Another still more palpable forgery was that of Jacob Ilive, a printer and type-founder in Bristol, who wrote, printed, and in 1751 published, *The Book of Jasher, translated into English from the Hebrew by Alcuin of Britain, who went on a Pilgrimage into the Holy Land.* Though the fraud was completely exposed by Horne, the book was republished in 1829, and again in 1833. Dr. J. W. Donaldson, an eminent English classical scholar, made an elaborate attempt to reconstruct the book of Jasher from the Pentateuch (*Jashar, Fragmenta Archetypa Carminum Hebraicorum*, etc., 1854), but his results were received with general incredulity. See an essay on Jasher in E. Deutsch's *Remains* (1874).

Jasmin, JACQUES (in Provençal, JACQUOU JANSEMIN): modern Provençal poet; b. at Agen, Mar. 6, 1798; d. there Oct. 4, 1864. The son of a poor tailor, he entered a seminary for the priesthood in 1810, but was later expelled for some misconduct. Apprenticed to a barber, at eighteen he married and established himself as a hairdresser. He liked to compose verses in the dialect of Agen, however, and soon these attracted attention. Before long he was famous, and received many honors. For many years he did not abandon his craft, taking a naïve delight in his successes, but having no desire to forget his own past. His first published work was *Lou Chaliberi* (Charivary), a kind of mock heroic (1825). During the ensuing ten years he wrote many songs, odes, and patriotic pieces, which in 1835 he collected in a volume called *Las papillotos* (curl-papers) *de Jasmin*, a title he gave also to his succeeding collections (1843, 1851, 1853). In 1835 he wrote his poem *Lou tres de Mai*, on the occasion of the unveiling of a monument to Henri IV. at Nérac. In 1836 appeared perhaps the most famous of his longer poems, *L'Abuglo de Castel-Cuillé* (transl. by Longfellow as the *Blind Girl of Castel Cuillé*). In 1847 he published *Lous dous frays-bessous*; in 1840, *Françounetto.* In 1852 the French Academy gave him an extraordinary prize of 5,000 francs. To his example and success, perhaps more than to any one other cause, is due the extraordinary revival of poetry in the dialect of Southern France in the nineteenth century. (See PROVENÇAL LITERATURE.) See Rabain, *Jasmin, sa vie et ses œuvres* (Limoges, 1867); Montrond, *Jasmin, poète d'Agen, Étude biographique et littéraire* (2d ed. Lille, 1875). A. R. MARSH.

Jas'mine, or **Jessamine** [*jasmine* is from O. Fr. *jasmin*, from Arab. *yesmîn*, from Pers. *yâsmîn*, jasmine; *jessamine* is from O. Fr. *jessemine*, from Pers. *yasamîn*]: the common English name for species of *Jasminum*, a genus of erect or climbing shrubby plants belonging to the natural order *Oleaceæ*, with regular gamopetalous flowers distinguished by having stamens fewer than the lobes of the corolla. The common species are the white jasmine or jessamine (*J. officinale*) and the yellow jasmine (*J. odoratissimum*), and in conservatories an Indian species (*J. sambac*), which exhales a powerful fragrance at evening. The first grows to the height of 12, or even 20, feet, and produces its wonderfully fragrant flowers continuously from June to October. It is said to be a native of India, but is now thoroughly acclimatized in Southern and Central Europe. One of the most remarkable varieties is the Spanish or Catalonian jasmine (*J. grandiflorum*). The flowers are larger, of a reddish hue, and still more odoriferous. It grows wild on the island of Tobago, but is cultivated with great care in Northern Spain and Southern France, especially at Cannes and Grasse, where the aroma is extracted by a process called *enfleurage*. It blooms from July to October. An acre of land will yield about 500 lb. of blossoms, and the extract produced is worth from $120 to $150. The process of *enfleurage* is a simple absorption of the aroma by some fatty body, either purified lard or olive oil. In Tunis and Algeria an essential oil is distilled from jasmine, but its high price prevents its being used to any extent. The East Indian oil of jasmine is a compound largely mixed with sandalwood oil. Another variety is largely used in China for scenting tea. In Catalonia and Turkey the wood is made into pipe-stems, which are highly prized by the natives. The name cape jasmine is popularly applied to a species of *Gardenia*, family *Cinchonaceæ*. The so-called yellow jasmine of the U. S. is a twining plant (*Gelsemium sempervirens*, family *Loganiaceæ*), growing in rich damp soil in the coast districts from Virginia to Florida and Texas. It is a beautiful plant, with large, deep-yellow, sweet-smelling flowers, and climbs trees in the Southern forests. The root is used in medicine under the name *gelsemium*, and contains as its active principle an alkaloid, *gelsemia.* It is a nerve-poison, causing motor and sensory paralysis, and may be fatal in overdose through paralysis of respiration. Revised by CHARLES E. BESSEY.

Ja'son [= Lat. = Gr. Ἰάσων, liter., Healer, deriv. of ἰάεσθαι, heal; cf Ἰασώ, goddess of healing]: in Greek mythology, son of Æson and Alcimede. His grandfather Cretheus, the brother of Athamas, whose son Phrixus was borne away to Colchis by the ram with the golden fleece, was King of Iolcus in Thessaly, and transmitted the kingdom to his son Æson, but Pelias, the younger brother of Æson, seized the kingdom and banished Æson. In this way it came about that Æson's son, Jason, was brought up in the country. An oracle had instructed Pelias to beware of the man who should come to him wearing only one sandal. When Jason, grown to manhood, returned to Iolcus to demand back his kingdom he appeared before the horrified Pelias with but one sandal, having lost the other on the way. Pelias, who told Jason of the oracle, asked him what he would do to one who threatened to slay him. Jason innocently answered that he would send him to recover the golden fleece. Pelias took him at his word, and promised to surrender the kingdom in exchange for the fleece. With the help of Athene, Jason built the ship Argo, and with his companions (see ARGONAUTÆ) arrived, after various adventures, in Asia. Æetes, the King of Colchis, agreed to surrender the golden fleece only on the hardest conditions. Jason must yoke together the fire-breathing cattle of Hephæstus, plow therewith 4 acres of ground, sow therein the dragon's teeth given to Æetes by Athene, and slay the armed men that should spring from the ground. By the help of the sorcery of MEDEA (*q. v.*), the daughter of Æetes, Jason complied with all the demands of the king, who, however, refused to keep his promise and determined to burn the Argo by night. Medea warned Jason, whom she loved, drugged the dragon that guarded the fleece, enabling the hero to bear it away, and then fled with him. During the voyage they came to Iolcus, where Medea compassed the death of Pelias, and Jason ascended the throne, only to be driven out later by Acastus, the son of Pelias. The guilty couple went to Corinth, where they lived happily for ten years. Jason then tired of Medea and married Creüsa, daughter of Creon, King of Corinth, but Medea avenged herself by sending a poisoned mantle to Creüsa, which caused her death, and by slaying her own children. Jason finally took his own life. The story of Jason is usually classed among the solar myths. It was utilized fre-

quently by the painters of vases. See Gröger, *De Argonautarum fabularum historia quæstiones selectæ* (Breslau, 1889); Mayer, *De Euripidis mythopœia capite duo* (Berlin, 1883); Kennerknecht, *Zur Argonautensage* (Bamberg, 1888).

J. R. S. STERRETT.

Jason: a tyrant of Pheræ in Thessaly; probably the son of Lycophron; came into power about B. C. 395, and undertook to reduce all Thessaly under his dominion. In B. C. 375 he had succeeded in conquering all the cities except Pharsalus, which was supported by Sparta. Soon afterward he was chosen dictator of Thessaly, took a prominent part in the wars between the states of Greece, and would probably have anticipated the career of Philip of Macedon had he not been assassinated, B. C. 370. J. R. S. STERRETT.

Jasper [from O. Fr. *jaspre, jaspe* < Lat. *jas'pis, jaspidis* = Gr. *ἴασπις, ἰάσπιδος*, from Arab. *yasb*, jasper]: a general name for the opaque non-crystalline varieties of quartz or SILICA (*q. v.*), the translucent to semi-transparent varieties being called CHALCEDONY (*q. v.*). It is somewhat abundant, forming veins and even rock-masses, and often occurring as rolled pebbles. It is opaque, and more or less impure from the presence of oxides of iron, which impart to it a variety of colors, often mingled in spots, clouds, or stripes. From these, and its hardness, and the fine polish which it takes, jasper has long been a favorite stone for ornamental purposes of almost every kind. Red and green are the finest colors; it is also frequently brown, yellow, and black, occasionally white, pink, or bluish. Among the principal varieties are basanite, touchstone, or Lydian-stone, a velvety-black jasper, used by jewelers and goldsmiths as a test for the purity of gold and its alloys, by the color of the streak left on the stone by rubbing the metal upon it, and noting the action of nitric acid on the gold rubbed on it; bloodstone, or heliotrope, a fine dark-green jasper with spots or streaks of bright red, like small drops of blood, the variety now most prized; ribbon jasper, in bands or stripes of different colors; Egyptian jasper, of mixed yellow and brown. Porcellanite, or porcelain jasper, is an impure variety never used in the arts. The largest mines of jasper are in the upper Ural Mountains and in Siberia, especially the Kalkan Mountains, where it is quarried in enormous blocks. These blocks are cut at the imperial lapidary-works at Peterhoff and Ekaterinburg. It took twenty-five years to cut a single vase now at the Winter palace in St. Petersburg. Jasper was highly prized by the ancients, and is frequently alluded to in the Scriptures; but as it is spoken of as clear, evidently some other stone was meant, doubtless rock-crystal. Probably the name was used for various substances which can not now be readily identified; this is largely the case with ancient names of precious stones. Jasperized wood is wood that has been naturally replaced by deposits of silica colored by metallic oxides, while retaining the ligneous structure and form. It is an elegant ornamental stone, and occurs in the U. S. at various localities W. of the Rocky Mountains, notably in Arizona and New Mexico. GEORGE F. KUNZ.

Jasper: town; capital of Dubois co., Ind. (for location of county, see map of Indiana, ref. 10–C); on the Patoka river, and the Louisv., Evansv. and St. L. Railroad; 55 miles N. E. of Evansville, 70 miles W. by N. of Louisville, Ky. It is in an agricultural region; has large block-coal, iron, and flint interests, and manufactures office-desks, flour, carriages, and wagons, agricultural implements, and worked lumber. There is considerable trade in coal, lumber, and tobacco. The town contains a college under the direction of the order of St. Benedict, an establishment and schools of the Sisters of Providence, public and parochial schools, and a weekly newspaper. Pop. (1880) 1,040; (1890) 1,281. EDITOR OF "COURIER."

Jasper, WILLIAM: soldier; b. in South Carolina about 1750; enlisted in the Second South Carolina Regiment at the beginning of the Revolutionary war; became a sergeant, and distinguished himself in the defense of Fort Moultrie against the British fleet, June 28, 1776, by leaping through an embrasure under a galling cannonade to recover the flag of the State. In recognition of this act of heroism Gov. Rutledge gave Serg. Jasper his own sword, offered him a commission as lieutenant, which he declined, and employed him thereafter upon outpost and picket duty, in which he frequently distinguished himself by deeds of daring. In the assault upon Savannah (Oct. 9, 1779) Serg. Jasper accompanied d'Estaing and Lincoln in their attack upon the Spring Hill redoubt, and was killed while attempting to fasten to the parapet the colors of his regiment. A square in the city of Savannah and a county in Georgia bear his name.

Jassy, yaas'sĕe: chief town of Moldavia, in Roumania; on the Bachlui, a tributary of the Pruth; 205 miles by rail N. W. of Odessa (see map of Turkey, ref. 1–D). It is a large but poorly built and dirty city, in which fine ecclesiastical buildings and splendid palaces belonging to the nobility alternate with the miserable huts of the poor. It has a university with 40 professors and about 170 students, schools of various grades, a museum with a public library, a theater, and 47 churches. It has few manufactures, but its trade in grain and wine—which is entirely in the hands of Jews—is important. The mineral springs and convent of Galata, the water-cure establishment of Rapide, Belvedere Castle, and the great ecclesiastical college of Socola are situated in the vicinity. In 1861 the seat of government was removed from Jassy to Bucharest. Pop. about 90,000; about half are Jews.

Jasz-Bereny, yaas'bā-rāñ': town; in the district of Jazygia, Western Hungary; on both sides of the Zagyva; 39 miles E. of Budapest (see map of Austria-Hungary, ref. 6–H). It has a Franciscan monastery, a Roman Catholic gymnasium, a high school, and a beautiful town-hall. It has also a considerable trade in corn, cattle, and wine. In the middle of the city stands a monument said to mark the burial place of Attila. The people of the town and vicinity are extensively engaged, on the adjacent communal lands, in raising horses, cattle, and sheep. They are nearly all Magyars and Roman Catholics. Pop. 24,594.

Jativa, or **San Felipe de Jativa**, saan'fā-lee'pe-de-chaa-tee'vaă (the ancient *Se'tabis* or *Sæ'tabis*): town in the province of Valencia, Spain; beautifully situated on the Albalda, a tributary of the Jucar; 35 miles by rail S. S. W. of Valencia (see map of Spain, ref. 16–I). It is a handsome and well-built town, with several monuments built in the times of the Moors. It was formerly fortified, and has been besieged successively by the Moors, Jacme I. of Aragonia, Charles V., and Philip V. The manufactures are not important. It was the birthplace of Ribera. Pop. (1887) 14,099.

Jats: a people of India, forming about half of the population of the Punjaub and Rajputana, and very numerous in the Northwest Provinces, Sind, and Baluchistan. Jat settlements have also occurred on the shores of the Persian Gulf, in Antioch (ninth century), and in the Chaldæan marshes, from which they were deported in 834. Their traditions point to an immigration from Afghanistan, and they may have been the ancient *Getæ*. The Jataki or Jat language is a variety of Sindi, and a pure Sanskrit tongue, with peculiar early grammatical forms. Though very tenacious of their language, they vary in their religion, being Brahman, Sikh, or Mohammedan, according to locality. They are divided into numerous tribes, occasionally become migratory in bands or individually, are harmless and industrious, though formerly warlike, and have a great store of popular songs and traditions. They are very dark in complexion, and have good teeth and large beards. Their social position in India is inferior. MARK W. HARRINGTON.

Jauja, how'hăă, or **Xauxa**: a town of Peru; department of Junin; in a beautiful and fertile valley, 11,150 feet above the sea; 108 miles in a direct line nearly E. of Lima, or 155 miles by road (see map of South America, ref. 5–B). It supplies the Lima markets with cattle, vegetables, etc. The climate is noted for its salubrity. The plans for the Oroya Railway contemplate a branch to this place. At the time of the Spanish conquest Jauja was a large native city; Pizarro passed through it on his way to Cuzco, and there was a battle with the Inca forces near the place. A colony was established here and Pizarro chose it as his future capital, but subsequently decided to build a new capital at Lima. Pop. about 3,000. HERBERT H. SMITH.

Jaundice, jăăn'dis [M. Eng. *jaundys*, earlier *jaunys*, from O. Fr. *jaunisse*, jaundice, liter., yellowness, deriv. of *jaune*, yellow < Lat. *gal'binus*]: a greenish-yellow color of the skin which is produced by the presence of the coloring-matter of the bile in the blood. It is not a specific disease, as is generally supposed by the laity, but a symptom. If jaundice occurs in any great abundance, or persists for a length of time, all the secretions are tinged with the bile, the urine becomes saffron-colored, but the stools being deprived of their coloring-matter are whitish. Jaundice may be produced in two ways—either from suppression or retention of bile; the former is due to some disease of the liver which incapacitates it for performing its function; therefore the bile, which in the healthy state of the organ is constantly being filtered from the blood, accumulates in it. Jaundice

from retention of bile is produced in this way: the bile, having been already formed, is prevented from making its way into the intestines by some obstruction in the bile-ducts; it is therefore reabsorbed, and makes its appearance in the blood. The obstruction to the ducts may be either external or internal. Externally there may be tumors of various kinds pressing on the ducts, as cancer of the pyloric end of the stomach, of the duodenum, or the end of the pancreas, or a colon impacted with fæces. Internally the gall-duct may be plugged up by mucus, or, what is far more common, by a biliary calculus passing through it; this is accompanied by a great deal of pain; indeed, it is said to be the most severe pain that could be felt. Some idea of it may be had from a knowledge of the fact that the common bile-duct is very seldom larger than a goose-quill, and the stones which pass through it are sometimes the size of a pigeon's egg. There is generally much more pain felt by the passage of a calculus for the first time than subsequently, as the ducts are generally left distended for its successors. Jaundice is also produced in some cases by destruction of the blood, the pigment of which becomes deposited. This is probably the explanation of the jaundice of the new-born, a very common condition and not usually attended with danger. The blood of the child at birth is much richer in corpuscles than at subsequent times, and a rapid destruction probably occurs within the first few days. The jaundice of severe infectious diseases like yellow fever, and of poisoning, may be explained in similar manner.

The technical name of jaundice is *icterus*, from the Greek name of the golden thrush, which, according to Pliny, when seen by a jaundiced person would die and the patient recover. Now, however, the affection is treated more scientifically, its origin being considered. Where it is due to suppression little can be done except in cases of acute inflammation of the liver, but in those cases due to obstruction there is more success with it. The indications are to improve the patient's general condition by a proper and nutritious diet. Fats of all kinds should be avoided, as they can not be digested without the assistance of the bile. Next, attention should be paid to the constipation from which these patients almost invariably suffer; for this rhubarb, senna, and aloes are the favorite remedies. If the formation of bile is sluggish or the secretion too thick, some form of mercury as calomel or salts of potash or soda may be given. Opium is useful for the pain attending the passage of a gall-stone. Revised by WILLIAM PEPPER.

Jaunpur: one of the richest districts of British India, in the Northwest Provinces; Allahabad division, on the Gumti river. Area, 1,554 sq. miles. Pop. 1,300,000. The town of Jaunpur is on the Gumti river; 60 miles N. W. of Benares; on the railway from Benares to Faizabad (see map of North India, ref. 7-G); an interesting city. The citadel incloses several fine monuments of the fourteenth and fifteenth centuries, and the river is spanned by a beautiful bridge of ten arches built in the sixteenth century. Pop. 25,000. M. W. H.

Jáuregui, JUAN, de: poet; b. at Seville, Spain, about 1570. The literary influences that were strong upon him were those of the Argensolas and Herrera; and he posed as an opponent of Gongorism, though he did not always avoid it himself. He was painter as well as poet, and Cervantes tells us in his *Tales* that his own portrait was done by him. It was probably in the pursuit of this art that he lived long in Rome; and here his first important literary production saw the light—his translation of the *Aminta* of Tasso (1607). After his return to Spain (1613, or earlier) he lived now in Madrid, now in Seville. It was in the latter place that the volume of poems appeared on which his fame chiefly rests. This contained his translation of the *Aminta*, much corrected and polished, other translations, and a few original poems of great beauty of diction. In 1624 he printed at Madrid his *Orfeo*, or *Story of Orpheus*, in five short cantos. This is not up to the level of the *Aminta*, but attracted attention enough to cause MONTALVAN (*q. v.*) to write in competition another but inferior poem on the same theme, in which affair he was abetted by the great Lope de Vega. Subsequently Jáuregui undertook the translation of Lucan's *Pharsalia*, taking great liberties with the original. This work did not appear till after the author's death, which occurred about 1640. He wrote several treatises of slight value, the most interesting being his attack on Gongorism—*Discurso poético contra el hablar cúlto y oscúro*. The best of Jáuregui's work is in Rivadeneyra's *Biblioteca de Autores Españoles* (vol. xlii., Madrid, 1875). A. R. MARSH.

Java, jaa'va: one of the largest of the East Indian islands (see map of East Indies, ref. 8-D), and the richest of the Dutch colonial possessions; about 600 miles long by 125 broad at the broadest part, lying nearly E. and W., with the Indian Ocean to the S. and the Java Sea to the N.; separated from Sumatra by the narrow Sunda Straits and from Bali on the E. by the still narrower Straits of Bali. With Madura and some small islands, the area is 50,848 sq. miles.

Mountains and Volcanoes.—A series of volcanoes extend along the axis of the island, forming a single row along the center and clustering toward the eastern and western end, culminating in the volcano Semera in the east (12,290 feet). The number of known volcanoes is forty-five, according to Junghuhn; of these fourteen are found near the western end of the island in a space not more than 35 miles long by 20 broad. The volcanoes are not generally in active eruption, though most of them continuously send up smoke or noxious gases. Ringghit, formerly one of the highest mountains in the island, exploded and was torn to pieces in 1586, causing the destruction of perhaps 10,000 lives. Papandayang, one of the southern volcanoes of the western cluster, in an eruption in 1772 engulfed 3,000 persons. It is well known for its dangerous exhalations of carbonic acid, and one of its valleys is especially dangerous and is called the valley of death or of poison. The volcano of Galungung, to the E. of Papandayang, has frequent eruptions. It is said to have destroyed 115 villages in 1822.

Earthquakes are frequent, but are not usually severe. Junghuhn has published a list of 143, of which 3 preceded volcanic eruptions, 19 accompanied, and 2 followed them, while 119 were independent of them. Although this does not show much trace of a direct relation between volcanoes and earthquakes, yet to the large number of the former is doubtless due the frequency of the latter, and also their relative harmlessness. An earthquake in 1867, however, was very destructive, and in 1883 the earthquake and tidal wave which accompanied the eruption of KRAKATOA (*q. v.*) destroyed about 50,000 people in Western Java.

Rivers.—Java is abundantly watered. The rivers are for the most part on the north side, corresponding to the greater width on that side of the plains at the base of the mountains. The largest stream is the Solo, which takes its rise on the volcano Merapi, near the center of the island, and flowing first N. and passing the city of Surakarta, then W., empties into Madura Strait after a course of 175 miles. It is navigable for large boats, except from August to October. The next largest is the Brantas or Surabaya river, which rises on the western slopes of Semeru and, flowing W., then N., then E., empties into the Madura Strait, to the S. of the Solo and by two mouths, one at the port of Surabaya. The other streams are much smaller. There are a few small lakes. There is some evidence of progressive desiccation. The Lake Danu, formerly 3 miles long and the largest on the island, is now dry.

Coast.—The shores on the north side are usually shallow, the coast low, and seldom protected by islets. There is only one good port on this side, and that is Surabaya. The south coast is abrupt, with very few islands. The Bay of Batavia near the northwest angle is capacious, and is somewhat protected from winds by a series of outlying islands, but it rapidly shallows near the coast, and large vessels lie out a mile or two from shore. The largest island on the coasts is Madura, near the northeast angle, 135 miles long by 50 broad, forming a distinct province. The other islands are small. The most interesting is Kambangan, close to the south coast, near the middle of Java. It contains several grottoes which are objects of veneration to the natives. The islands in the Sunda Straits were much changed by the eruption of Krakatoa (1883). The island of Krakatoa has only one-fourth of its former area, and several new islets have made their appearance.

Climate.—Java is subject to the monsoons, the wind being from the S. W. from December to March and from the N. E. from May to September. The rainy season lasts from October to March, and during January and February the rains are often torrential, though fortunately of short duration. The dry season is from April to September, and it is driest in August. The total annual rainfall is about 80 inches. The mean temperature (at Batavia) is 77° F., and the extreme range 26°. This is in the hot zone, which exists at elevations of less than 2,000 feet. This zone is not unhealthful, except in swampy districts. The monsoons and land and sea breezes succeed each other here with great regularity. The temperate zone extends from 2,000 to 4,750

feet above sea-level. The mean annual temperature here runs from 73 at the lower to 64 at the higher elevations, and the wet and dry seasons are less marked. The cool zone extends from 4,750 to 8,000 feet of elevation. The mean temperature varies from 64° to 55°. This region is foggy and the southeast winds prevail. The cold zone is above 8,000 feet. The temperature may in the highest parts of this zone fall as low as 31°, but it is rare and only in exposed places. Rain is rare in this zone. The temperate and cold zones are beneficial to invalids from the coast.

Vegetation and Crops.—The wealth of vegetation in the hot zone is amazing and the fertility of the soil fairly incredible. Here are successfully raised all the products of the tropics. In the temperate zone the forests are more extensive and the trees larger. Tobacco is raised with especial success. Tea has been planted, but does not prove to be as good as the Chinese article. Coffee is extensively cultivated, and in this and the next higher zone the cinchona from Bolivia has been planted and thrives. The cool zone has forests of oaks, chestnuts, and laurels, along with which are seen the flowers of azaleas and rhododendrons. Ferns and mosses are especially abundant, and prairies are to be found on the higher plateaus. In the cold zone the teak is a characteristic tree, while the flowering plants have a familiar European aspect. The chief vegetable productions are rice, maize, sugar-cane, tobacco, indigo, cotton, coffee, and tea. The poisonous upas has long been celebrated, and includes two different trees, one of which produces strychnine, the other is the *Antiaris toxicaria*, the dried sap of which is used by the natives to poison the tips of their arrows. This tree grows elsewhere in the East Indies. The fresh sap of the *Antiaris* on the flesh causes deep ulcers, which are slow to heal, but there is no tree known there which fatally poisons those who rest in its shade, old traditions to the contrary.

Animals.—Wild sheep, gazelles, deer, the tiger, the leopard, the two-horned rhinoceros (in the west), and a great variety of monkeys, are among the animals found in the forests. Neither tapirs nor elephants are found there, though they abound in the forests of Sumatra. Bats are very numerous, as also are lemurs, animals which fly like the flying squirrel. Horses have been introduced from Arabia, and, though small, are excellent. The Chinese pig has been introduced, and thrives wonderfully. The bird fauna is very rich, and includes many species of parrots unknown elsewhere. The swallow, which makes an edible nest much prized by the Chinese, builds here in caverns near the sea. The crocodile abounds, and the pythons sometimes attain a length of 30 feet. The insects are very numerous but not especially venomous.

Minerals.—Bantam furnishes lignite of fair quality. Asphalt is found in great abundance in several localities. Salt springs are numerous, and those of Kuwu, S. E. of Samarang, produce large quantities of salt. Thermal springs are abundant, generally sulphurous, and those of Rembang are held to be curative.

Inhabitants.—The Sundanese occupy the western part of the island. They are of fairly pure Malay stock, and their language is distinctly Malayan. They number about 4,000,000. The Javanese proper occupy the most of the island. They appear to be Malay, with a strong infusion of Hindu blood and language. They number about 11,000,000. The Madurans are but little different from the Javanese proper except in their language, which is a distinct dialect. In the mountains there are to be found some fragments of an aboriginal people called Kalang, apparently negritos. Besides these there are immigrant Malays; also Chinese, active, industrious, economical, and quite numerous; Arabs, less numerous, skillful sailors, intelligent merchants, and highly respected; some Hindus and other Orientals; and a few Dutch and other Europeans.

The Javanese proper are of good size and well made, very short-armed, deep brown in color but lighter on the mountains; the nose is small and less flat than among the Malays, the face elongated; the eye black, large, deep, and slightly oblique; beard slight. The Sundanese are shorter, more muscular, and more independent, with lighter skin and coarser features.

The Javanese language is very rich and expressive, interspersed with many foreign words. There are two forms, one for addressing an inferior, the other for a superior. The literature is a considerable one, and consists of romances, chronicles, poems, moral and legal treatises, and translations from the Sanskrit and Arabic.

In religion the Javanese are generally Mohammedans. They were formerly Brahmans and Buddhists, but still retain elements foreign to all these religions, probably traces of their own original form of faith. The Christian missions have not been very successful in the islands. There is little suffering from poverty, as nature provides abundant food, and other wants are few. The people are gentle, kind, and affectionate, but lacking in force, though they make excellent soldiers and dangerous personal enemies. The principal occupation is agriculture, and rice the principal domestic crop. Fishing occupies a large number of people on the north coast. Of an industry proper there is little development, though the native cloths, swords, and musical instruments are made with great skill.

Administration.—The island is divided into twenty-two provinces or residencies, Madura making the twenty-third. It was formerly administered, politically and socially, on what was called the culture system, really a system of enforced labor, established by van den Bosch in 1832. It was employed in the cultivation of most of the valuable colonial products, but its range has been gradually decreased until in 1891 it applied only to coffee. Each residency is governed by a resident appointed through an examination, and he controls almost absolutely, through lesser native officers, the province in his charge. The general control in Dutch India rests in the hands of a governor-general, who resides in Batavia, the capital of Java and of Dutch India. While the culture system was employed, the Javanese were not far from slavery, but under the milder, more modern policy they appear fairly content. The population in 1889 was 23,064,086, or about 450 to the square mile, one of the most dense populations on the earth, and it is rapidly increasing. As many parts of the island are still uncultivated, it is probably safe to estimate that the population may be doubled before the full capacity of the island is reached. The European inhabitants form scarcely two-tenths of 1 per cent. of the whole, and the Chinese barely 1 per cent. The largest cities in 1891 were Surabaya (pop. 107,878), Batavia (105,126), Surakarta (91,368). A railway extends nearly the entire length of the island. It crosses the island from Batavia to near the middle of the south coast, then recrosses to Samarang, and to Surabaya and other ports on the Madura Straits.

History and Antiquities.—The Javanese annals are rather romantic chronicles than precise history, and their accounts are conflicting. There have been three elements in the history which are evident in character, though date and details of two are not precisely fixed. The first is the Hindu immigration, which probably preceded the Christian era by several centuries. A Buddhist wave seems to have early passed over the island, and to have been succeeded by a Brahman wave, judging from the antiquities. This was followed by a Mohammedan invasion, beginning in the twelfth century, resulting in the fifteenth century by the complete ascendency of this faith, politically and religiously. In 1596 the Dutch appeared at Bantam, on the Straits of Sunda, where the Portuguese already had a factory. In 1602 the company of the East Indies was created in Holland. In 1619 the governor-general selected Jakatra as his residence, and this eventually became Batavia. From 1811 to 1815 Batavia was in the hands of the English. Since then the Dutch have been in undisturbed ownership.

Hindu ruins of remarkable character are found at many places in the island, except at the western end and in Madura. The most remarkable is that of Bara-Budur, on the south coast, S. of the volcano of Merapi. It is a square structure on a series of terraces, the lowest measuring 497 feet on each side, capped by a cupola 52 feet in diameter, and containing many images of Buddha and other figures. About 3 miles to the N. E. is another beautiful temple. On the Dieng plateau, in Bagalen, near the center of Java, is a remarkable group of temples, and in the same residency are four groups of Brahman temple caves. Beside the temples there are many inscriptions on stone and copper, the deciphering of which presents many difficulties.

REFERENCES.—Veth, *Java*; [illegible], *historisch* (3 vols., 1875–80); Forbes, *Eastern Archipelago*; Beckmore, *East Indies*; [illegible]; W[illegible], *Archipelago* (1869); Reclus, *Geographie universelle*, vol. xiv. (1890). The literature on Java is very extensive, as is shown by the four bibliographical works (in Dutch) of J. A. van der Chjis (1880; in the *Transactions* of the Batavian Society of Arts and Sciences), C. M. Kan (1881), Nyhoff (1883), and Roorda van Eysinga.

MARK W. HARRINGTON.

Java Deer: a popular name for the chevrotains or pygmy musk deer of the genus *Tragulus*, applied to these little creatures from the fact that they are often brought from Java, although found in other islands of the Malay Archipelago and parts of Southern Asia.

Javary, zhä-vä-rē' (also written JAVARÍ and YAVARÍ): a southern affluent of the Amazon, forming part of the boundary between Brazil and Peru. The lower portion is very crooked, and flows in a narrow valley through heavy forest. The upper courses are entirely unknown, though politically they are of great importance. By treaty the boundary between Brazil and Bolivia passes in a straight line from the confluence of the Mamoré and Beni in the Madeira to the principal source of the Javary, if it be N. of lat. 10° 20′ S.; in the contrary case it follows that parallel to the Javary, thence to the Amazon. The Javary, by treaty, limits Brazil and Peru. Thus until the source of the Javary is ascertained it will be impossible under existing treaties to determine the limits and areas of the three countries.

HERBERT H. SMITH.

Java Sparrow, or **Rice-bird** (*Padda oryzivora*): popular name of one of the largest of the Asiatic finches, abundant in Southern Asia, Java, and Sumatra. It is of a delicate gray, with conspicuous white patches on the cheeks, and a black tail. The large beak is of a bright-rose color. The name was given to the bird because it was first taken to Europe by vessels touching at the island of Java. F. A. L.

Javelin [Fr. *javeline*; cf. Fr. *javelot*: Ital. *giavelotto*: deriv. of Lat. *gladius*, sword]: a short, heavy spear used for throwing with the hand at an enemy. The Roman *pilum* was essentially a javelin; it was about 5½ feet long, consisted of a hardwood shaft and barbed iron or steel head, and was one of the most formidable of the offensive weapons of those times. See SPEAR and LANCE. Revised by J. MERCUR.

Javelle Water: See EAU DE JAVELLE and HYPOCHLORITES.

Jaworow, yä'ä-wō'rov: town; in Galicia, Austria-Hungary, on the Krahowska; 30 miles W. N. W. of Lemberg (see map of Austria-Hungary, ref. 3–K). It has large paper-mills, valuable fisheries, and in the vicinity some mineral springs much resorted to for their medicinal powers. Pop. 9,000.

Jaxar'tes: classical name for the SYR-DARIA (*q. v.*).

Jay [from O. Fr. *jai* > Mod. Fr. *geai*: Ital. *gajo*, merry, bright; perhaps of Teutonic origin, cf. O. H. Germ. *gāhi*, quick, active]: the common name for a number of moderate-sized birds of the crow family, forming the sub-family *Garrulinæ*. They have short, rounded wings and long, rounded tails; the plumage is usually soft and lax, often brightly colored, and conspicuous crests are frequently present. Jays

The European jay.

feed on seeds, acorns, eggs, and young birds. The common jay of Europe (*Garrulus glandarius*) has a cinnamon-colored body, white rump, black tail and wings, the latter ornamented by a patch of bright blue, white, and black. The blue jay of the U. S. (*Cyanocitta cristata*) has a brilliant plumage of blue, with white and black markings. Jays are found throughout the greater portion of the northern hemisphere, in Northern Africa, and in Southern South America.

F. A. LUCAS.

Jay, Sir JAMES, M. D.: physician; a brother of Chief Justice John Jay; b. in New York city, Oct. 27, 1732. He was associated with the celebrated Rev. Dr. William Smith, Provost of the College and Academy of Philadelphia (now the University of Pennsylvania), in securing the means for the establishment of King's (now Columbia) College in New York, and the college in Philadelphia projected by Benjamin Franklin and presided over by Dr. Smith. Dr. Jay visited England in 1762 on business of a personal nature, and was further employed in soliciting funds for King's College. In 1763 he was knighted by the king, George III. He published two letters relating to the collection of the endowments for the two colleges (London, 1771, 1774), both in octavo. He also published *Reflections and Observations on the Gout* (1772). D. at Springfield, N. J., Oct. 20, 1815.

W. S. PERRY.

Jay, JOHN, LL. D.: statesman, jurist, and diplomatist; b. in New York city, Dec. 12, 1745, of Huguenot stock; graduated at King's (now Columbia) College in 1764; was admitted to the bar in 1768; became law-partner with Robert R. Livingston, and marrried (1774) a daughter of William Livingston. In the agitations caused by the policy of the British cabinet toward the North American colonies, Jay first became conspicuous as a member of the committee of correspondence appointed May 16, 1774, by the citizens of New York to represent their views upon the questions growing out of the Boston Port Bill; was supposed to be the author of the suggestion emanating from that committee for the convocation of a Continental Congress; was elected a member of that body and took a prominent part in its proceedings. He was the author of the address to the people of Great Britain adopted by the first Congress (Oct., 1774), and of that to the people of Canada adopted by the second Congress (May, 1775); was a member of the committee of correspondence with European friends of American liberty, in which capacity he became the channel of secret negotiations with France; was commissioned colonel of the Second Regiment raised in New York city, and in Apr., 1776, was chosen a member of the Provincial Congress of New York, retiring from the Continental Congress in order to lend his counsels to his native State in that critical juncture. Jay was the leading member of the New York Congress; was author of its chief public documents, including the constitution of 1777; and on its dissolution was appointed chief justice of New York, which office was confirmed to him by the new State Legislature. In 1778 he was again elected to the Continental Congress, became president of that body (Dec. 10), and was appointed in the following year minister to Spain, where he arrived in 1780. He remained at Madrid two years, obtaining from the Spanish Government some material and moral aid for American independence; was a colleague with Franklin and Adams in the commission which negotiated peace with Great Britain (Nov. 30, 1782), and on returning to America in 1784 was chosen by Congress Secretary for Foreign Affairs—a post which he held for five years, until the establishment of the Federal Government under the Constitution (1789). Jay was one of the writers in the FEDERALIST (*q. v.*) in defense of the Constitution, took a leading part in the New York State convention, which, after much opposition, gave its adhesion to the Constitution (1788), and was appointed by Washington (1789) the first chief justice of the U. S. In 1792 he was the candidate of the Federalists for Governor of New York; was sent as minister to Great Britain in 1794; and signed (Nov. 19) the instrument known as Jay's treaty. By its provisions the eastern boundary of Maine was determined; U. S. citizens recovered above $10,000,000 for illegal captures by British cruisers, and the western posts held by British garrisons were surrendered; but in consequence of the exclusion of U. S. vessels from Canadian ports, the restriction placed upon the West India trade, the absence of any provision respecting impressment, and the regulations upon neutrality as between British and French privateers, an unprecedented agitation ensued, and the treaty was violently denounced, but was ratified by Washington, with the approval of the Senate, Aug. 14, 1795. Jay for a time was violently attacked by the Republicans, who passed denunciatory resolutions in public meetings, and in Boston went to the length of burning him in effigy. During his absence in England, Jay was elected Governor of New York—an office

which he held for six years—and in 1801 withdrew from public life, declining a second appointment as chief justice of the U. S. Supreme Court, for which he was nominated by President Adams and confirmed by the Senate. For the remainder of his life, extending over more than a quarter of the nineteenth century, Jay resided upon his ancestral estate at Bedford, Westchester County, holding aloof from political contests, but taking a lively interest in religious and philanthropic movements. As early as 1785 he had been president of a society in New York for promoting the emancipation of slaves, and it was under his auspices that slavery was abolished in New York in 1799. D. at Bedford, N. Y., May 17, 1829. See his *Life* by his son, William Jay (1833); a volume in the American Statesmen Series by George Pellew (1890); and *Correspondence and Public Papers of John Jay*, edited by H. P. Johnston (4 vols., 1890–93). Revised by C. K. Adams.

Jay, John: diplomatist; a son of William Jay; b. in New York city, June 23, 1817; graduated in 1836 at Columbia College; became a lawyer in 1839. He was a prominent member of the Protestant Episcopal Church, the Union League Club, and various historical and other learned societies; author of many anti-slavery, legal, political, ecclesiastical, and other pamphlets and reports. In 1869 he was appointed U. S. minister to Austria. He negotiated a naturalization treaty and a convention on trade-marks, and supervised the U. S. commission to the World's Fair of 1873 at Vienna. D. in New York city, May 5, 1894.

Jay, William, LL. D.: jurist; a son of John Jay (1745–1829); b. in New York city, June 16, 1789; graduated at Yale in 1807, and studied law, which he never actively practiced. He was prominent in temperance, anti-slavery, peace, and Bible societies; became in 1818 a judge of the common pleas, and was 1820–42 first judge of Westchester co., N. Y., but lost the place because of his anti-slavery views. He published a *Life of John Jay* (2 vols., 1833); *An Inquiry into the Character and Tendency of the American Colonization and Anti-Slavery Societies* (1834); *A View of the Action of the Federal Government in Behalf of Slavery* (1837); *War and Peace* (1848); a *Review of the Causes, etc., of the Mexican War* (1849); and numerous minor publications. D. at Bedford, N. Y., Oct. 14, 1858.

Jeanne d'Arc, zhăn'daark': See Joan of Arc.

Jeannette: borough (founded in 1888 by H. Sellers McKee, and named after his wife); Westmoreland co., Pa. (for location of county, see map of Pennsylvania, ref. 5–B); on the Penn. Railroad; 4 miles W. of Greensburg, the county-seat, 27 miles E. of Pittsburg. It is in the natural-gas belt of West Pennsylvania; contains 10 churches, 2 public-school buildings, 2 banks, several hotels, and 2 daily newspapers; and has manufactures of plate, window, and decorated glass, tableware, tannin, carbon, brick, and other articles, employing about 4,000 persons. Pop. (1890) 3,296; (1893) estimated, 7,000. Editor of "Dispatch."

Jean Paul Richter: See Richter, Jean Paul.

Jebail', or **Jubeil** (modern *Gebal*, or *Byblos*): one of the most ancient cities of Phœnicia; between Berytus and Tripolis; noted in mythology for the birth of Adonis, and in biblical history for having furnished the artificers (Giblites) of Solomon's temple. Gebal is thought to have been the metropolis of the Phœnicians before the rise of Sidon, to have taken an important part in the earliest operations of ship-building, navigation, and colonization, having founded commercial and mining settlements throughout the Ægean islands and the coasts of the Black Sea, as also to have introduced into Greece a knowledge of the alphabet. The Greek name *Byblos* is derived from the Egyptian word for papyrus, and perhaps alludes to the earliest cultivation of writing. The Egyptian myths of Isis, Osiris, and Typhon were partially of Phœnician origin, and some of the incidents are located at Byblos. In Byzantine times it was the seat of a bishop. It was taken by the crusaders, and after varying fortunes finally came into the hands of the Turks. Jebail is now a village of 600 inhabitants, on the seacoast, 20 miles N. of Beyrout; it contains a castle noted in the annals of the crusades. Revised by J. R. S. Sterrett.

Jebb, John, D. D.: ecclesiastic and author; b. at Drogheda, Ireland, Sept. 27, 1775; educated at Trinity College, Dublin; entered the Church of England, and became Bishop of Limerick in 1823. Residing in a district chiefly inhabited by Roman Catholics, Bishop Jebb was noted for his liberal spirit toward them and his maintenance of their rights. He wrote several works on doctrinal theology, but is remembered chiefly by his *Sacred Literature* (1820), in which he combated some of the views of Dr. Lowth concerning Hebrew poetry, and elucidated many obscure or difficult biblical topics. He also published *Practical Theology* (2 vols., 1830, and a second ed. 1837); *Pastoral Instructions* (1831; another ed. 1844). *Thirty Years' Correspondence between Bishop Jebb and Alexander Knox, Esq.*, ed. by Rev. Charles Forster, and *Life of Bishop Jebb, with a Selection from his Letters* (2d ed. 2 vols., 1837; 3d ed. 1851), by Rev. Charles Forster, throw an important light not only on the life of a good and great man, but on the history of the times in which he lived. D. at Limerick, Dec. 7, 1833.
Revised by W. S. Perry.

Jebb, John, D. D.: ecclesiastic and author; b. in England in 1805; was ordained to the ministry in 1828; became rector of Peterstow, Herefordshire, 1843–86; was canon residentiary of Hereford Cathedral 1870–86. D. in 1886. He published *Divine Economy of the Church* (1840); *Choral Service of the Church of England and Ireland* (1843); *Choral Responses and Litanies of the Church* (1847; 2d vol. 1857); *Three Lectures on the Cathedral Service of the Church of England* (2d ed. 1845); *Literal Translation of the Book of Psalms* (2 vols. 1846); *Six Letters on the Present State of the Church* (1851); *A Plea for what is left of the Cathedrals* (1852); *Hints on Reading the Liturgy* (1853); *The Principle of Ritualism Defended* (1856); *The Ritual Law and Custom of the Church Universal* (1866); *The Right of the Irish Branch of the United Church of England and Ireland considered* (1868). W. S. Perry.

Jebb, Richard Claverhouse, Ph. D., LL. D.: Hellenist; b. at Dundee, Scotland, Aug. 27, 1841; graduated with highest honors from St. Columba's College, Dublin, the Charterhouse, and Trinity College, Cambridge, 1862; elected shortly after fellow of his college; public orator of the university 1872; classical examiner in the University of London and tutor at Cambridge in 1875; Professor of Greek at St. Andrews, and in 1889 Regius Professor of Greek at Cambridge. In 1891 Prof. Jebb succeeded Dr. Lightfoot, Bishop of Durham, as president of the Society for the Promotion of Hellenic Studies. He received honorary degrees from Edinburgh, Cambridge, Bologna, and Harvard Universities, and the gold cross of the Order of the Saviour from the King of Greece in 1878, as a reward for high attainments and his strenuous advocacy of the teaching of modern Greek. His works are as distinguished for their profound and sober scholarship as for their brilliant style. Jebb published a commentary to the *Characters of Theophrastus* (1870); *Translations into Greek and Latin Verse* (1873); *Modern Greece* (1880); *Richard Bentley* (English Men of Letters Series, 1882); *The Growth and Influence of Greek Poetry* (lectures delivered at the Johns Hopkins University in 1892, published in Boston in 1893); *Attic Orators from Antiphon to Isæos* (2 vols., 2d. ed. 1893); *A Primer of Greek Literature*; a monograph on Homer; and the monumental edition of the plays and fragments of Sophocles (introduction, text, commentary, and prose translation). This work will remain for a long time to come the standard edition of the poet.
Alfred Gudeman.

Jedburgh: town; in Roxburghshire, Scotland; on the Jed; 49 miles by road S. E. of Edinburgh (see map of Scotland, ref. 11–H). It contains some very interesting ruins of a magnificent abbey erected in the twelfth century and destroyed in the sixteenth, and of a castle which was once the residence of the Scottish kings. Pop. (1891) 3,397.

Jeddah, or **Jiddah**: town; in vilayet (province) of Hedjaz, Arabia, on the Red Sea; 21° 28′ N. lat. and 39° 13′ E. lon.; 48 miles W. from Mecca, of which city, as of the entire province, it is the port (see map of Persia and Arabia, ref. 7–C). Surrounded by a barren desert, dependent on scanty rainfalls for water-supply, without productions of any kind, it is a great entrepôt where are exchanged gums, coffee, and especially mother-of-pearl, for rice, wheat, and the manufactured goods of Europe and India. Near the walls is a curious building, called by the Arabs the tomb of Eve. Over 350 steamers touch here every year, and 50,000 or 60,000 pilgrims arrive by sea on their way to Mecca. Pop. 30,000, among whom are 30 Greeks and 20 other Europeans, almost all the rest being zealous Mussulmans. Edwin A. Grosvenor.

Jeddo: an old spelling of Yedo, now called Tokio (*q. v.*).

Jefferson: town; capital of Greene co., Ia. (for location of county, see map of Iowa, ref. 5–F); on the Coon river,

and the Chi. and N. W. and the Des M. N. and W. railways; 50 miles N. W. of Des Moines. It has manufactures of flour and cigars, a national bank, capital $50,000, and two weekly newspapers. Pop. (1880) 1,444; (1890) 1,875; (1895) 2,260.

Jefferson: village founded in 1807; capital of Ashtabula co., O. (for location of county, see map of Ohio, ref. 1–J); on the Lake Shore and Mich. S. Railway; 13 miles S. of Lake Erie, 65 miles E. of Cleveland. It is in a rich dairy, grazing, and vineyard region, and has 5 churches, electric lights, and 2 weekly newspapers. Pop. (1880) 1,008; (1890) 1,346; (1893) estimated, 1,400.

EDITOR OF "ASHTABULA SENTINEL."

Jefferson: city (settled in 1843); capital of Marion co., Tex. (for location of county, see map of Texas, ref. 2–K); on Big Cypress bayou, and the Sher., Shreve. and S., and the Tex. and Pac. railways; 40 miles N. W. of Shreveport. The bayou, which connects with Red river, is navigable, and with the railways gives the city much importance as a shipping-point for produce, cotton, and live stock. The city contains sawmills, woolen-mills, cotton-compress, iron-furnaces, two national banks with combined capital of $150,000, and a weekly newspaper. There are beds of iron and coal in the vicinity. Pop. (1880) 3,260; (1890) 3,072.

Jefferson: city (settled in 1836); capital of Jefferson co., Wis. (for location of county, see map of Wisconsin, ref. 7–E); at the junction of Rock and Crawfish rivers, and on the Chi. and N. W. Railway; 13 miles S. of Watertown, 50 miles W. of Milwaukee. It contains 5 churches, 2 public-school buildings, 2 parochial schools, and a weekly newspaper, and has flour and woolen mills, foundries and machine-shops, tanneries, agricultural-implement works, pork packing-house, brick-yards, boot and shoe, furniture, and cigar factories, and brewing and malting houses. Pop. (1880) 2,115; (1890) 2,287; (1895) State census, 2,702.

EDITOR OF "BANNER."

Jefferson, JOSEPH: actor; b. in Philadelphia, Pa., Feb. 20, 1829; descended from several generations of actors. He appeared on the stage in his boyhood in comic parts, but received his thorough professional training in the school of hardship. He joined a theatrical company in Texas in 1846, at the beginning of the Mexican war. Two days after Matamoras was taken by U. S. troops he played in the old Spanish theater of that place. In 1849 he appeared at Chanfrau's National theater, New York. In 1850 he married Miss Margaret Lockyer, an English actress. Afterward he drifted about for several years, playing in the chief cities of the Southern States, and for a long time in Philadelphia and Baltimore. In 1857, at Laura Keene's theater, New York, he appeared with great success as Dr. Pangloss in *The Heir-at-Law*. In the same year he established his reputation as a great comedian by his performance of Asa Trenchard in *Our American Cousin*. The piece ran 140 nights. In 1860 Jefferson went to California, where his engagement proved a failure; then he sailed for Australia, where he remained four years, playing in English comedies with the greatest success. Thence he went to England, where he met Dion Boucicault, who rearranged and rewrote the play of *Rip Van Winkle*, in which Jefferson made the success of his life. It was produced at the Adelphi theater, London, in September, 1865, and ran over 150 nights. The English critics were unanimous in their praise of Jefferson's performance. He reappeared in New York in 1866, and repeated his triumph in *Rip Van Winkle* in all the cities of the Union, playing nothing else for years. After the death of his first wife he was married in 1867 to Miss Sarah Warren. He again visited England in 1877, where he played Mr. Golightly in *Lend me Five Shillings*, and Sir Hugh de Brass in *A Regular Fix*. In 1880 he revived *The Rivals* at the Arch Street theater, Philadelphia, and at the Union Square theater, New York, playing the character of Bob Acres. For several years he has acted but a small part of each season. In 1890 he traveled through the U. S. with William J. Florence, appearing with that actor in *The Heir-at-Law*, *The Rivals*, and other comedies. Mr. Jefferson has amassed a fortune, and has a large estate at New Iberia, La. His acting is characterized by ease of manner and perfection of method. He is a clever amateur artist, and has written an autobiography. Yale College in June, 1892, conferred on him the honorary degree of M. A.

B. B. VALLENTINE.

Jefferson, THOMAS, LL. D.: third President of the U. S.; b. in Albemarle co., Va., Apr. 13 (N. S.), 1743; the son of Peter Jefferson, who died in 1757, a native of Virginia, and a citizen of some prominence. Thomas attended William and Mary College and afterward studied law at Williamsburg under George Wythe. In 1767 he was admitted to the bar and obtained at once a large and profitable practice which he held for eight years, until drawn into public life by the conflict between the colonies and Great Britain. His income for his first year at the bar is estimated at £500 sterling, by which he increased his estate to 5,000 acres of land. He married, Jan. 1, 1772, Martha Skelton, a young, beautiful, and childless widow, daughter and heiress of John Wayles, a leading lawyer of Virginia, whose death the next year doubled Jefferson's estate. Elected a member of the House of Burgesses in 1769, he served in that body till the Revolution, a firm supporter of liberal measures, noted for his disapproval of slavery. With Patrick Henry and the Lees he was a leader of the party in opposition to the British king, though strongly attached to the mother-country. He took his seat as a member of the Continental Congress June 21, 1775, the day on which the news of the battle of Bunker Hill reached Philadelphia, and Washington left that city to take command of the army at Cambridge. Seldom joining in debate, for he was no orator, he acquired great influence by his courtesy, his readiness in composition, his knowledge of law and usage, his general information, his moderation of tone, and his warm devotion to the country's cause. After serving on several leading committees and drawing important papers, he was chosen to draft the Declaration of Independence, which, after three days' debate and extensive amendment, was adopted and signed on Thursday afternoon, July 4, 1776. In September of the same year he resumed his seat in the Virginia Legislature, where, in conjunction with George Wythe and James Madison, he spent three years in adapting the laws of Virginia to the new order of things, and in other patriotic labors. He effected the abolition of entail and primogeniture, and introduced the law—the first ever passed by a legislature or adopted by a government—which secured perfect religious freedom. His plans for the establishment of common schools and for the abolition of slavery failed, though warmly supported by the liberal members. June 1, 1779, he succeeded Patrick Henry as Governor of Virginia, an office which he resigned after holding it two years, during which he ably co-operated with Washington in defending the country. One of his own estates was ravaged and plundered by Cornwallis, and his house at Monticello was held for some days by Tarleton's cavalry, Jefferson himself narrowly escaping capture. On Sept. 6, 1782, his wife died, leaving three children of six to whom she had given birth. Distracted with grief, he now accepted an appointment as plenipotentiary to France, which he had declined in 1776. Before sailing he served for some weeks in Congress at Annapolis, where he succeeded in carrying a bill establishing a system of decimal currency—one of the most useful of his public services. Reaching Paris in June, 1784, he remained until Oct., 1789.

He was an active and vigilant minister. Besides performing the usual duties of his place, he published his *Notes on Virginia*, sent to the U. S. seeds, plants, and shrubs, enriched Buffon's collection with American specimens, forwarded literary and scientific news, and gave useful advice to La Fayette and the other Revolutionary leaders. Nov. 18, 1789, he landed in Virginia, having obtained six months' leave for the purpose of bringing his daughters home, one of whom was engaged to be married to Thomas Mann Randolph, afterward Governor of Virginia. Jefferson was met soon after his arrival by a letter from President Washington appointing him Secretary of State. He accepted the place, and entered upon its duties in New York in Mar., 1791, residing at 57 Maiden Lane, and held the office until Jan. 1, 1794, when he resigned. During his tenure of this office the two political parties became sharply defined, and Jefferson, who was in warmest sympathy with the French Revolution and strongly democratic in his feelings, was recognized as the leader and candidate of the Republican party. His colleague, Alexander Hamilton, became his decided and aggressive political opponent. "We were pitted against each other," Jefferson once wrote, "every day in the cabinet like two fighting-cocks." In 1796 he was elected Vice-President of the U. S., and was sworn in Mar. 4, 1797. In 1800 he was elected to the presidency, and being inaugurated Mar. 4, 1801, he entered upon a part of his career which will ever be regarded with interest by republicans of every land. He selected an able and accomplished

cabinet: James Madison, of Virginia, State; Albert Gallatin, of Pennsylvania, Treasury; Henry Dearborn, of Maine, War; Robert Smith, of Maryland, Navy; Gideon Granger, of New York, Post-Office. Administering the Government in unbroken harmony with his ministers, he gradually won to his support a majority of the people so great that he deemed the opposition scarcely strong enough adequately to criticise and admonish the party in power. He waged a successful war against the piratical Algerines, in which the navy of the U. S. won great distinction. Louisiana was purchased of Napoleon for $15,000,000. The public debt was greatly reduced; the western country was explored by Lewis and Clarke and by Pike; the system of precedence was abolished, and a rational etiquette substituted. Re-elected with but slight opposition, he entered upon his second term Mar. 4, 1805. He now had to deal with matters of a more serious nature, and in so doing increased the number of his political enemies. Burr's trial for the attempted raid into Mexico caused hostile criticism, and the President's embargo policy retaliating upon Great Britain and France by prohibiting all U. S. vessels from leaving home ports, struck a heavy blow at the shipping interests and started anew the opposition of the Federalists. The embargo was repealed in Feb., 1809. Having declined urgent solicitations to accept a nomination for a third term, he retired to private life Mar. 4, 1809, and spent the remainder of his days at his beautiful seat, Monticello, cheered by the society of his eldest daughter and a large number of affectionate grandchildren. Many of his later years were employed in founding the University of Virginia. He died on the fiftieth anniversary of the Declaration of Independence, a few hours before his contemporary and friend, John Adams. Mr. Jefferson was tall, well-formed, straight, and uncommonly strong. He had sandy hair, a ruddy complexion, and a tranquil, benevolent expression of countenance. His temper was perfect; his manners were natural and easy. He was one of the best-informed men of his day, and all his habits and instincts were those of a student and observer. For fuller information, see his *Works*, 9 vols. 8vo, and an edition in 10 vols. (New York, 1892); *Memoirs and Correspondence*, by his grandson, T. J. Randolph (4 vols., 1829); *Biographies*, by George Tucker (2 vols., 1837), by H. G. Randall (3 vols. 8vo, 1858), by his granddaughter, Sarah N. Randolph (1 vol., 1871), by James Parton (1 vol., 1874), and by John T. Morse (1 vol., 1883, in the American Statesmen Series). See also Henry Adams, *History of the United States during the Administrations of Thomas Jefferson* (4 vols., New York, 1888–90).

Revised by C. K. Adams.

Jefferson City: city; capital of the State of Missouri and of Cole co. (for location of county, see map of Missouri, ref. 5–G); on the Missouri river, and the Chi. and Alt., and the Mo. Pac. railways; 125 miles W. of St. Louis. It has an elevated site near the geographical center of the State, and is in a region of great agricultural and mineral wealth, timber, coal, iron, and glass-sand abounding. The notable buildings include the State Capitol, executive mansion, State armory, State penitentiary, U. S. Government building, and Lincoln Institute, a normal and manual training-school for colored youth. The city contains 10 churches, 3 public-school buildings, 4 banks, 2 libraries (Missouri State and Lincoln Institute), water, gas, and electric-light plants, 5 hotels, and a daily, a monthly, and 5 weekly newspapers. Among the industries are manufactures of flour, agricultural implements, wagons, shoes, brick, ale and beer, and foundry and machine-shop products, besides special articles made in the penitentiary under the contract system. Pop. (1880) 5,271; (1890) 6,742. Editor of "Tribune."

Jefferso'nia [Mod. Lat., named from Thomas Jefferson]: a vernal plant, *J. diphylla*, of the family *Berberidaceæ*; popular known as twin-leaf, from its two-parted leaves, which rise in a tuft from the roots. The flowers are white, resemble those of blood-root, and appear in early spring. The *Jeffersonia* is indigenous to the Northern Central States of the U. S., but is cultivated in England. The root has been recommended as a specific for rheumatism, but the medicinal quality is somewhat doubtful.

Revised by Charles E. Bessey.

Jefferson Medical College: an institution in Philadelphia. It was founded as the medical department of the Jefferson College of Cannonsburg, Pa., in 1826, and was operated under the charter of that institution until 1836, when the Jefferson Medical College of Philadelphia was incorporated as a separate institution, with the same powers and restrictions as the University of Pennsylvania. The college was founded largely through the effort of Dr. George McClellan, and has graduated about 10,000 men with the degree of M. D. The most celebrated professors of the school have been Mütter, Dunglison, the elder and younger Gross, Joseph Pancoast, and Mitchell. H. A. Hare.

Jeffersonville: city (site of old Fort Finney); capital of Clark co., Ind. (for location of county, see map of Indiana, ref. 11–F); on the Ohio river, and the O. and Miss. and the Pitts., Cin., Chi. and St. L. railways; opposite Louisville, Ky., 108 miles S. of Indianapolis. It is at the head of the falls of the river, which aggregate 26 feet in 2 miles, and provide exceptional water-power for manufacturing. The river is here about a mile wide, is dotted with attractive islands, and is spanned by two bridges. The city contains 15 churches, U. S. Government supply dépôt, State Prison South, free infirmary, orphans' home, 2 libraries (State prison and township), and a daily and 2 weekly newspapers. There are gas, water, and electric-light plants, large ship-yards, railway-car and locomotive works, machine-foundry, lumber-yards, and flour-mills. The principal suburbs are Port Fulton, Clarksville, Claysburg, and Ohio Falls. Pop. (1880) 9,357; (1890) 10,666.

Editor of "News."

Jef'frey, Francis, Lord: critic; b. in Edinburgh, Scotland, Oct. 23, 1773; was educated at Glasgow, Edinburgh, and Oxford, and in 1794 was passed an advocate at Edinburgh, but his literary tastes and Whig principles rendered his progress in his profession slow. In 1802 he was one of the founders of *The Edinburgh Review*, of which he became the leading spirit, and was for twenty-six years the principal editor; in 1813 visited New York and married Miss Charlotte Wilkes, his second wife. He won wide fame by the ability and severity with which he opposed the new schools of poetry which sprang up in Great Britain. Acquiring a brilliant though tardy reputation at the bar, he was made dean of the Faculty of Advocates 1829; lord advocate, with the title of Lord Jeffrey, 1830; sat in Parliament for Perth 1830, for Malton 1831, for Edinburgh 1832. The first number of *The Edinburgh Review* appeared on Oct. 10, 1802, and the effect it produced has been described as electrical. The first three numbers were practically edited by Sidney Smith, who was also the originator of the idea of such a publication. Then Jeffrey was the real editor until June, 1829 (the ninety-eighth number). His own contributions numbered 200, of which a selection was published in 1843 in four volumes. Jeffrey is chiefly remembered in literary history on account of his close connection with men who have achieved immortal literary fame; but as a jurist he was just and able; as a man he was beloved even by his literary adversaries. D. at Craigcrook, Jan. 26, 1850. Revised by H. A. Beers.

Jeffreys, George, Baron Jeffreys of Wem: judge; b. at Acton, near Wrexham, in Denbighshire, Wales, probably in 1648; attended St. Paul's School and Westminster School, in London, and then (1663) was admitted to the study of the law in the Inner Temple, living for the most part a dissipated life, but acquiring considerable influence and popularity. He was called to the bar Nov. 22, 1668, and practiced chiefly at the Old Bailey, where he acquired the ferocious brutality which then distinguished that court, and which characterized him through life. He rose rapidly in his profession by influence and his own ability, and was elected common sergeant of London in 1671; affecting Puritanism with the sober, and vices with the vicious, he maintained himself as the favorite of both parties, and was knighted in 1677, and made solicitor to the Duke of York; elected recorder of London 1678–80. He then broke with the liberals and openly supported and cultivated the court party, being made chief justice of Chester and king's sergeant, and baroneted 1680; was crown counsel against Lord Russell, and became chief justice of the king's bench 1683; sentenced Algernon Sidney 1683; tried Baxter and Titus Oates 1685; was made a baron in 1685. In that year he held the Bloody Assize for the trial of Monmouth's adherents, of whom he caused 320 to be executed and 800 or more to be sold into slavery in the colonies, and numerous others to buy their deliverance with exorbitant ransoms (in one case £15,000), for which services he was made lord chancellor. He was a party in nearly all the misdeeds of James II.; tried to escape in the disguise of a sailor after the flight of the king, but while drinking in a low house in Wapping he

was seized by a mob, rescued by the train-bands, committed to the Tower 1688, and died there Apr. 19, 1689. He was a man of great talent, singularly agreeable manners, when he chose, and (usually) free from hypocrisy, but was dissipated, intolerably cruel, revengeful, and unscrupulous. See his *Memoirs* by N. W. Woodrych (London, 1827); John Campbell's *Lives of the Lord Chancellors* and *Keepers of the Great Seal of England*. Revised by F. Sturgis Allen.

Jeffries, George: same as Jeffreys, George (*q. v.*).

Jeffries, John, M. D.: b. in Boston, Mass., Feb. 5, 1744; graduated at Harvard in 1763; studied medicine at London and Aberdeen; returned to Boston to practice his profession; and, accompanying the British forces on their withdrawal to Halifax in 1776, was appointed surgeon-general by Gen. Howe. In 1779 Dr. Jeffries became surgeon-major to all the British forces in America, but soon retired to England, where he devoted much attention to scientific experiment, especially upon atmospheric phenomena. In 1785 he crossed the Channel from Dover into France in a balloon, a feat which attracted much attention from the learned societies of Paris. In 1789 Dr. Jeffries returned to Boston, where he practiced his profession until his death, Sept. 16, 1819. Dr. Jeffries delivered in 1789 the first public anatomical lecture ever given in New England, but on account of the great popular sentiment existing against dissections, he was compelled by mob violence to discontinue his course of instruction.

Jehol, yā'hol, or zhā'hol: an important city of inner Mongolia, called by the Chinese *Ching-teh-foo* (see map of China, ref. 3–J). It is situated in a mountainous, finely wooded region near the borders of Manchuria, about 140 miles N. E. of Peking. It is unwalled, and consists of one great street about 2 miles long, with numerous smaller streets branching off from it in all directions. Pop. about 10,000, mostly Chinese. Here the emperors of China have a fine hunting-park and a summer palace built in 1703 on the model of the Yuen-ming-yuen at Peking. There are many Lama monasteries in the neighborhood, the chief being that built in 1780 on the model of the residence at Tashi-lumbo in Tibet of the Panshen Erdenni, or Spiritual Ruler of Tibet, on the occasion of his visit to Peking to take part in the ceremonies connected with the seventieth anniversary of the emperor commonly known as K'ien Lung, from the name of his reign-period. The main building is described as "a huge square erection, with eleven rows of windows, the stories colored alternately red, green, and yellow, surmounted by a row of five dagobas, and with the roof covered with enameled tiles of a bright turquoise blue." See Williamson's *Travels in North China, Manchuria, and Mongolia* (2 vols., London, 1870) and the *Journal of the Royal Geographical Society* (London, 1874). R. L.

Jehosh'aphat [from Heb. *Yehoshāphāt*; liter., whom Jehovah judges, i. e. pleads for]: the fourth King of Judah; the son of Asa, and reigned, according to Ussher, 914 to 889 B. C. Although he was utterly defeated by the Syrians in the battle of Ramoth-gilead, and although his first expedition to Ophir was foiled by the wreck of his whole fleet, his reign was nevertheless generally very fortunate. He made strenuous efforts to extirpate idolatry, he kept the nations on the borders in awe, and agriculture and commerce prospered under his rule. From the name (Jehovah judgeth) comes the figurative expression of the prophet Joel, "the valley of Jehoshaphat." Revised by W. J. Beecher.

Jeho'vah: a name which occurs only four times in the Authorized Version of the Bible, but the Hebrew word (יהוה) for which it stands is used hundreds of times, being usually represented in our Bible by Lord or the Lord, printed in small capitals, to distinguish it from other words similarly translated. This singular phenomenon arises from the fact that while the consonants of the name (the Hebrew alphabet having originally had no signs for vowels) have been faithfully preserved by transcription, the Jews for ages have refrained from pronouncing the name on account of its sacredness; so that the original pronunciation has been lost. Whenever the word occurs they substitute for it, in reading, אֲדֹנָי (*Adhonai*); and to indicate this the Masoretic punctators connected with the consonants יהוה the vowels of אֲדֹנָי. But when these two words are found together, יהוה is punctuated with the vowel-points of אֱלֹהִים (God). This practice must be one of long standing, inasmuch as we find in the Septuagint (the Greek translation of the Old Testament dating from the second or third century B. C.), *κύριος* uniformly put for יהוה. This example has been followed in most of the versions. There are now no respectable scholars who suppose that the form יְהוֹה (Jehovah) represents the original sound of the name. From Exodus iii. 14, 15, where אֶהְיֶה, the first person imperfect of הָיָה, to be, is identified with יהוה; from the form which the word assumes in proper names compounded with it (especially יָהּ at the end of such names); and from ancient testimony respecting the pronunciation, it is now generally conceded by scholars that probably the verb had originally ו (vav) instead of י (yodh) for its second radical, and that the third person singular imperfect was יִהְוֶה (Yahveh or Yahweh), and that this is the proper form of the sacred name. As to its significance, since it expresses *existence* emphatically as the characteristic of God, we may say that it denotes the *perfection of existence*. Hence eternity, self-existence, sovereignty, unchangeableness, and especially personality, are conceptions fairly to be inferred as embodied in the name. In the Old Testament generally יהוה is the term used when God's *personal* relation to his people is emphasized. Jehovah, rather than Elohim, is God as *revealing* himself, as a *lawgiver*, as inspiring *prophecy*, as the *faithful* one, as the object of *worship*, as the *living* God, as the *rewarder* of good and *punisher* of evil. In general, Elohim may be called the God of nature, and Jehovah (Yahveh) the God of revelation. On this subject the principal writers are Hengstenberg, *Authenticity of the Pentateuch*; Reinke, *Philosophisch-historische Abhandlung über den Gottesnamen Jehova*; Tholuck, in the *Literarische Anzeiger* (1832); Reland's collection of essays entitled *Decas Exercitationum Philologicarum de vera Pronunciatione nominis Jehova*; E. Ballantine, on the *Import of the Name Jehovah*, in the *Biblical Repository*, vol. iii.

Revised by W. J. Beecher.

Je'hu [= Heb. *Yēhū*, seemingly for **Yehohū*, Jehovah is He]: the eleventh King of Israel, and founder of the fourth dynasty in the northern kingdom; reigned twenty-eight years, from B. C. 884. (So Ussher. Others place it forty years later.) In his youth Jehu was one of the guards of Ahab, and in the reigns of Ahaziah and Jehoram had become one of the chief military leaders. In the account of the vision which appeared to Elijah at Horeb in the time of Ahab, that prophet was commanded to anoint Jehu King of Israel as instrument of the divine vengeance upon idolatrous Israel. (1 Kings xix. 16, 17.) This command was not obeyed until nearly twenty years later, when Jehu was anointed by one of the prophets under Elisha's directions, and proceeded to massacre King Joram, his mother Jezebel, his guest Ahaziah, King of Judah, seventy sons of Ahab, forty-two brothers of Ahaziah, and, in general, all the prophets, priests, and worshipers of Baal. According to the biblical record, the reign of Jehu was marked by the decline of the power of Israel. According to the Assyrian records (including the black obelisk now in the British Museum), Jehu was a tributary of Assyria. A comparison of data shows that he became so immediately on assuming the throne.

Revised by W. J. Beecher.

Jeisk, yā'isk, or **Eisk**: town; in the territory of the Kuban Cossacks, Russia; on the Sea of Azof, 65 miles S. W. of Azof (see map of Russia, ref. 10–E). It was founded in 1848 as a port for the rich produce of the surrounding country, and has grown very rapidly. Pop. (1886) 25,915.

Jejeebhoy', Sir Jamsetjee: philanthropist; b. at Bombay, India, July 15, 1783; belonged to that Parsee race which is the present representative of the ancient Zoroastrians and fire-worshipers of Persia. He began life in poverty, made several commercial voyages to China, and succeeded so well as to be able in 1822 to release all the debtors held in prison in Bombay by paying their debts. He founded a hospital and numerous schools. In recognition of his princely benefactions he was knighted by Queen Victoria in 1842, and made a baronet in 1857. In 1856 a statue was voted to him by the citizens of Bombay. Sir Jamsetjee died at that place Apr. 15, 1859, and on Aug. 1 after his death the statue was placed in the town-hall. His estate was valued at £1,000,000; his charitable foundations, widely distributed through Western India, most of them set in operation during his life, were estimated to have cost £300,000.

Jekaterinodar: See Ekaterinodar.

Jelalabad: a town of Afghanistan. See JALALABAD.

Jelal-ed-Deen (glory of the faith): an Afghan usurper, known as Fyrouz Shah II., who reigned at Delhi 1289–96, and is chiefly remarkable for his cruelties.

Jelāl-ed Dīn Rūmī: famous Persian poet and teacher. See RŪMĪ.

Jelisawetgrad: See ELIZABETHGRAD.

Jelissawetpol: See ELIZABETHPOL.

Jel'lachich von Buzim, Count JOSEPH: Austrian general; b. at Peterwaradin, on the so-called military frontier of Hungary, Oct. 16, 1801; was a son of Baron Franz Jellachich, a field-marshal in the Napoleonic wars; entered the army at an early age; spent many years on the Turkish border in military service; became in 1841 colonel of the first Banat border regiment, and when the Magyar revolution broke out in 1848 threw his great influence with the Slavic populations into the scale in favor of the Austrian empire. At the request of a Slavic committee, Jellachich was appointed to the chief command of the southern districts of the empire, under the mediæval title of ban of Croatia, Slavonia, and Dalmatia. This title theoretically gave him an almost independent sovereignty, which he hastened to use by assembling a Slavic diet, being consecrated in the banate by the bishop, and organizing the Southern Slavonians against the Hungarians. The emperor became alarmed at his proceedings, and at the instance of the Hungarian cabinet, which he was still trying to propitiate, issued a decree depriving Jellachich of his new rank, and summoning him to answer for his conduct; but the sagacious ban of Croatia understood the situation; he not only disregarded all inconvenient orders from Vienna, but after a personal visit to the imperial family invaded Hungary in September, effected a junction with Windischgrätz, aided in the reconquest of Vienna, and participated in the important campaigns of the ensuing year. (See HUNGARY and KOSSUTH.) Jellachich gave no proof of great tactical ability, but the weighty influence he exerted upon the events of the time was rather political than military. He was well educated, and had a profound knowledge of the tendencies and aspirations of the heterogeneous mass of nationalities composing the Austrian empire. Jellachich published a volume of poems in 1850; commanded in 1853 an army of observation on the Bosnian frontier; received the rank of count in 1855; and died at Agram, May 20, 1859.

Jellyfish: See ACALEPHÆ, FAVONIA, and MEDUSA.

Jemappes, *zhā'mäăp'*: town; in the province of Hainaut, Belgium; 3 miles by rail S. W. of Mons (see map of Holland and Belgium, ref. 11–D). Here the raw levies of the first French republic under Dumouriez won a decisive victory over the Austrian army, Nov. 6, 1792. It has extensive manufactures and in the vicinity are large coal mines. Pop. (1891) 11,682.

Jemeel Pasha: See DJEMIL PASHA.

Jena, *yā'năă*: town in the grand duchy of Saxe-Weimar-Eisenach, Germany, on the Saale; 14 miles by rail S. E. of Weimar (see map of German Empire, ref. 5–F). Its university, founded in 1558, was 1787–1806 the most celebrated scientific institution of Germany. Schiller, Schlegel, Oken, Schelling, and Fichte were professors here, and more than 1,000 students heard their lectures. The university still has a high reputation. It is still an important scientific center, and as the center of the Herbartian movement in education has attracted to it many students from the U. S. There are (1894) 600 students and 85 professors. Its library contains 200,000 volumes. On Oct. 14, 1806, Napoleon totally defeated the Prussian army on the heights outside of Jena, and this battle, together with the defeat at Auerstadt on the same day, caused the prostration for many years of Northern Germany. Jena is now a typical quiet university town. Pop. (1890) 13,449. Revised by C. H. THURBER.

Jenckes, THOMAS ALLEN: legislator; b. at Cumberland, R. I., in 1818; graduated at Brown University in 1838; studied law, and became a prominent member of the Rhode Island bar; was clerk of the State Legislature 1840–45, and member of the 38th, 39th, 40th, and 41st Congresses. D. at Cumberland, Nov. 5, 1875. He was the author and advocate of the bill which established a uniform system of bankruptcy throughout the U. S., and in the 40th Congress he introduced a bill to regulate and promote the efficiency of the civil service of the U. S.

Jengis Khan: same as GENGHIS KHAN (*q. v.*).

Jenkin, HENRY CHARLES FLEEMING: physicist and writer; b. near Dungeness, on the Kentish coast, England, Mar. 25, 1833. He was the son of a naval officer, Capt. Charles Jenkin; was educated at Jedburgh, Scotland, then at Edinburgh Academy, where he had for schoolmates Maxwell and Tait, and afterward on the Continent, chiefly at Frankfort, Paris, and Genoa, where his father (retired upon half pay) resided until 1851. On the return of his parents to England in that year he became an apprentice in one of the great machine-shops of Manchester. Subsequently he served as a draughtsman in London, and drifted finally into the work of submarine cable-laying, a field to which he was destined to devote many years of his life (1855–73). Much of his time during this period was spent upon cable-ships, at first in the Mediterranean, later in the transatlantic service, and finally upon the coast of South America. In 1868 he was appointed Professor of Engineering in the University of Edinburgh, and the Scottish capital became his home. D. June 12, 1885. Aside from his many scientific papers, perhaps the most important of which was the now classical memoir embodying the results of the labors of the committee appointed by the British Association for the Advancement of Science to establish certain practical standards, Fleeming Jenkin was the author of a well-known text-book on electricity and magnetism. He was a man of strong artistic feeling, skilled with the pencil, devoted to music and literature. His essays on philosophic and speculative subjects have been accorded a high place. See *Papers of Fleeming Jenkin* (vol. i.), with *Life*, by R. L. Stevenson (1887). E. L. NICHOLS.

Jenkins, CHARLES JONES, LL. D.: statesman and jurist; b. in the district (now county) of Beaufort, S. C., Jan. 6, 1805. His father moved to Jefferson co., Ga., 1816, and Charles was educated partly at the Georgia University and partly at Union College, Schenectady, N. Y., where he graduated in 1824. He studied law, and opened an office in the city of Augusta, Ga. In 1830 he was elected to the Legislature; in 1831 was elected attorney-general of the State, but resigned the position before the expiration of his term of office, and was again returned to the Legislature in 1836, and held the position continuously from 1836 to 1850, ranking among the ablest and most eloquent of the House during all that period, and being its Speaker whenever his party was in the majority. In politics he was trained in the Jeffersonian State's Rights school, but supported Harrison for President in 1840, and Clay in 1844. He was a member of the Union convention of the State in 1850, and as chairman of the committee on resolutions was the author of the celebrated Georgia platform adopted by that body. In 1860 he was appointed one of the judges of the Supreme Court of the State to fill the vacancy occasioned by the resignation of Hon. Linton Stephens. This position he held until the close of the civil war. He was a member of the constitutional convention of the State called under the proclamation of President Johnson in 1865, in that body acted a prominent part, and in the same year was elected Governor of the State without opposition under the new constitution so formed. This position he held until he was superseded by Gen. Thomas H. Ruger, of the U. S. army, who was appointed provisional Governor of Georgia in 1868 under the reconstruction acts of Congress. He was for many years one of the most influential members of the board of trustees of the State University. D. at Summerville, Ga., June 14, 1883.
Revised by C. K. ADAMS.

Jenkins, JOHN EDWARD: author; b. at Bangalore, India, in 1838. He was educated at McGill College, Montreal, and at the University of Pennsylvania. His *Ginx's Baby* (1870), a clever dash at the problems of British pauperism and overpopulation, made a great sensation. His other writings, some twenty-five in number, relate largely to education, philanthropy, colonial questions, and practical politics. In 1870 he was in British Guiana as agent of the Aborigines Protection Society; served as agent-general for Canada 1874–76, and was member of Parliament for Dundee in 1874–80. H. A. BEERS.

Jenkins, THORNTON ALEXANDER: naval officer; b. in Orange co., Va., Dec. 11, 1811; entered the U. S. navy as a midshipman Nov. 1, 1828; served on the east coast of Mexico during the war between the U. S. and that country, and took part in the capture of Tuspan and Tabasco. Commanding a hydrographic party of the Coast Survey 1848–51, he framed the organic law which was passed in 1852 under which the present lighthouse establishment was created and is now administered. In Sept., 1858, he commanded

the sloop-of-war Preble in an expedition against Paraguay, and subsequently (1859–60) on the coasts of Central America and the east coast of Mexico; in 1863–64 was fleet-captain and chief of staff to Admiral Farragut; commanded, temporarily, sloop-of-war Richmond under the guns of Port Hudson; was senior naval officer in command at the surrender of that place to the army and navy July, 1863. He commanded the sloop-of-war Richmond and the second division of Admiral Farragut's fleet blockading Mobile 1863–65; from 1865 to 1869 was chief of the bureau of navigation; in 1850–58, 1860–62, and 1869–71 naval secretary of the light-house board; from 1871 to the date of his retirement in command of the fleet on the Asiatic station. Retired Dec. 11, 1873. D. Aug. 9, 1893. Revised by CHARLES BELKNAP.

Jenks, JEREMIAH WHIPPLE, A. M., Ph. D.: educator; b. at St. Clair, Mich., Sept. 2, 1856; was educated at the University of Michigan and at Halle, Germany; held the positions of Professor of Political Science and English Literature in Knox College, Illinois, and Professor of Economics and Social Science, Indiana State University, Bloomington, Ill., and in 1891 became Professor of Political, Municipal, and Social Institutions at Cornell University. He has published *Henry C. Carey, als Nationalökonom* (Jena, 1885); *Road Legislation for the American State*, American Economic Association (Baltimore, 1887); besides articles in Conradi's *Jahrbücher für national Ökonomie und Statistik*, and in various periodicals, especially on the subjects of trusts and monopolies.

Jenks, JOSEPH: inventor; b. at Hammersmith, near London; emigrated to Lynn, Mass., about 1645; was the first founder who worked in brass and iron in North America, and probably the first inventor. He received from the Massachusetts general court, May 6, 1646, a patent "for the making of engines for mills to go by water," and for making scythes and other edged tools, with a new-invented sawmill. He patented an improvement of the latter process in May, 1655. Jenks is said to have made the dies for the silver coinage of the colony in 1652; he contracted in 1654 with the selectmen of Boston "for an engine to carry water in case of fire"; and in 1667 asked the general court for aid in wire-drawing. Jenks's works were on the river Saugus at Lynn, where he died in 1683.

Jenner, EDWARD, M. D., F. R. S.: inventor of vaccination as a preventive of smallpox; b. at Berkeley, Gloucestershire, England, May 17, 1749; the son of a vicar. He studied surgery at Sudbury and London, where he was a pupil of John Hunter 1771–73; acquired the friendship of Sir Joseph Banks, who procured him the appointment of naturalist on Cook's second expedition, but he retired to his native town in 1773, and became a surgeon-apothecary; received in 1792 his degree from St. Andrews, Scotland; sent to the Royal Society a paper on the cuckoo, which gained him a fellowship in the society. In 1796 he made his first successful arm-to-arm inoculation with the virus of cowpox as a preventive to infection with smallpox. The first idea of this measure had been conceived by him some twenty years before, when he learned that the Gloucestershire peasants considered accidental cowpox (acquired in milking cows) a preventive of smallpox. Observation having convinced him of the truth of the popular belief, in 1770 he communicated his opinion to Hunter, who advised him to continue his observations. In 1798 he announced his discovery, now established by abundant observations, but was almost universally denounced by physicians and clergy, often in the severest language. He published a series of *Inquiries* (1798, 1799, 1800) upon the subject. The importance of his discovery was finally conceded, and he received in all some £37,000 in grants from Parliament and other sources as testimonials to the value of his labors. In Sicily, South America, and Naples religious processions were formed when vaccination was performed, and in Germany the birthday of Jenner was celebrated as a holiday. In his own country he had to encounter a new attack on his discovery in 1818, when a severe smallpox epidemic prevailed; but he was ably defended by Sir Gilbert Blane. D. at Berkeley, Jan. 26, 1823.
Revised by C. K. ADAMS.

Jenner, Sir WILLIAM, F. R. S., K. C. B.: physician; b. at Chatham, Eng., in 1815; was educated at University College, London, where he became in 1848 Professor of Pathological Anatomy, and in 1857 of Chemical Medicine. In 1861 Dr. Jenner was appointed physician to the Queen, and attended Prince Albert in his last illness. He is a member of numerous scientific societies, has contributed largely to medical literature, and was the first to establish the difference in kind between typhus and typhoid fevers. He was created a baronet in 1868, and a Knight Commander of the Bath in 1872, in recognition of his services to the Prince of Wales during a dangerous illness. He has written a number of papers on fever, the acute specific diseases, diphtheria, etc. In 1881 he was president of the College of Physicians. He retired from professional practice in 1889.

Jensen, WILHELM: poet and novelist; b. at Heiligenhafen, Holstein, Germany, Feb. 15, 1837; studied medicine and later on history and philology at Kiel, Würzburg, and Breslau; was for a short time editor of a daily paper in Stuttgart and Flensburg, and is now living at Munich. Jensen has written a great many of shorter and longer novels, all of which show the author's truly artistic intentions as to both contents and form. He has, however, a peculiar mania of making his principal characters the representatives of his own gloomy pessimistic philosophy, especially in stories whose plot is of his own invention. His historical novels are therefore to be preferred, since the historical background of these stories necessarily limits the author's subjectivity. Among his novels may be mentioned *Die braune Erica* (1868); *Nirwana* (1877); *Um den Kaiserstuhl* (1878); *Aus den Tagen der Hansa* (1885); *Am Ausgange des Reichs* (1885); *In der Fremde* (1886); *Kinder von Oudacker* (1890).
JULIUS GOEBEL.

Jen'yns, SOAME: author; b. in London, Jan. 1, 1704; was educated at Cambridge; entered Parliament for Cambridgeshire in 1742, and in 1755 was appointed one of the commissioners of the board of trade and plantations. Jenyns was a poet and wit, but is chiefly remembered for his work *View of the Internal Evidence of the Christian Religion* (1776), which has been often reprinted, has elicited an unusual amount of criticism, and exerted a considerable influence. Though now obsolete, it was long reputed the best argumentative presentation of the Christian evidences. D. in London, Dec. 18, 1787. His complete *Works* appeared in 1790, 4 vols., with memoir by C. N. Cole (2d ed. 1793).
Revised by S. M. JACKSON.

Jeph'thah [from Heb. *Yiphtāḥ*, whom Jehovah sets free]: the ninth judge of the Israelites, a natural son of Gilead of the tribe of Manasseh. After the death of his father he was expelled from his home by his brothers on account of his illegitimate birth, and he withdrew to the land of Tob, where he became the chief of a band of brigands. Later on, when the tribes beyond the Jordan resolved to oppose the Ammonites, they invited Jephthah to become their commander, and he accepted the invitation on the condition that he should remain their ruler if he defeated the Ammonites. This he did. Ussher dates his reign 1143 to 1137 B. C. Others make it much earlier or much later, but all is mere conjecture. A great sorrow came over his house. When setting forth against the enemy he made a solemn vow to the Lord that if he returned home victorious he would offer up for a burnt-offering whatsoever first "came forth from the doors of his house" to meet him. On his return his daughter, an only child, "came first out of the doors of his house" with her companions to greet him with timbrels and dances. At this sight he rent his robes and cried out loudly in despair, but his daughter encouraged him "to do with her according to his vow," and so, after two months, he assented. Up to the twelfth century A. D. it was universally understood, by both Jewish and Christian commentators, that Jephthah actually sacrificed his daughter, and there was among all readers only one feeling—that of admiration for the daughter and of horror at the conduct of the father, but since the twelfth century several commentators have attempted to mitigate the tragical impression of the narrative by proving that Jephthah only condemned his daughter to celibacy and perpetual service at the tabernacle of Shiloh. There is no evidence for this particular alternative, but it is not unlikely that Jephthah fulfilled the vow in some other way than by offering a human burnt-offering to Jehovah.
Revised by W. J. BEECHER.

Jequitinhonha, *zhā-ki-tĕn-yōn'yăa* (called in its lower course the RIO GRANDE DO BELMONTE): a river of Eastern Brazil. It rises near the city of Serro, in the central part of Minas Geraes, and flows with a general E. N. E. course through Minas Geraes and Southern Bahia, to its mouth in the Atlantic near lat. 15° 40′ S. Its length is about 525 miles. The lower course, about 84 miles, is navigable for vessels of a very light draught, but the mouth is obstructed by a shifting sand-bar, which can only be passed under very

favorable conditions. The upper course is full of rapids and rocks, and in one place, on the confines of Minas and Bahia, there is a splendid series of rapids and cascades in a narrow gorge, the river falling 300 feet in the space of a mile; this is the Salto Grande, renowned as one of the finest cataracts in Brazil. The Upper Jequitinhonha flows through open and mountainous land, and some of the most important of the old gold and diamond washings were located on it; the lower course is partly in flat land covered with forest. The river Pardo has its mouth close to that of the Jequitinhonha, and both rivers are joined by a navigable channel. Notwithstanding the difficult navigation, canoes loaded with salt ascend the Jequitinhonha, passing the rapids with great difficulty and danger; at the Salto Grande the cargoes are transferred by land. See Hartt, *Geology and Physical Geography of Brazil* (p. 163, *et seq.*). Herbert H. Smith.

Jeřábek, yĕr'aab-ek Františ'ek V.: dramatist; b. at Sobotka, Bohemia, Jan. 26, 1836; studied theology at Litoměřice, philology at Prague; was employed on the editorial staff of the *Pokrok*, and later (1861) of the *Národní Listy*; was active as a journalist and politician, but finally accepted the position of teacher at the high school for women at Prague, where he died Mar. 31, 1893. Though a lyric poet of merit, he is best known as a dramatist, and is justly considered one of the greatest dramatic writers of Bohemia. His first efforts—*Hana* (Prague, 1858); *Svatoplak* (1859); *Veselohra* (The Comedy, 1861); and *Cesty veřejného mínění* (The Ways of Public Opinion, 1865); and other works—show great talent; and his later productions have become real classics. *Služebník svého pána* (A Servant of his Master, 1871) shows a complete mastery of dramatic technique, and abounds in highly dramatic scenes. His *Syn člověka* (A Son of Man, 1878), is an historical tragedy. The theme of the tragedy *Závist* (Envy, 1885) is taken from Podiebrad's time. In 1883 Jeřábek published a historical work of considerable research, entitled *Stará doba romantického básnictví* (History of Early Romantic Poetry). J. J. Král.

Jer'boa, also written **Gerboa** [from Arab. *yarbū*, flesh of back and loins]: a common name for many small rodents of the family *Dipodidæ*, sub-family *Dipodinæ*, noted for their powers of leaping. They have the hind legs very much longer than the fore, the cervical vertebræ more or less ankylosed, only three toes on the hind foot, and the metatarsals united. The ears are large and rounded, the tufted tail much longer

Jerboas.

than the body, being 10 inches long, while the body is only 6 or 8. The jerboas inhabit desert or arid regions of Africa and Asia, are gregarious, nocturnal, and dwell in burrows. They are to the Old World what the kangaroo rats (*Saccomyidæ*) are to the New. The most familiar species is *Dipus ægypticus* of Northern Africa. See also Jumping Hare.

F. A. Lucas.

Jerdan, William, F. S. A.: journalist; b. at Kelso, Scotland, in 1782; studied law; went to London in 1804, and became a writer for *The Morning Post* and other newspapers. On May 11, 1812, he was instrumental in arresting Bellingham, the murderer of the prime minister, Spencer Perceval. In 1817 he became editor of *The Literary Gazette*, and remained in charge of that influential journal for thirty-four years. In 1821 he was one of the founders of the Royal Society of Literature. On his retirement from editorship a pension of £100 was granted him, and a flattering testimonial was signed by many of the leading public men of the day. Mr. Jerdan wrote four volumes of biographical sketches for *Fisher's National Portrait Gallery of Eminent Personages of the Nineteenth Century*, published his *Autobiography* (4 vols.) in 1852–53, and a supplement entitled *Men I have Known* in 1866. A selection from his memoirs was edited by R. S. Stoddard in the Bric-à-brac Series (New York, 1874). D. at Bushey Heath, Hertfordshire, July 11, 1869.

Jeremi'ah [from Heb. *Yirmeyah*, whom Jehovah (Jah) has appointed]: the second of the greater prophets of the Hebrew canon; began his work in the thirteenth year of King Josiah (ch. i. 2); i. e. about 626 B. C. He survived the fall of Jerusalem (586), so that his work lasted for over forty years. He was born at Anathoth in Benjamin (ch. i. 1; xxix. 27). His father was a priest. During Josiah's reign occurred the invasion of the Scyths (Herod. i. 103–106; see Jer. v. 6, 8, 9). This prophet's life therefore covered the catastrophe of the history of Judah. He had to contend against bigotry, obstinacy, and dogmatism, and to endure persecution. He was imprisoned for speaking words of warning and opposition to the prevailing policy. His warnings fell on ears deafened by fanaticism, and when all was lost, even the hope of retaining some native authority, though under Chaldean supremacy, he fled to Egypt. Whether he afterward went to Babylon, or when or where he died, is unknown, though Jerome and Tertullian say that he died in Egypt, and his grave is shown in Cairo. The version of his book which appears in the Septuagint differs very much from the Masoretic text. The Hebrew contains one-eighth more than the Greek, and the order of the chapters varies. This fact has excited the interest of biblical scholars, but no final explanation has yet been suggested. Tradition attributes to Jeremiah the books of Kings and of Lamentations (*qq. v.*). Revised by W. J. Beecher.

Jérémie, or **Trou-Jérémie**, troo'zha'rā'mee' (from a fisherman who formerly lived there): a beautiful village of attractive aspect in the republic of Haiti; 120 miles W. of Port-au-Prince. It is on the coast near the southwest angle of the island. Pop. 5,000. Near here was born a Negro slave, Alexandre Davy Dumas, the father of the great novelist Alexandre Dumas. M. W. H.

Jer'emie, James Amiraux, D. D.: ecclesiastic and author; b. in England in 1800; graduated at Trinity College, Cambridge, in 1824, having obtained the Norrisian, the Hulsean, and the Members' prizes; became a fellow of Trinity; took holy orders in 1830, and was soon appointed Professor of Classical Literature in the East India College at Haileybury, holding that post twenty years. In 1833 he was chosen Christian advocate for the University of Cambridge, in 1849 Regius Professor of Divinity, and in 1864 Dean of Lincoln. Dr. Jeremie was considered to be one of the most learned divines of his time. He published a *History of Rome from Constantine to the Death of Julian*, and a *History of the Church in the Second and Third Centuries*, both in the *Encyclopædia Metropolitana*; *Christianity in the Middle Ages* (1857); and many other occasional productions, besides editing the sermons of the Rev. Prof. William Archer Butler (1855). Dr. Jeremie preached Latin sermons in St. Paul's Cathedral in 1852 and 1868 before the convocation of the province of Canterbury; also in French in Westminster Abbey in 1862, during the exposition of that year. He resigned his professorship in 1870, and in the same year gave £1,000 to the University of Cambridge to found two annual prizes for the study of biblical Greek. D. June 11, 1872. Revised by W. S. Perry.

Jerez de la Frontera, chā-reth' [Arab. *Sherish*], generally called simply **Jerez** or **Xeres**: a large, rich, and elegant town in the province of Cadiz, Spain; on the Guadalete; 14 miles N. E. of Cadiz. The plain in which it stands is hilly, extremely fertile, densely peopled, and very carefully cultivated; it produces the celebrated Xeres wine (sherry). The town itself is old and surrounded with walls, but its streets are wide and lined with handsome houses; its public buildings are elegant, and it contains many educational and benevolent institutions. Its trade in wheat and wine is very important, about 16,000 quarters of wheat and 4,700,000 gal. of wine being exported annually. Jerez is the classical Asta and the Arab Sherish, which is said

to be a corruption of the Latin *Cæsaris Asylo*. The name often occurs in the Arab chronicles. The town was recovered from the Moors by Alphonso the Wise in 1255. Pop. (1887) 61,708.

Jerfalcon: same as GERFALCON (*q. v.*).

Jerichau, yār'i-chow, JENS ADOLF: sculptor; b. at Assens, island of Fünen, Denmark, Apr. 17, 1816. In 1849 he became a resident of Copenhagen, where he died July 24, 1883. Among his chief works are *Hercules and Hebe*, *The Panther Hunter*, *Christ*, *Adam and Eve after their Fall*, *A Female Slave in Chains*, *David*, and the *Oersted Monument* in Copenhagen. His wife, ANNE MARIE ELISABETH (b. Baumann, 1819–81), was a celebrated painter. Their son, HARALD ADOLF NICOLAJ JERICHAU (b. Aug. 17, 1852; d. Mar. 6, 1878), was a landscape-painter of rank. RASMUS B. ANDERSON.

Jericho [from Heb. *Yerichoh*, liter., fragrant place, or *Yerēchō*, city of the moon]: one of the most flourishing towns of ancient Palestine, known as the city of palm-trees; situated a few miles N. E. of Jerusalem, and 5 miles W. of Jordan (see map of Palestine, ref. 10–D). Its capture and destruction by the Israelites on their conquest of Canaan is related in Joshua vi. Joshua uttered a curse upon him who should presume to make a *fortified* city out of it again (Josh. vi. 26). It was rebuilt, and assigned to Benjamin (Josh. xviii. 21), and inhabited during the time of the Judges and under David (Judg. iii. 13; 2 Sam. x. 5). Notwithstanding Joshua's curse, it was fortified in the days of Ahab, and the builder experienced the curse (1 Kings xvi. 34). The second city was not on the same site as the first. It grew into considerable importance, and is frequently mentioned in the later history (e. g. 2 Kings ii. 4, *sqq.*; 2 Kings xxv. 5; Jer. xxxix. 5, lii. 8; Ezra ii. 34; Neh. vii. 36). Here Simon Maccabeus was murdered (1 Macc. xvi. 11, 14). The New Testament Jericho was the third city of the name, and on a different site, although not far removed. It was visited by Pompey, and raised to great importance by Herod, who resided and died there. It became a priestly city. Here Christ wrought miracles (Matt. xx. 29–34; Mark x. 46–52; Luke xix. 2–10). It was destroyed by Vespasian, but again rebuilt, though not on the same site. The site of ancient Jericho is at Tellor Sultan; of the second city of the name, the entrance to Wady Kelt; modern Jericho, called Erîha, is 1½ miles E. of the second, and is on the north bank of Wady Kelt. It is a wretched village. The road from Jericho to Jerusalem is still infested by robbers, as in the days of the Good Samaritan (Luke x. 30, *sqq.*). The plain of Jericho is naturally very fertile. Revised by S. M. JACKSON.

Jericho, Rose of: popular name of *Anastatica hierochuntina*; a prostrate, branching annual, of the cruciferous family, inhabiting the deserts of Egypt and Palestine. After death the softer green parts disappear, leaving the ligneous framework; this rolls into a ball in drying, is uprooted by the winds, and rolls away. When wetted, the branches expand hygrometrically, so that the plant seems to revive; hence its name, derived from the Greek ἀνάστασις, resurrection.

Jericó, hā-rĕe-kō': a city of Antioquia, Colombia; 31 miles S. S. W. of Medellin; near the river Cauca (see map of South America, ref. 2–B). It is built on a mountain-side overlooking the Cauca valley, has a pleasant and salubrious climate, and is the center of a rich grazing district. Jericó is a modern town with a brisk trade, and is rapidly growing. Pop. (1892) 11,593. H. H. S.

Jeroboam [from Heb. *Yārobeām*, whose people are many]: the name of two Kings of Israel. JEROBOAM I., the founder of the kingdom, was a son of Nebat. By Solomon he was made superintendent of public works, but having been informed by the prophet Ahijah that according to divine appointment he should become king over the ten tribes, he entered into conspiracies, and was compelled to flee to Egypt. When Solomon died (975 B. C., Ussher), Jeroboam returned and headed the deputation appearing before Rehoboam; and when the demands of the deputation were refused the ten tribes separated from Judah and Benjamin and chose him for their king. He took up his residence at Shechem, and the most prominent tendency of his reign of twenty-two years was to make the breach between the two kingdoms as wide and deep as possible. For this reason he forbade his subjects to resort to the temple at Jerusalem, and established shrines at Dan and Bethel, where golden calves were set up as symbols of Jehovah.—JEROBOAM II. was the fourteenth King of Israel, the son and successor of Jehoash (825–784 B. C., Ussher). He carried on successful war against the Syrians, from whom he took the cities of Damascus and Hamath; Ammon and Moab were also conquered. Indeed, he recovered the whole of the northern kingdom, having reduced all the revolted countries on the E. of the Jordan; but he kept up the idolatry of the golden calves.
Revised by W. J. BEECHER.

Jerome, je-rōm', or jer'ŭm, JEROME KLAPKA: author; b. at Walsall, England, May 2, 1861; son of a colliery proprietor in the west of England; was educated at the Philological School, Marylebone; has spent most of his life in London, and has been clerk, schoolmaster, shorthand-writer, reporter, actor, and journalist. He has written *On the Stage and Off* (1885); *Idle Thoughts of an Idle Fellow* (1886); *Three Men in a Boat* (1889); *Novel Notes*; and several plays and farces. In 1893 he started *To-day*, a weekly magazine-journal. C. H. T.

Jerome, SOPHRONIUS EUSEBIUS HIERONYMUS, Saint: b. of a wealthy family about 345 at Stridon, a town on the confines of Dalmatia and Pannonia; received a very careful education, completed in Rome; traveled in Gaul; was baptized, and lived for some years at Treves and Aquileia; went in 373 to the East, where he visited Antiochia, and retired in 374 to the desert of Chalcis, where he spent four years in ascetic practices and in studies, especially of the Hebrew language. Having been ordained a presbyter by Bishop Paulinus of Antioch, he repaired to Constantinople in 380 to hear the celebrated Gregory Nazianzen, and while there he translated into Latin the chronicle of Eusebius and the homilies of Origen on Jeremiah and Ezekiel. In 382 he returned to Rome, where he lived in intimate connection with Bishop Damasus until Damasus's death in 384. In Rome he made a great impression by his passionate praise of asceticism and monastic life. Many became his enemies, but many others, especially among the rich and noble ladies, were his firm adherents; and one of these, Paula, followed him to Palestine, and in 386 settled in Bethlehem, where she built four convents—three for nuns and one for monks; over the latter she placed St. Jerome, and in it he died, Sept. 20, 420 (traditional date). During his residence in Rome he began, at the instigation of Damasus, a critical revision of the Latin translation of the Bible, the Vulgate; this he afterward discarded for a new translation into Latin from the original, and this work, which he finished in Bethlehem, is his chief work and the foundation of his great fame. It was for many years unpopular, but by its merits won its way and became the Bible version of Latin Christianity, and was endorsed by the Council of Trent as authentic (Schaff's *Creeds*, ii., 82). Besides he wrote a great number of controversial papers against Helvidius, Jovinianus, Vigilantius, Rufinus, and the Pelagians, and several exegetical relating to the Old Testament. The best edition of his works is that by Vallarsi (11 vols., Verona, 1734–42), reprinted in Migne, *Pat. Lat.*, xxii.–xxx.; English translations of his *Lives of Illustrious Men*, and *Apology in Reply to Rufinus* in vol. iii. of *Nicene and Post-Nicene Fathers* (New York, 1892); and his *Principal Works*, including his letters, and with elaborate prologemena, historical and critical, in vol. vi. of the same series (1893). See Zöckler, *Hieronymus, sein Leben und Wirken* (Gotha, 1865), and Amédée Thierry, *Saint-Jérôme, la Société Chrétienne à Rome* (Paris, 1867). Revised by S. M. JACKSON.

Jerome Buonaparte: See BONAPARTE, JÉRÔME.

Jerome (or **Hieronymus**) **of Prague**: reformer: b. about 1375; was descended from a noble Bohemian family of the name of FAULFISCH; studied in his native city, in Paris, Cologne, Heidelberg, and Oxford, and attracted everywhere great attention by his learning and brilliant gifts. While at Oxford he became acquainted with the writings of Wycliffe, and he espoused the ideas of the English Reformer with his whole heart. On his return to Prague he found that these ideas were well known there, and he immediately allied himself to the Bohemian reform party under the leadership of HUSS (*q. v.*). In learning and eloquence he surpassed Huss, but he lacked his wisdom; he was violent, and even rude: once in a dispute with a monk he threw his adversary into the Moldau. When he heard that Huss had been imprisoned in Constance he immediately hastened to the rescue of his friend. Having failed in procuring a safeguard, and finding himself unable to do anything to aid Huss, he determined to return home, when (Apr. 25, 1415) he was seized at Hirschau in Suabia, put in chains, and delivered to the council. The great indignation which the execution of Huss (July 6, 1415) excited

made the council hesitate in the case of Jerome. He was kept in a dungeon, and for a long time was fed on bread and water. Thus worn in body and mind, he recanted his opinions on the doctrine of transubstantiation (Sept. 11, 1415); but this did not satisfy the council. He was subjected to new examinations on still more serious accusations, and he declared himself ready to answer any questions on the condition that the hearing should be public. On May 23 and 26, 1416, the examination took place, and he ended by disclaiming in a most passionate manner his former recantation, declaring it the greatest sin he had committed in his life. His condemnation was now sure to follow. On May 30 he was sentenced and burned at the stake, and his ashes were strewn on the Rhine. See Krummel, *Geschichte der Böhmischen Reformation* (1867); and Czerwenka, *Geschichte der Evangelischen Kirche in Böhmen* (1869).

Revised by C. K. Adams.

Jerrold, Douglas William: humorist; b. in London, Jan. 3, 1803; the son of the manager of a theater; became midshipman in the navy 1813–15, and was apprenticed in 1816 to a printer. His first play, *More Frightened than Hurt* (1818), after some years of neglect, was very successful. The comedy *Black-eyed Susan* (1822) established his reputation. *Rent Day* (1830), *Men of Character* (a collection of republished tales, 1838), *Bubbles of the Day* (1842, a comedy), *Time works Wonders* (1845), *The Caudle Lectures* (first published in *Punch*, with which he became connected in 1841), and numerous other plays, sketches, and tales, widely extended his fame as a humorist and a powerful delineator of character. He twice failed as a publisher of newspapers, and once as a theatrical manager, but his connection (1852-57) with *Lloyd's Weekly* was very successful. D. in London, June 8, 1857. Revised by H. A. Beers.

Jerrold, William Blanchard: author; eldest son of Douglas Jerrold; b. in London, England, in 1826; was educated as an artist, and illustrated some of his father's articles, but later gave his attention to literature. In 1849 he married a daughter of Laman Blanchard. He was long prominently connected with the London press. Among his works are several comedies and farces: *Cool as a Cucumber* (1851); *Cupid in Waiting* (1870), etc.; novels: *The Disgrace of the Family* (1847); *Up and Down in the World* (3 vols., 1866), etc.; sketches: *Swedish Sketches* (1852); *Imperial Paris* (1855); *Life of Douglas Jerrold* (1858); *At Home in Paris* (1864); *The Cockaynes* (1871); and a multitude of articles in various London papers. Also *London* (1872), illustrated by Doré, and *Life of Napoleon III.* (4 vols., 1874–84). He gave special attention to the condition of the poor in Paris and London. D. Mar. 10, 1884.

Jersey [from Lat. *Cæsare'a*, deriv. of *Cæ'sar*, Cæsar, applied as a name to many places]: the largest of the Channel islands; situated in the English Channel; 16 miles W. of the coast of France, and 100 miles S. of the coast of England. Area, 28,717 acres, of which nearly 20,000 acres are under cultivation. Pop. 54,518, of whom 13,000 are English and 2,000 French. The natives speak a kind of Norman-French, as the island originally belonged to the French province of Normandy. The ground is high and rocky, but presents many fertile valleys, which, on account of the fine, mild, and equable climate, are well adapted for the cultivation of fruits. The climate of Jersey is somewhat colder in the winter and warmer in the summer than that of Guernsey. The annual mean temperature is 51°, the rainfall about 30 inches, and the number of days upon which rain falls about 150. The wettest season is from October to January, but rain seldom continues long. The island has a very early spring and a protracted autumn. Snow and frost are rare, though dense fogs are of frequent occurrence; fruits and flowers indigenous to warm climates freely grow in the open air. Large quantities of peaches, apricots, apples, pears, grapes, and melons are annually exported to London. The oyster-fisheries form another extensive branch of industry. Ship-building is also important. The principal occupation, however, of the inhabitants of the island is dairy-farming. The number of cattle gives a considerably larger average to every acre under cultivation than is found in any other place in the United Kingdom. The breed is that commonly known as the Alderney, and it is kept pure by stringent laws against the importation of foreign cattle. The milk is used almost exclusively for the manufacture of butter. The island, on account of its climate, is a great resort for people of delicate health. The principal towns are St. Helier's and St. Aubin.

Jersey City: city (originally known as Paulus Hook, laid out 1804, incorporated as a village 1820, chartered as a city under its present name 1838); capital of Hudson co., N. J. (for location, see map of New Jersey, ref. 2–E); on the Hudson river, opposite New York city, with which it is connected by several steam ferries; terminus of the Cent. Railroad of N. J., the Easton and Amboy, the Erie, the N. J. and N. Y., the N. Y. and Greenwood Lake, the N. Y., Ont. and West., the N. Y., Susq. and West., the Northern of N. J., the Penn., and the W. Shore railways. It is also the terminus of the American (freight), Guion, Knott Prince, Manhanset, and Red Star steamship lines. The city is noted for its large foreign commerce, its extensive manufactures, and its stock-yard and slaughter-house interests. As the city is included in the customs district of New York, no separate official account of its imports and exports is kept. Its manufacturing establishments include tobacco-factories and sugar refineries that are among the largest in the world; glass, locomotive, crucible, iron, steel, zinc, tin, copper, and boiler works; graphite pencil, oakum, soap, and candle factories; and potteries, foundries, and machine-shops. There are two very large grain-elevators, owned by the Penn. and the Erie railways. There is an extensive abattoir in the north part of the city, near the river-front, and another in the northwest part, on the Hackensack river, both connected with the railways. It is on these abattoirs that New York city mainly depends for its daily supply of meat. In 1893 there were 88 churches, a high school, 24 grammar schools, 4 convents, 5 libraries of all kinds which contained 36,859 volumes, and 2 daily, 4 weekly, and 8 monthly periodicals. The assessed valuations of taxable property were: real $78,174,530, personal $6,894,450, total $85,068,980; tax rate $27.50 per $1,000; and tax budget for 1893–94, $1,979,693. The city debt, including a water debt of $5,136,000, was $18,756,220; treasury resources and sinking funds, $10,338,373; net debt, $8,417,847. There were 4 national banks, with combined capital of $1,100,000, 3 savings-banks, with surplus of $602,517, and a title guarantee and trust company, with a capital of $200,000. The township of Van Vorst was annexed to the city in 1851, the cities of Hudson City and Bergen in 1870, and the village of Greenville in 1872. Pop. (1880) 120,722; (1890) 163,003.

Editor of "Journal."

Jerseyville: city; capital of Jersey co., Ill. (for location of county, see map of Illinois, ref. 8–C); on the Chi. and Alton, and the St. L., Chi. and St. P. railways; 19 miles N. W. of Alton, 45 miles N. of St. Louis, Mo. It is in an agricultural region; has manufactures of flour, plows, carriages and wagons, and watch-making machinery; and contains nine churches, court-house (erected in 1893–94, at a cost of $45,000) graded public school, school for colored children, convent, railway-car shops, electric lights, artesian wells, and a monthly and two weekly periodicals. Pop. (1880) 2,894; (1890) 3,207.

Editor of "Jersey County Democrat."

Jeru'salem: chief city of Palestine; the capital of the ancient united kingdom of Israel and Judah; in lat. 31° 46′ 50″ N. and lon. 35° 13′ 25″ E.; lying on the very summit of the great mountain-ridge which extends from the plain of Esdraelon to the southern desert, the ridge itself being higher farther S., near Hebron, where it reaches an elevation of 3,000 feet above the Mediterranean Sea (see map of Palestine, ref. 10–D). At Jerusalem (Mount of Olives) the elevation is 2,700 feet. The highest part of the city itself is 2,600 feet (Kasr Jalud). From the Mount of Olives the descent is rapid to the Jordan valley, the grade being 3,700 feet in 10 miles. Westward the descent is more gradual to the plain along the Mediterranean coast, about 2,500 feet in 15 miles. The city is 29 miles E. of the Mediterranean, and 33 miles S. E. of its port, Joppa, with which it is connected by rail. Pop. (1887) 43,000.

The name *Jerusalem* is the Greek form (Ἱερουσαλήμ), as found in the Septuagint, of the Chaldee *Jerush'lem*. In the New Testament it is written both as in the Septuagint and also *Jerosolyma* (Ἱεροσόλυμα), the evangelists, with the exception of Luke, using almost exclusively this latter form, while in Luke (including the Acts) and in the Epistles the former form is generally preferred. The Hebrew name is *Jerushalaim*, *Yerushalaim*, or *Yerushalayim* (the full form is ירוּשָׁלַיִם). The form on Maccabee shekels is either ירוּשָׁלֵם or ירוּשָׁלִם. The punctuation of the termination as a dual is probably a Masoretic refinement upon an unpointed text. The name was very early made the subject of etymological

s and texts. For example, it was divided into יראו שלם, and interpreted "they shall see peace." This rendering underlies Ps. cxxviii. 5, "that thou mayest see the good of Jerusalem . . . peace upon Israel," and probably Isaiah xxxiii. 20, "thine eyes shall see Jerusalem a quiet habitation" A. V.). To obtain the true etymology we must go back through the Syriac to the Assyrian equivalent. In Syriac the name is written אורישלם, while the Assyrian form is *Ur-Salimmus*. Traces of a primitive pronunciation agreeing with these forms are said to still exist in Palestine. We have, then, to do with a name analogous to Ur-Casdim (Ur of the Chaldees), whose interpretation may be either "City of Peace" or, which is nearly the same thing, "City of the God Salem." It is curious that false etymologies have also been current for the Greek name of the city, Ἱερουσαλήμ; the pious connected it with *ἱερὸς*, and hence we have the Greek Ἱεροσόλυμα; the profane coupled it with *ἱερυσυλέω* (see Josephus, *C. Apion*, i., 34), and it is probable that St. Paul alludes to this derivation in Rom. ii. 22, "thou that abhorrest idols, dost thou commit sacrilege (*ἱεροσυλεῖς*)?"

History.—*First Period* (c. 1450 to B. C. 1048).—The earliest biblical reference to Jerusalem is in Gen. xiv. 18, where Melchizedek, King of Salem, who is also a priest of El-elyôn, brings forth bread and wine to Abraham on his return from the slaughter of certain invading kings, and receives from him a tithe of the spoils in token of fealty.

The earliest non-biblical mention of the city is not long subsequent to the previous case. Excavations made at Tell-el-Amarna, about 180 miles up the Nile from Memphis, have brought to light numbers of clay tablets, which belong to the foreign office of King Amenophis IV. (Khu-en-aten), and throw much light on the relations between the Egyptian Government and subject cities in Palestine and Syria in the fifteenth century B. C. Curiously, these documents are written in the Babylonian language, a fact which speaks volumes for the wide and early diffusion of the civilizing influences of the great empire of the East, and for its historical connection with the Egyptian civilization. Among the dispatches in the Tell-el-Amarna collection are a number from Ebed-tob, the governor of Jerusalem. These dispatches indicate a very unsettled state of the country and a decline of the Egyptian power. Conspiracies and confederations were being formed, and, if we may believe Ebed-tob, the loss of Jerusalem was imminent unless reenforcements were sent from Egypt. Letter after letter is sent by the governor, of which the following may be taken as a specimen: "The country of the king has gone over to the confederates, and now at this moment the city of the mountain of Jerusalem, the city of the temple of the god Uras, whose name there is Salim, the city of the king, is separated from the locality of the men of Keilah. May the king listen to Ebed-tob, thy servant, and may he dispatch troops, and may he restore the country of the king to the king." The confederates in question, in all probability, had their headquarters at Hebron (a name which means confederacy), and it may be suspected that Jerusalem passed into their hands at the death of Amenophis IV., when much unsettlement prevailed in Egypt.

From the documents referred to we may be sure that even at this early period Jerusalem contained a temple and a fortress, probably administered by a priest-king, who was at the time of the correspondence a vassal of Egypt. Ebed-tob's language, and especially the mention of the local divinity Salim, renders it reasonably certain that the events in Gen. xiv. are actual history.

The next reference is in Joshua xv. 8, where it is called the "shoulder" (*ketheph*) of the Jebusites (as in ch. xviii. 16), an admirable description of the projection of Mt. Zion, as it appears from the boundary-line of Judah and Benjamin, there described as running along the south side of the city. The Jebusites held it as their special stronghold, and hence the name Jebus (i. e. the Jebusite city) is given it in Judges xix. 10, 11, and 1 Chron. xi. 4, 5. The Jebusites seem to have been territorially one of the smallest of the Canaanitish nations, but from their position one of the strongest. Their king, Adoni-zedek, was slain by Joshua at Makkedah after the battle of Beth-horon (Josh. x.). After Joshua's death the Israelites made their first assault upon the city. The tribes of Judah and Simeon succeeded in taking it and setting it on fire (Judges i. 8), when on their way to complete the settlement of their lot. This capture of the city must have been but partial (as Josephus says), for the tribe of Benjamin, to which it was assigned, left the Jebusites in quiet possession of a part of the city, the upper city (*ἡ καθύπερθεν*) on Zion (Judges i. 21). For nearly four centuries the citadel of Jerusalem remained in the possession of the Jebusites, and probably during that time its Canaanitish inhabitants thoroughly fortified it, adding to its natural strength all that the art of that day could suggest. It is not likely that during those centuries a state of war continued between the Jebusites and the Israelites, but that some sort of peaceful intercourse was maintained, in which Jerusalem, or the chief part of it, was tacitly understood to belong to the Canaanitish tribe. During all this long period the central capital was at Shiloh, except, as in Saul's reign, Gibeah, his residence, may claim the precedence. It may be that the fact of Saul's capital, Gibeah, being only 4 miles N. of Jerusalem, was one inducement to David to seek to set up his throne in the Jebusite stronghold. It would be more central than Hebron, where he had begun his reign, and it would also be in the tribe of Benjamin, which had under Saul been the royal tribe, while its strength would make it far more desirable than Gibeah or Shiloh. Indeed, the latter city was probably already destroyed by a Philistine invasion. (See Jer. vii. 12.) Whatever the motive may have been, David, in the eighth year of his reign, organized an attack upon Jerusalem when the enthusiastic adhesion of all Israel to his government rendered success most probable. The diversion in the direction of the house of Saul would have seriously interfered with such a project earlier in David's reign. Joab, David's chief captain, took a conspicuous part in the siege (1 Chron. xi. 6), which was marked by the self-confidence of the Jebusites and daring valor on the part of Israel. The strong citadel was taken, and called afterward "the city of David." We may be sure that this citadel was Zion, and that Millo was its bluff front on the valley of the Son of Hinnom. From David's conquest of Jerusalem dates its fame. Probably before that time it was of no more consequence than any well-placed stronghold, but now the concentrated royalty of the twelve tribes made it the seat of power and glory, and for 460 years, until Nebuchadnezzar destroyed it, it stood forth as one of the conspicuous capitals of the world, vying at one time, in some respects, with Nineveh, Babylon, Tyre, and Thebes.

Second Period (1048 B. C. to 586 B. C.).—David immediately turned his attention to the reconstruction and strengthening of his new city, and when this work was accomplished had the ark of God, which had been for a century at Kirjath-jearim (ever since the great Philistine invasion of Eli's time and most probably the destruction of Shiloh), conducted with great pomp and jubilation to the royal city and placed in a new tabernacle especially prepared for it, the old Shiloh tabernacle being at Gibeon, 5 miles N. of Jerusalem (2 Chron. i. 3, 4). David may have already had in his mind the construction of a grand temple in place of the old tabernacle, and therefore have preferred to bring the ark to Jerusalem, where the future structure would be reared, rather than carry it to the old tabernacle at Gibeon. The rest of the tabernacle furniture was doubtless at Gibeon. The brazen altar, we are expressly told, was there. This position of the ark on the large citadel-hill (Zion) continued for forty years, making the name Zion a favorite name for the city, especially when viewed as a *holy* city, a center of worship. The consolidation and strengthening of the whole Israelitish commonwealth in David attracted the attention of his powerful neighbor, the King of Tyre, who did him the high honor of building the royal palace in Jerusalem with material and workmen from the Phœnician kingdom (2 Sam. v. 11). David's conquests over the Syrians, Moabites, Ammonites, Philistines, Amalekites, and Edomites extended the territory of his empire to the Euphrates on the N. E. and to the Red Sea and Mediterranean on the S. and W., making his dominion the most conspicuous in the world at a time when the Assyrian empire had fallen into feebleness between its exaltation under the first Tiglath-pileser and its renewed glory under Asshur-nazir-pal. During this period of David and Solomon, Egypt, the other great monarchy, seems to have been in a like low plight with Assyria, previous to the accession of the new and powerful dynasty of Shishak. From Hiram's conduct we may readily see that the Israelitish kingdom out-topped Tyre, so that the throne of David and Solomon must have represented the grandest empire then existing on the earth. Of this empire Jerusalem was the central seat, which naturally, under such influences, began to assume an extent and grandeur corresponding with its important position. Especially under Solomon, in his peaceful reign, did the city grow into magnificence.

What war had before done, commerce now accomplished, and Jerusalem received a vast stream of wealth from its active relations with many rich and distant countries. Egypt, Arabia, Tyre, Ophir (India?) and perhaps Tarshish (Spain?), are especially spoken of as connected with Jerusalem by important commercial ties at this time, by which this capital became an entrepôt of trade for all the subject kingdoms of Syria (1 Kings x. 29). With the enormous wealth thus acquired, and that laid up by his father, Solomon erected the temple on the rocky height opposite Zion, which David had prepared for the purpose, having purchased the site from Araunah the Jebusite.* The sharp ridge of the height was taken off and the surface leveled, vast vaults being erected to support extensions of the level, and on this grand, conspicuous area of nearly 1,000 feet square one of the most costly shrines the world has ever seen was erected by the monarch. With men and materials from Tyre (the center of mechanical art) he raised the massive structure (whose wall-stones, still bearing the Tyrian marks, astonish the explorer), completing the work in seven years. He also erected a palace of corresponding grandeur for himself, which occupied thirteen years in its construction. Another superb edifice, erected for state occasions and called the House of the Forest of Lebanon (perhaps because of its many cedar pillars), was constructed at the same time. The walls of the city also received his attention. These were extended around suburbs, increased in height, strengthened with towers, and probably increased into fortresses at such points as Millo and Orphel, where already fortresses existed. A palace was built for Solomon's queen, the daughter of the Egyptian monarch, and doubtless his thousand wives and concubines called for an enormous outlay in architecture. The monarchy and the gorgeous temples together seduced Israel from its simplicity and destroyed its separateness from the nations, so important for its great spiritual mission. Commercial intercourse with the nations, by which the wealth was secured, and royal pomp which sought the wealth, brought into the country the idolatry and immorality of other lands, with all the recklessness and oppression that follow human aggrandizement, so that just when the nation seemed to be most exalted it was preparing its ruin. It is remarkable that (in accordance with the prophetic declaration that the Babylonian captivity should last long enough for the land to make up its lost sabbatical years—Lev. xxvi. 34, compared with 2 Chron. xxxvi. 21), if we count backward from the year B. C. 518 (the end of the seventy years), the seventy sabbatical years, or 490 years, we reach B. C. 1008, the period of Solomon's greatest glory. In the worldliness of this magnificent reign the keeping of the sabbatical year declined. Solomon was succeeded by Rehoboam, a foolish *porphyrogenitus*, who soon began to experience the evil results of his father's extravagant policy. The kingdom was divided. Jeroboam, returning from Egypt, where he had been an exile protected by Shishak, the Pharaoh during the later years of Solomon, became king of the northern realm, and Jerusalem was left the metropolis of the tribes of Judah and Benjamin only, and of the subject countries at the S. and E. This fearful schism in the nation and the tempting treasures of Jerusalem brought Shishak (perhaps through Jeroboam's influence) from Egypt against the Holy City. This enterprising and illustrious monarch made his attack upon the kingdom of Judah in the fifth year of Rehoboam with an enormous host of Egyptians and foreign auxiliaries. The glory of Jerusalem had for two generations eclipsed that of Egypt. Egypt would now have its revenge. The fortified cities of the Judæan kingdom fell one after another. Although they are not specified, we may readily suppose that Gath, Mareshah, Lachish, and Bethlehem, among those places which Rehoboam had lately fortified against Egyptian attack (2 Chron. xi. 6–10), were overcome by Shishak to clear his way to Jerusalem. In the city had assembled all the dignitaries of the realm, who, at the word of the prophet Shemaiah, humbled themselves with the king before God, and so averted the evil. The Egyptian seems not to have entered the city,† but a treaty was made, most humiliating to Judah, by which the kingdom became tributary to Egypt, and the treasure accumulated in the temple and royal palace was delivered up to Shishak, who also carried off the 500 shields overlaid with gold which Solomon had placed as ornaments in his stately House of the Forest of Lebanon. The gold of these shields alone represented a sum of $720,000—a sum of vast magnitude in those days. Abijah, the successor of Rehoboam, by his great victory over the kingdom of Israel, helped Jerusalem to recover from this blow, but it was not till the year B. C. 941, more than thirty years after Shishak's disastrous raid, that Jerusalem regained her independence and dignity by the complete overthrow of the Ethiopian Zerah (supposed to be Pharaoh Usarken I.) at the battle of Mareshah, to which point he had penetrated, with an army like that of Shishak's, against Asa, Rehoboam's grandson. This great victory filled the kingdom with joy, restored treasure to Jerusalem, drew many Israelites of the northern kingdom to the city, and caused a reform in the religious condition of the people, who had been led astray from Solomon's day. Soon afterward Asa took the new treasure, which he had placed in the temple in lieu of that which Shishak had seized, and gave it as a bribe to Benhadad, King of Syria, that he might attack Baasha, King of Israel. The prosperity which Asa brought to Jerusalem continued for fifty years—a period of national power and dignity that was to be followed by the evils of a close alliance with idolatrous Israel in the union of Jehoshaphat's family with the corrupt family of Ahab and the Tyrian Jezebel. Jehoram, Jehoshaphat's son and Asa's grandson, married Athaliah, daughter of Ahab and Jezebel. Through her the abominations of idolatry again filled the royal city. Jehoram began his reign by murdering his six brothers. He ended it with the successful revolt of Judah's dependencies, and a fearful onslaught of the Philistines and Arabians upon Judah itself, in which the enemy carried off many of the king's wives and all his sons but one, with all the treasure found in one of his country palaces.* When Jehoram died, and his son Ahaziah had been slain by Jehu, Athaliah immediately slew her grandchildren (one only, Joash, escaping the massacre), and for six years wielded her usurped authority. Thus for fifteen years the prevalence of Baal-worship in Jerusalem caused the temple to fall into decay; indeed, Athaliah's family had even defaced the holy shrine and carried off the sacred vessels for use in Baal's temples. The piety and patriotism of Jehoiada, who had preserved the infant prince Joash, put an end to these enormities by slaying the guilty queen and the priests of Baal, and restoring the worship of Jehovah; but when Jehoiada died at the remarkable age of 130 years, a state policy led King Joash to restore idolatry and to slay Jehoiada's sons (among them Zechariah, the high priest) in the court of the temple while they were protesting against the apostasy. This event shows how deeply seated in the public regard was the idolatry which first Solomon and then Jehoram had fostered, and which the people doubtless connected with their grandeur before the nations. Not long after, Hazael, the energetic King of Syria, besieged and took Gath, and then turned toward Jerusalem, defeating the Judæan army on the way and making havoc everywhere, when Joash purchased deliverance for the royal city only by giving up to Hazael all the sacred vessels which had been accumulated since Asa's day, 100 years before, together with all the ecclesiastical and royal treasure in the city. Although this invasion of Judah was most disastrous to the country, involving immense loss of treasure and the death of all the prominent nobles who attempted to stop the progress of the Syrian king, yet the record gives no countenance to the idea that Jerusalem was captured either by him, by the Philistines in Jehoram's day, or by Shishak in Rehoboam's day. Its capture from the Jebusites by King David was thus far the only seizure of the famous stronghold. The first actual capture of the city after David's conquest was made by the Israelitish monarch Joash, who had been provoked to war by Amaziah, King of Judah, son of the Jerusalem Joash. The King of Israel, after defeating Amaziah at Bethshemesh, appeared before Jerusalem, and probably through the Jewish king, whom he held as prisoner, obtained entrance into the city, which he plundered, and 400 cubits length of whose wall he leveled. This was about the year 826 B. C., more than two centuries after David's conquest of the Jebusite stronghold. Uzziah, Amaziah's successor, in his long and prosperous reign repaired the injury done to the walls of the city and added to its fortifications. It was in this

* Probably he was the very Jebusite king whom David had conquered thirty years before. The Hebrew words of 2 Sam. xxiv. 23, literally translated, are, "Araunah the king gave the whole to the king."

† Josephus says that Shishak entered the city without a battle, but if this had been the case we should have expected a more thorough ruin of the city. Where Josephus enlarges on the sacred narrative he is often using his imagination.

* No mention is made of Egypt entering Jerusalem, 2 Chron. xxi. 17. Probably the royal family were sojourning elsewhere.

reign that the great earthquake occurred which is referred to as a memorable epoch by the prophets Amos (i. 1) and Zechariah (xiv. 5), and which is by Josephus connected with the king's sacrilege (*Ant.*, 9, 10, 4). If we disregard the statement of Josephus, we may believe that this extensive building of the walls and fortifications may have been suggested by the ruin caused through this grievous visitation. In the reign of Jotham, Uzziah's son, the "high gate" of the temple was built (perhaps the predecessor of the "beautiful gate" of Herod), and the wall of Ophel was erected. If Ophel was the southern spur of Moriah, as seems quite proven, it is hardly possible that it was not fortified to some extent from Solomon's day. Jotham probably added to its fortifications or rebuilt those that had been destroyed. This enterprising king also erected fortresses throughout the kingdom. Ahaz, Jotham's son, sustained fearful defeats from Rezin, King of Syria, and Pekah, King of Israel, so that he called upon Tiglath-pileser, King of Assyria, to come to his aid. This alliance was purchased by despoiling the temple and royal palace in a far more wholesale manner than it had been done by Rehoboam, Asa, or Joash. Ahaz, in his infatuation with the Assyrian alliance, removed the brazen altar, built a new one of heathen pattern in its place, and defiled the temple itself with idolatrous rites. Hezekiah, succeeding his father Ahaz, immediately restored everything to its original service, purified the temple, and celebrated the Passover with unusual solemnity. During Hezekiah's reign occurred the formidable invasion of Sennacherib, King of Assyria, against which Hezekiah prepared the city with wonderful industry and in the most thorough manner. Although the kingdom was devastated, the city was saved, yet with a new stripping of temple and palace as a tribute to the great conqueror. (See Sennacherib's own account in the Nineveh records.) This was the sixth time within three centuries that the treasures of Jerusalem had been seized. Manasseh, Hezekiah's son, had a long and eventful reign. He brought back all the idolatries which his father had removed, even putting an image of Baal in the temple itself. Esar-haddon, King of Assyria, who reigned in Babylon, subjected the kingdom of Judah, as his father Sennacherib had done, and managed to seize the person of Manasseh and carry him captive to Babylon. On humbling himself before God, he was released from his captivity, returned to Jerusalem, and added to the fortifications of the city on the N. W. and S. E. But it was not till the reign of Josiah, Manasseh's grandson, that the idolatrous objects in and around Jerusalem were thoroughly removed. Under an impulse caused by the discovery of a copy of the Mosaic Law (a discovery which shows the lamentable condition of the nation during the preceding reigns), Josiah not only purified the temple precincts, which were filled with vessels consecrated to Baal and Ashtoreth and to the heavenly bodies, and where houses of abomination had been erected, but he also defiled Tophet in the valley of the Son of Hinnom, where the Moloch-worship had been held, destroyed the altars which had been erected in the royal quarters, and made utter havoc of all the idolatrous shrines in the vicinity of Jerusalem which Solomon had erected, and which had been allowed to stand for 400 years, perhaps because of their architectural beauty. At the end of thirty-one years' reign the body of Josiah was brought from the fatal battle-field of Megiddo (where the king had foolishly met Pharaoh-necho in his march against the Oriental empire), and buried in Jerusalem. Then followed the sad reigns of Josiah's three sons and one grandson. Jehoahaz, the first (though not the oldest), succeeded his father, taking precedence of Jehoiakim, perhaps because of the latter's inclination to an Egyptian alliance. In three months the victorious Necho dethroned him and carried him captive to Egypt, putting Eliakim or Jehoiakim in his place. A few years after, the Oriental empire of Nebuchadnezzar asserted its supremacy over Egypt, and Jehoiakim was obliged to become a vassal to that distinguished monarch. Three years later he rebelled against the Babylonian, and brought upon him the full force of Nebuchadnezzar's fury. The conqueror seems to have seized the person of the king to carry him to Babylon, and then to have permitted him to ransom himself by the delivery of much of the treasure of the temple. At Jehoiakim's death a new siege of the city by Nebuchadnezzar occurred, and the city was saved only by the delivery to Nebuchadnezzar of the young king, Jehoiachin, Jehoiakim's son, with his mother, wives, and court, and all the treasure that could be gleaned from the temple and the palace. At this time also the Babylonian monarch made a vast deportation of the higher classes, as well as the craftsmen, to Babylon. The manner in which this is narrated in the sacred story seems to show that the city was not entered by the victorious monarch. Nebuchadnezzar placed Mattaniah, Josiah's youngest son, on the throne, changing his name to Zedekiah. This weak and foolish king, trusting in an Egyptian alliance, dared to rebel against Babylon, and brought upon Jerusalem its destruction by Nebuchadnezzar in the year B. C. 586. After a siege of eighteen months, famine and superior numbers conquered the holy city. The walls were leveled, the temple and royal palace and the whole city were burned, and everything worth carrying off became plunder to the exasperated Nebuchadnezzar. Zedekiah's sons were slain before his face at Riblah on the Orontes, and then his own eyes were put out, and he was carried away to Babylon to adorn the monarch's triumph. Another deportation marked this epoch, so that only some of the poor of the land were left to be vine-dressers and husbandmen.

Third Period (586 B. C. to 70 A. D.).—Jerusalem lay waste until the Persian monarchy absorbed the Babylonian, and the Persian hostility to idolatry produced a friendship between the new empire and the monotheistic Jews. One of Cyrus's first acts was to send back to Jerusalem with riches and honor all the Jews who desired to return. Less than 50,000 returned, however, an exile of from fifty to seventy years from Palestine having rooted the vast majority to their Oriental homes. This return, under Zerubbabel of the royal house (but not as king) and Jeshua, the high priest, occurred probably in the year B. C. 536, and had largely a religious character. The rebuilding of the temple was the first object sought, and the work went on while Cyrus reigned; but during the reigns of Cambyses and Smerdis the enemies of the Jews succeeded in obtaining a royal veto on their enterprise. Darius Hystaspis, in his vigorous restoration of the policy of Cyrus throughout the empire, permitted the Jews to finish their temple, and in the sixth year of his reign (B. C. 516) the new structure was completed and dedicated.* It was the Holy City once more. The new temple, somewhat smaller than its predecessor, was also inferior in costly adorning to the structure of Solomon, but still it was a rallying-point for the scattered Jews. Doubtless many found their way from year to year from their distant places of exile to dwell again by the hallowed precinct, themselves and their city now forever purged from idolatry. In the year B. C. 457 Ezra the priest brought a train of 5,000 Jews (nearly 2,000 males) from the land of exile to Jerusalem, and acted as guide and teacher to the feeble restoration. In B. C. 445 Nehemiah visited Jerusalem and aroused the despondent people to build the walls of the city, which had been prostrate for 140 years. With wonderful enthusiasm and rapidity, in the face of threats from the neighboring hostile tribes, the people went to work, and in fifty-two days finished the great undertaking. Nehemiah acted as the Persian governor, and by his earnest piety and fearless conduct did much to establish the purity of the Jewish commonwealth.† The first Persian interference with the Jewish province (for such it now was) arose from the murder of Joshua by his brother Johanan, the high priest, in the temple, in the year B. C. 366. These two were grandsons of Eliashib, the high priest, whom Nehemiah was obliged to rebuke (Neh. xiii. 7), and Johanan,‡ the murderer, was son-in-law of Sanballat, the Samaritan governor (Neh. xiii. 28). Bagoses (Bagoas), the Persian general, by reason of this fearful murder defiled the temple by entering it, and laid a tax for Johanan's lifetime (which proved to be seven years longer) of fifty drachmas for each lamb used in the daily sacrifice. Johanan's two sons, Jaddua and Manasseh, held jointly the high priesthood after their father's death, until Manasseh was tempted to go to the Samaritans, who, under Alexander's sanction, erected their own temple on Mt. Gerizim, and made Manasseh their high priest. During Jaddua's high priesthood Alexander overthrew the Persian monarchy. His remarkable reception at Jerusalem by the high priest,

* Josephus makes a second return from Babylon under Darius Hystaspis, with Zerubbabel as leader. Those who returned (he says) numbered 4,677,600 souls. He of course considers the Sheshbazzar of Ezra i. 11 as a different man from Zerubbabel.

† Josephus puts both Ezra and Nehemiah in Xerxes's time (B. C. 485-465). But the Artaxerxes of Ezra and Nehemiah could not have been the Xerxes of history, for Xerxes reigned only twenty years, but in Neh. xii. 11 we find Artaxerxes's thirty-second year mentioned. Artaxerxes Longimanus reigned forty years.

‡ Josephus says that Johanan's son, Manasseh, was Sanballat's son-in-law, but this is highly improbable. He also makes Sanballat to be living at Alexander's invasion, 113 years after he opposed Nehemiah!

his entrance into the temple to attend the offering of sacrifices, his delight at finding the record of Daniel predicting the overthrow of Persia by the Greeks, and his confirmation of the Jews in their own peculiar laws, are all graphically recited by Josephus. Alexander's visit was in B. C. 332, and the Seleucian empire dates from B. C. 312. The period between Alexander's death and the settlement of the empires of Syria and Egypt was a chaotic and stormy one. Ptolemy Lagi acquired possession of Jerusalem by a trick, and enslaved many thousands of the Jews, carrying them into Egypt. For more than a century Judæa was a tributary province of Egypt under the high priesthood of Onias, Simon the Just (who extensively repaired and enlarged the temple and the walls), Eleazar, Manasseh, Onias III. and Simon II. In the time of Simon the Just large donations were bestowed upon the temple by Ptolemy Philadelphus, in whose reign and by whose order (according to the received story) the Greek (Septuagint) translation of the Hebrew Scriptures was made for the Alexandrian library. After the battle of Raphia (B. C. 217), Ptolemy Philopator, who had there defeated Antiochus the Great, attempted to enter the *naos* of the temple, but was opposed by Simon II., the high priest; eighteen years after which Antiochus wrested Jerusalem from the Egyptian empire. With a brief exception of a year, in which the Egyptians again held the city, Jerusalem remained a province of Syria until the Maccabean revolt. During these thirty-five years Simon II. (who was grandson of Simon the Just) died, and Onias III. became high priest, in whose administration the city was greatly disturbed by the quarrels of the Josephine family, a priestly family that had become rich through political favors received from Egypt. In B. C. 175 Antiochus IV. (Epiphanes) succeeded to the throne of Syria, and began deliberately to plan the extinguishment of all the peculiarities of the Jewish people. He was determined to make Jerusalem a Greek town. On the death of Onias he put Onias's brother, Joshua, into the high priesthood, changed his name to the Greek Jason, introduced Greek games, put the temple service into relation with that of idolatrous shrines, and in every way undermined the integrity of the Jewish character and religion. At length a younger brother, also named Onias, changed in his turn his name to Menelaus, and persuaded Antiochus (who was ready to sow dissensions) to make him high priest in place of Jason. Dissensions continued between the two Hellenizing brothers till Jason died. Antiochus now came to the city and stripped it of all its treasures and carried away a multitude of captives. In B. C. 168 he followed this by sending an army to Jerusalem, which entered on the sabbath day, made havoc of the inhabitants, and leveled the city walls. The temple was dedicated to the Olympian Jupiter, swine's flesh was offered upon the altar, and the defilement of the temple made complete. All the Jewish ritual was forbidden, and fearful punishments were visited on those who dared to uphold their ancient faith. This extreme policy of the Syrian monarch served to defeat its object. Under the guidance of the Asmonean family (so called from the priest Chashmon, an ancestor) the Jews organized a general revolt. In B. C. 165 they entered Jerusalem and dedicated the temple anew, the citadel being still held by the Syrians. The next year the monster Antiochus died of a loathsome disease. Under his successor fortune wavered between the Jews and the Syrians till the death of Judas called Maccabæus (the "Hammer") in B. C. 161. Alcimus, high priest, was a tool of the Græco-Syrian monarch, and strengthened himself in the citadel of Jerusalem until his death. Jonathan and Simon, brothers of Judas, were now the leaders of the revolt, and taking advantage of a disputed succession to the Syrian throne on the part of Demetrius and Alexander Balas, Jonathan became high priest by Alexander's appointment, and then received for Jerusalem extraordinary gifts and privileges, including its thorough fortification. After Jonathan's death Simon became high priest, and captured the citadel (B. C. 142), which had held out against the Jews for more than twenty years. The citadel was razed and its hill lowered, and a new fortress, the Baris, built to command its site. The enterprising Asmonean then entered into alliance with the spreading power of the Romans, which had already overwhelmed Macedonia. John Hyrcanus succeeded his father Simon in the high priesthood, and successfully resisted an elaborate siege of the city by Antiochus Sidetes, who was compelled to grant him honorable terms and withdraw his army. Hyrcanus afterward accompanied Antiochus in his war with the Parthians. In B. C. 107 Hyrcanus died, and was succeeded by his son Aristobulus, who assumed the title of king. The history now becomes a series of fierce and bloody strifes. Aristobulus kills his brother. Another brother, Alexander Jannæus, who succeeds Aristobulus, is a cruel tyrant, and reigns for a quarter of a century, engaged equally in fighting the Syrians and destroying the Jews of the Pharisean party. His two sons quarrel for the throne, and this quarrel brings Pompey, the Roman general, into the Jewish history. He takes the part of Hyrcanus against Aristobulus. The latter holds the temple, and Pompey besieges it, capturing it at last by assault and the slaughter of 12,000 Jews. The Roman victor made Hyrcanus high priest (but no longer was the title of king allowed), destroyed the city walls, and carried off Aristobulus to Rome. This occurred in the year B. C. 63. Antipater, an Idumæan, became the chief adviser of Hyrcanus, and this crafty foreigner made such interest with Julius Cæsar that he received the procuratorship of Judæa, while Hyrcanus was allowed to assume the title of ethnarch. In B. C. 43 Antipater was murdered, and great disturbances arose. Antigonus, son of Aristobulus and nephew of Hyrcanus, went to Jerusalem with a Parthian force, and by stratagem brought the Parthians into the city, seized Hyrcanus, cut off his ears that he might be no longer high priest, and imprisoned Phasaelus, Antipater's son, who committed suicide in prison. Herod, another son of Antipater, who had endeavored to resist the attack of Antigonus, escaped, and soon organized a Roman attack upon the usurper. At this time Herod married Mariamne, Hyrcanus's granddaughter. Herod's siege of Jerusalem lasted five months, when the city was stormed and a fearful slaughter followed; Antigonus was slain. Herod now determined to hold all power in his own hands, his marriage with Mariamne furnishing a slim claim to the Asmonean succession. He put out of the way all Asmoneans who might be claimants of the throne, his own wife Mariamne and her old grandfather falling victims at length to his cruelty; he cultivated the friendship of the Romans, enlarged the Baris into the grand fortress of Antonia, constructed a magnificent palace, built a theater, and instituted games in honor of Cæsar. He then sought to win the esteem of the Jews themselves by building a new temple, rivaling the original edifice of Solomon in its richness and grandeur. For thirty-two years this extraordinary despot, plausible and politic, though remorselessly cruel, held firm sway over Judæa as king, beautifying the city and restoring its importance—loved by none, feared by all—maintaining peace and thrift in his kingdom, and showing a boldness and strength in his administration seldom equaled. In the year B. C. 4 of the common reckoning Herod died, a few months after the birth of our Lord in Bethlehem. Ten years later his son and successor, Archelaus, was deposed and Judæa made a Roman province. Pontius Pilate was the fifth Roman procurator of the province, under whose administration our Lord was crucified. The Roman government of Judæa was strong, and on the whole peaceful, for many years, except as the Jewish horror of Gentile defilement of the temple and Holy City produced from time to time collisions between the citizens and soldiers. These troubles were generally ended by a prudent yielding on the part of the Romans, until in A. D. 41, Herod Agrippa, grandson of Herod the Great, was made king of all Palestine by the Emperor Claudius. This last Jewish monarch* built a strong wall to inclose the suburbs on the N. of Jerusalem, thus more than doubling the size of the city. On his death at Cæsarea (a visitation for his blasphemy), Rome again made Judæa a province, and a list of reckless procurators followed till the final fall of the Holy City. Cumanus, Felix, Albinus, and Florus were conspicuous for their utter disregard of Jewish customs and prejudices. Indignant outbursts, developing into riots and insurrections, occurred constantly, the nation meanwhile becoming thoroughly demoralized, until in the year 66 Cestius Gallus, the prefect of Syria, was obliged to interfere and attempt, with the aid of the high priest and a peace party, to put down the insurgents. Gallus was severely beaten, and Rome now began the war in earnest. First, Vespasian, and afterward his son Titus (both becoming emperors at length), conducted the war. The terrible dissensions among the Jews, the agony of the nation shut up within the walls of Jerusalem, the destruction of more than 1,000,000 Jews (including all the sick and old), the enslaving of all the youth, the entire demolition of the city, all this forms one of the gloomiest pages in history.

* His son Agrippa, although made King of Chalcis and the northern tetrarchies, and the right exercising influence in Jerusalem, seems never to have used royal power in Judæa

Fourth Period (70 A. D. to this time).—In Hadrian's reign (A. D. 118–138) there was an attempt of formidable dimensions to rebuild the city of Jerusalem and establish the Jewish polity. Of this attempt Bar Cochba was the enterprising leader, who for three years kept the power of Rome at bay, until the insurrection was entirely quenched in the blood of hundreds of thousands. Hadrian's exasperation at this event made him first raze everything he could find on the site of Jerusalem, and then build a new city on the spot, which he peopled with Romans and called Ælia Capitolina. On the old temple site he erected a temple to Jupiter Capitolinus, and placed his own statue on the site of the holy of holies. Jews were not allowed to enter the new city, and this prohibition continued in effect till the empire became Christian, when permission was given them to weep by the west temple-wall (where, in spite of the frequent and wholesale destructions, much of the ancient wall of the sanctuary remains)—a custom continued until this very day. Constantine restored the old name, Jerusalem, although the Hadrianic name of Ælia is found in use for centuries afterward. His mother, Helena, devoted herself to recovering the lost sites of Christian importance in Jerusalem and elsewhere in the Holy Land, and erected costly churches on these supposed sites. Julian (A. D. 363) attempted to rebuild the Jewish temple and restore the Jewish worship as a part of his design against Christianity, but the work was hindered and stopped by subterraneous fires, as Ammianus, an unprejudiced witness, asserts. In the first Christian centuries of the empire, Jerusalem occupied the position of a venerable and sacred relic, to which pilgrims constantly found their way. Bishops presided over the Church there, and emperors from time to time built or repaired the holy edifices. The first disturbance of this peaceful condition was when the Persian monarch, Chosroes II., took the city by storm in 614, destroyed the churches, and slew the ecclesiastics. Fourteen years afterward the Greek emperor Heraclius, victorious over the Persians, restored the churches and re-established the Christian dominion in Jerusalem; but it was only for a short period. In 637 Omar made Jerusalem the first grand conquest of the rising Mohammedan power. From that day to this Jerusalem has been a Mohammedan city, except during the brief interval in which the crusaders held it. Ommiades, Abbassides, and Fatimites took their turns in ruling it from Damascus, Bagdad, and Cairo as their capitals; Christians were more or less persecuted from time to time, and the Church of the Holy Sepulchre was repeatedly destroyed and rebuilt; but Christian pilgrims continued to visit the Holy City, paying tribute to the Moslem rulers for the privilege. In 1099, after a Turkish tribe had had brief possession of the city, and had shown unusual severity to the Christians, but had been supplanted by the Egyptian caliph, the crusaders appeared before Jerusalem. In six weeks the city was in their hands, and Godfrey of Bouillon elected its king. It remained in the hands of the Christians till Salah-ed-din (Saladin), the Sultan of Egypt, reconquered it in 1187. Thrice afterward the city was for a short time in Christian hands. In 1517 it fell into the hands of Selim, the Turkish conqueror of Egypt, and remains in possession of his successor, the sultan, to this day.

Jerusalem in her decay

Topography.—From the history of Jerusalem, briefly given above, it may readily be seen that its internal topography can not be very accurately determined. Especially were the demolitions by Titus and Hadrian so complete that all traces of detail, even in the general surface of the ground, must be well-nigh impossible. Hills were lowered and valleys filled up, and buildings reared upon ruins and of material afforded by other ruins. This, with the ordinary changes and decays of 3,000 years, must make the internal topography of the city a puzzling problem. With the outer topography of the city the conditions are different. The eastern, southern, and western limits are accurately defined by the deep ravines of the Kedron and the Bene-Hinnom, and beyond these the Mount of Olives, the Hill of Evil Council, and the western heights remain as David must have seen them, so far as their natural features go. On the N. there are no such marked topographical features. From Scopus the descent to the city is gradual, and it was in this direction that the suburb existed which Herod Agrippa inclosed with a wall. The modern city walls, built only 300 years ago by Suleiman (Solyman the Magnificent), probably inclose the area of the ancient city of David's day, with the exception of the southern portion of Zion and Ophel, which are now without the walls. The positions of Zion and Moriah (of which latter Ophel is the southern extension) seem to be thoroughly determined. Mr. Fergusson's startling and ingenious theory that the ancient Zion was the temple hill, where the temple, the city of David, Baris, Acra, and Antonio stood, has too much to contend with it in uniform tradition, in spite of the few problems that this theory solves. Josephus tells us (*Ant.*, 13, 6, 7) that Simon the Asmonean destroyed the citadel (*τὴν ἄκραν*) to the foundation, and then lowered the hill on which it had stood, so that the temple could be higher than it; and this work, he tells us, occupied three years. As the hill generally known as Zion is higher than the temple hill, this fact recorded by Josephus does not prove that the modern Zion is not the ancient Zion, but that the *ἄκρα* of Simon was not upon Zion. The citadel, and indeed the main city, when David conquered Jerusalem, was certainly the modern Zion. In later days a new citadel was formed on the northern hill or lower city (Acra), then much higher than now, which was afterward superseded (when Simon had reduced its hill) by the Baris, and afterward Antonia, nearer to the temple. Josephus calls the new part of the city inclosed by Agrippa's wall Bezetha (*ἐπὶ χωρίως δὲ ἐκλήθη Βεζεθὰ τὸ νεόκτιστον μέρος*), and yet speaks of it as a *λόφος* (crest). As a *λόφος* we should suppose the hill N. of the temple hill was intended—a hill which is high and well defined; but from the other words of Josephus, and the meaning of the word Bezetha (new town), we should suppose all that was encircled by Agrippa's wall from Hippicus to the Kedron was meant. Probably the name Bezetha was given to the whole.

The Ancient Walls.—We may suppose that Nehemiah, in restoring the walls, followed the old foundations and rewalled the same area which constituted the city in David's day. In the rebuilding, as recorded by Nehemiah (chap. iii.), Eliashib, the high priest, is first mentioned as leading the workers at the sheep-gate, and at the wall as far as the Tower of the Hundred (Ha Meah) and the Tower of Hananeel. These places we must of course find in the temple region, for there the high priest would be set. Moreover, the passage in Jeremiah (xxxi. 38–40) seems to be a reference to the temple precincts rather than to the whole city, and the Tower of Hananeel is there prominent. The description in Nehemiah follows the wall from the center of the east side of the city northward. The sheep-gate must have been in the center of the temple-precinct wall, and perhaps derived its name from the sheep brought in by that gate for sacrifice. It is probable that this "sheep-gate" is the same as the Mishneh or "second (gate)" of Zeph. i. 10 and the "college" of 2 Kings xxii. 14, where the prophetess Huldah lived. In this case the "fish-gate" would be the first gate (see Zeph. *l. c.*), and would represent the northeast corner of the city, opposite the Mount of Olives. Between the "fish-gate" and the "sheep-gate" would stand the Tower of Hananeel and the tower of Meah (or the Hundred). The "old gate" would be found next, as we follow the north wall northwestward. The course would be along the "second wall" of Josephus, for the first or old wall seems to have been the northern fortification of Zion. The "old gate" may be really the "Jeshanah gate" (by leaving the adjective untranslated), and may be the gate leading to Jeshanah (2 Chron. xiii. 19, and Joseph., *Ant.*, 14, 15, 12), a town near Bethel. The "gate of Ephraim" comes next in Nehemiah (not in his account of the building, but in his record of the dedication, xii. 39), and may have occupied the site of the present Damascus gate. Then follows "the broad wall" (some local peculiarities of the wall, perhaps for defense' sake), and then we reach the "tower of the furnaces," which may have stood over the western valley as the towers of Hananeel and the Hundred overlooked the eastern. The "valley-gate" would correspond with the present Jaffa gate. Near this was the dragon-well (Neh. ii. 13). The "dung-gate" would be a thousand cubits S. of the Jaffa gate (Neh. iii. 13); that is, on the southwestern part of Zion over against the Birket-es-Sultan. The "fountain-gate" would lie on the opposite side of Zion, facing the Pool of Siloam. The "stairs that go down from the city of David" would be found between the fountain-gate and the southwest temple-corner. They were probably an ascent from the king's gardens to the Davidian palace on Zion. The "sepulchres of David," the "made pool" ("king's pool" in Neh. ii. 14), and the "house of the mighty" were probably at the corner of Zion over against the southwest temple-corner, where the wall crossed the Tyropœon. The "armory" is in this neighborhood, at the very corner where the wall turns abruptly southward to encircle Ophel. The "house of the high priest" and the "house of Azariah" are near this. After turning the extreme corner of Ophel southward we reach "the tower which lieth out from the king's high house," which may be the *extra* tower discovered by Capt. Warren's subterranean explorations (*Recovery of Jerusalem*, p. 229), as he himself suggests. It may have been built out in order to guard the "Fountain of the Virgin." The "water-gate" would be so called in relation to this fountain. By this water-gate on Ophel was a broad street or square where assemblies could be held in the immediate vicinity of the temple (Neh. viii. 1, 3, 16). Near by was the "horse-gate," famous as the spot where Athaliah was put to death. This gate was probably at this division between the Solomonian palace (S. E. of the temple) and the precinct of the temple itself. The gate "Miphkad" may mark some angle of the walls connected with the division, as a special corner is mentioned (iii. 32) before we reach the sheep-gate again.

This view of the walls of Nehemiah's time will help us in our survey of the city in our Lord's day. Between those periods there had been much demolition and rebuilding in the city, as a glance at the brief history above will indicate, but we may believe that until the destruction of the city by Titus the general outline of the fortifications was the same. It will be seen by the sketch of the walls, as described by Nehemiah, that no difficulty is found in having the "stairs from the city of David" and "the sepulchres of David" mentioned after "Siloam"; an order which Mr. Fergusson thinks quite staggering to the old hypothesis of Zion and the city of David. The difficulty that Mr. Fergusson finds with the places enumerated in the last sixteen verses of the third chapter of Nehemiah arises from his overlooking the wall around Ophel. His own explanation, that the first sixteen verses refer to the city of Jerusalem, and the last sixteen to the city of David (his Zion or the temple-mount), is by no means natural.

The Temple-area.—The researches of Capt. Wilson and Capt. Warren have thrown much light upon the question of the original temple-area. The discovery by the latter officer of immense stones [illegible] the southeast corner of the present Haram wall, lying in the rocky foundation scarped to receive them, 80 feet below the present surface, and marked with the Phœnician quarry-marks in paint, destroys Mr. Fergusson's theory that the temple-area extended from the present southwest corner of the Haram but 600 feet E., this southeast corner being 900 feet E. The vaults under this southeastern portion of the area seemed to him too slight to have supported the stoa, and Josephus's assertion that the temple-area was only a stade square, and thirdly the apparently unchanged position of the stones at the southwestern corner, confirmed his view. Capt. Wilson and Capt. Warren proved that the southeastern corner is unchanged, while the southwestern has undoubtedly been added, as the real bed of the Tyropœon valley lies nearly 100 feet E. of the southwest corner and under the Haram, while a new bed for that valley has been cut out of the rock, to prevent the moisture passing under the temple-area. This doubtless was the new portion inclosed by Herod. (Jos., *B. J.*, i., 21, 1.) About 600 feet N. of the southwest corner is Wilson's arch, the beginning of the causeway across the Tyropœon, and for 23 feet S. of this Capt. Warren found the old Haram wall *in situ*. The inference from these discoveries is that the southwest angle of the Haram wall was built by Herod in his reconstruction of the temple. The temple of Solomon, therefore, in all probability, occupied the site of the Mosque of Omar (Kubbet-es-Sukhrah), while the palace of Solomon occupied the southeastern portion of the Haram, from which was communication by road and bridge (Robinson's arch, or rather beneath Robinson's arch, the valley having been filled up with rubbish 20 feet deep before the new pavement and Robinson's arch were constructed by Herod) to the lower city on the plateau below and E. of the upper city. The causeway over Wilson's arch was of a later date, but doubtless marked the old and direct communication between temple and city. Herod's Stoa Basilica ran along the southern wall, but whether it extended to the southeast corner of the Haram is uncertain. Perhaps Fergusson's argument is correct there, and the vaults beneath could not have supported it at that corner. However, as Capt. Warren shows, all the vaults known as Solomon's stables at the S. E. of the Haram are of modern construction and there may have been in Herod's day a substruction, quite sufficient for the support of Herod's stoa, so that the "pinnacle" (πτερύγιον) of the temple may have been exactly at the southeast corner overhanging the Kedron. Beneath the present Haram surface are tanks and subterranean passages and aqueducts in great numbers (see *Recovery of Jerusalem*, ch. vii., and accompanying plan from Wilson and Warren), which at least seem to prove that the present area very largely coincided with the old temple-area; * but a complete survey when Moslem fanaticism shall no longer be a hindrance will be necessary for any satisfactory arrangement of details.

The Holy Sepulchre.—The next point of special interest in the topography of Jerusalem is the site of the Holy Sepulchre and Calvary. The commonly received site lies about 400 feet N. of a line running from the Jaffa gate to the Mosque of Omar (Kubbet-es-Sukhrah or "Dome of the Rock"), and about 300 feet W. of the street leading N. to the Damascus gate. That this site is the same selected by the Empress Helena, although the edifices on the site have been many, may be regarded as certain, but whether Helena selected the true site three centuries after the crucifixion, and after Jerusalem had been so completely reduced to chaos by Titus, and then by Hadrian, is by no means so clear. The chief objection is that the site must have been within the walls of the city in our Lord's day. The controversy here depends greatly on fixing the position of the gate Gennath in the first wall (which ran from the neighborhood of the Jaffa gate to the west wall of the temple), from which gate the second wall (the main city wall) took

* The fortress of Baris, afterward enlarged to Antonia, stood probably in the northwestern portion of the Haram, occupying perhaps about 500 feet square.

its course northward. The old arch near the south end of the bazaars, which has been called the gate Gennath, is proved to be a comparatively recent structure, and the ruins near the present Church of the Holy Sepulchre, which have been called fragments of the second wall, are proved to be portions of a church. (See *Recovery of Jerusalem*, pp. 9, 213.) If the Kasr Jalud, which stands on the highest point of the city, and is built of huge beveled stones, like those of the foundations of the temple, be the ancient Hippicus, then the present site of the Holy Sepulchre is altogether wrongly fixed. The Kasr Jalud may be Psephinus in the Agrippa wall, built after our Lord's day to include the northern suburbs. Another argument against the common theory is the necessity of extending the area of the city as much as possible to give it the size of so renowned a capital. Even by putting the Kasr Jalud in the original wall, we can only make the city to include about 200 acres. Its circumference would be only 2½ miles, and the population of a city of this size could not have been more than 25,000. (*Fergusson.*) The great suburb included in Agrippa's wall was twice the area of the old city, and if we crowd that as much as the old city, we shall have only 75,000 for the population of Jerusalem at its destruction by Titus. These numbers are extreme, and we should probably reduce them largely to reach the truth. They certainly form a strong argument against still further contracting the "second wall" and putting the present site of the Holy Sepulchre outside of the city. Yet the arguments are far from conclusive. If we knew where the gate Gennath was, all would be known. If the present site is erroneously fixed, where are we to find the true site? An ingenious but not convincing argument was that advanced by Mr. Fisher Howe, of Brooklyn, N. Y., in favor of the remarkable hillock over the grotto of Jeremiah, N. E. of the Damascus gate. There are many reasons for the belief that this hill is the Tarpeian rock of ancient Jerusalem, and the discovery of the ruins of an early Christian church dedicated to St. Stephen on the N. W. of the hill shows the place of martyrdom of St. Stephen has been wrongly located by those who placed it in the Kedron valley. But if, as is probable, the execution of St. Stephen took place in regular process at a recognized place of execution, it is equally likely that the crucifixion may be referred to the same locality. The *Via Dolorosa* would then be the street leading from the present Ecce Homo arch; only instead of following the pilgrim's route westward to the Church of St. Sepulchre of Helena, it must have turned upward to the Damascus gate. It is interesting to observe the remains

Jerusalem at the time of King Herod. (Sketch showing approximately the lie of rock.) 1, Temple of Solomon; 2, Palace of Solomon; 3, added on by Herod; 4, Exhedra (the tower Baris or Antonia); 5, Antonia (the Castle); 6, cloisters joining Antonia to Temple; 7, Xystus; 8, Agrippa's palace; 9, Zion and Acra; 10, Lower Pool of Gihon, or Amygdalon; 11, Herod's palace; 12, Bethesda, or Struthion; 13, bridge built by Herod; 14, the Lower City, called sometimes Akre; 15, British cemetery. A. D. 1870.

of the crown of the arch of the ancient Damascus gate are incorporated in the modern structure, and that, as reported by Consul Gilman to the U. S. Government, the remains of an ancient Roman pavement have been discovered some 10 or 12 feet below the level of the present street. It follows that the present Damascus gate is on the site of an ancient gate, and may be counted as a fiscal point in the line of the second wall. There is, therefore, nothing adverse to the theory which makes the hill over the grotto of Jeremiah to be the Golgotha of the New Testament. We have, however, to leave the discussion in a state of incertitude.

The other points of topographical interest are Zion, the Tyropœon, the towers, and the pools. Zion (ἡ ἄνω πόλις of Josephus) is the high broad hill which lifts itself by an abrupt front 400 feet above the southern valley, its plateau extending from this brow 2,400 feet to the Jaffa gate road, where a valley ran eastward from the gate to the Tyropœon. Along this northern brow the "first wall" was built. The width of this plateau at its broadest is about 1,600 feet from the western valley to the Tyropœon. This height embraced nearly one-half of the ancient city. On the E. of it, beyond the Tyropœon, was the temple mount, 100 feet lower, and on the N. was the part of the city called Acra, which (some think) extended to the N. W. as far as the present Kasr Jalud, where the ground rises to a height of 73 feet above the top of Zion. Although, in that case, this one point of Acra was higher than any other point in the city, yet the main portion of Acra was lower than either Zion or the temple mount (after Simon had reduced its height), and was the "lower city" of ancient times; this latter appellation also including the valley of the Tyropœon. Zion was the seat of the citadel which David stormed, and its broad, elevated summit became the "city of David." Here were the royal palaces and tombs of David's line, connected by a bridge with the Solomonian palace (1 Kings vii. 1) and the temple on Moriah. Here also Herod built his palace, including the magnificent buildings called in honor of his friends Cæsar and Agrippa. On its northeastern corner was the Xystus, or gymnasium, connected with the temple by another bridge, probably where Wilson's arch now is, the southern bridge being now marked by Robinson's arch. The height of Zion above the Mediterranean is 2,537 feet. The Mount of Olives rises only 200 feet higher.

The Tyropœon (valley of the cheesemongers) ran between Zion and Moriah southward into the Hinnom valley and the Kedron valley at their junction, the junction of the three forming the rich soil of the "king's garden" (Neh. iii. 15; Joseph., *Ant.*, 7, 14, 4). The Tyropœon continued in two branches northward, one toward the present Damascus gate and the other toward the Jaffa gate. The latter seems to have been the recognized continuation of the Tyropœon. The depth of the valley increased rapidly as it reached southward, and at the southwestern corner of the temple-area the bed of the valley was 90 feet below the present surface.

One of the most prominent objects in Jerusalem is the old tower in the midst of the citadel near the Jaffa gate, 56 ft. 6 in. on one face and 70 ft. 3 in. on the other. It has been generally supposed to be Hippicus (Joseph., *B. J.*, 5, 4, 3). Whichever one of the Herodian towers this was, its style of building tempts us to believe that Herod only rebuilt an ancient tower, and that we may have here "the tower of David builded for an armory" (Cant. iv. 4). If this be Hippicus, we may suppose Phasaelus and Mariamne lay to the E., and that the Kasr Jalud, 1,200 feet to the N., is Psephinus.

The Pools.—The pools (so called) in and by Jerusalem which now attract attention are Birket Mamilla, Birket Sultan, the Pool of Siloam, and the Fountain of the Virgin without the walls, and Birket Israil (or Es-Serain) and the Pool of Hezekiah within the walls. The Birket Mamilla is supposed to be the "upper pool" (Isa. vii. 3; 2 Kings xviii. 17). It lies 2,000 feet W. of the Jaffa gate. The Birket Sultan is a section of the great western valley dammed up for more than 500 feet. The Pool of Siloam (Neh. iii. 15; John ix. 7) is in the mouth of the Tyropœon at its junction with the Hinnom and Kedron. It was probably used to irrigate the "king's garden." It is connected by a long, rude, and crooked subterranean passage with the Fountain of the Virgin on the other side of Ophel, from which the water flows "softly" (Isa. viii. 6). This subterraneous aqueduct is connected with extensive rock-hewn caverns, which were doubtless part of the fortifications of Ophel.

(See the deeply interesting account of their discovery by Capt. Warren in his *Recovery of Jerusalem*, pp. 190–198.) The Fountain of the Virgin is a pool on the eastern side of the Ophel rock, to which is a descent of twenty-eight steps. The pool is lower than the bottom of the valley, and is excavated deeply within the rocky wall. The water comes from the direction of the temple, but has never been traced. It has a periodic and sudden rise of a foot in height, the periods varying from two or three times a day to once in two or three days. This periodic troubling of the water seemed at first to mark the Fountain of the Virgin as the Pool of Bethesda, but the requirements of the sheep-gate (as we have seen) seem to put Bethesda farther N. In fact the actual pool has been discovered by excavations conducted in the northeast angle of the city in the inclosure belonging to the convent of St. Anne. An ancient stone staircase leads down, first to the crypt of an ancient church, the wall of which is decorated with five false arches, and contains also the remains of a fresco representing the angel troubling the waters, and secondly leads to the actual pool which lies beneath the crypt and is arched over by five arches, which must certainly be the "five porches" of John v. There can be no reasonable doubt that this is the ancient Bethesda, which was seen by the pilgrim from Bordeaux in 333, but has been lost sight of for many hundred years. As the quarter of the city in which the pool lies corresponds to the Bezetha of Josephus, it is extremely likely that those biblical MSS. which give the name of the pool as Bezatha (with allied forms of spelling) are correct. The Birket Israil, just inside of the St. Stephen's gate and N. of the Haram (supposed by Dr. Robinson to be the trench of Antonia), is the damming up of the valley that runs E. of Bezetha in a southeastern direction, originally under the northeastern corner of the Haram, into the Kedron. It is 360 feet long, 130 feet broad, and 75 feet deep. The Pool of Hezekiah (*Amygdalon* of Josephus) is N. of the Jaffa gate street and to the S. W. of the Church of the Holy Sepulchre. It is supplied by an aqueduct from the Birket Mamilla. It lies among the houses of the Christian quarter. It is 240 feet long and 144 feet wide. It seems to be properly designated. (See 2 Kings xx. 20; 2 Chron. xxxii. 30.) A system of wells and aqueducts in the Kedron ravine below Jerusalem (the En-Rogel of antiquity) presents features of peculiar interest. One of several ancient aqueducts still conducts the water from Solomon's Pools beyond Bethlehem to the city.

See Warren and Conder's *Jerusalem* (Palestine Exploration Fund); Wilson's *Ordnance Survey of Jerusalem*; Conder's *Tent-work in Palestine*; Besant and Palmer's *Jerusalem, the City of Herod and Saladin*; and Baedeker's *Palestine and Syria*. Revised by J. Rendel Harris.

Jerusalem Artichoke: popular name of a species of sunflower (*Helianthus tuberosus* of Linnæus, family *Compositæ*) which bears subterranean tubers of the same nature as potatoes. The tubers got the name of artichokes from a resemblance in taste to the true Artichoke (*q. v.*), while the name Jerusalem is a curious English corruption of *girasola*, Italian for sunflower. The plant probably reached England by way of Italy or Spain. The French name is *topinambour*. It has been cultivated in Europe ever since the beginning of the seventeenth century, and doubtless was introduced from America, the native country of the whole sunflower genus. It is generally said to be of Brazilian origin, but there is no historical evidence of it; it is not known to occur either there or in any part of South America, and it has all the characters of a plant of a warm climate. Moreover, it is so much like a species of sunflower (*H. doronicoides*) indigenous to the valley of the Mississippi, which bears long and narrow tubers, that it may well be regarded as a probable variety of this species, altered and fixed by cultivation. The tubers, boiled or stewed, are of delicate flavor and are much esteemed in Europe. In the U. S. they are commonly pickled or used as food for swine. C. E. B.

Jerusalem Cherry: the popular name of two shrubby species of *Solanum* cultivated as ornamental house-plants (*S. capsicastrum* and *S. pseudo-capsicum*), the first from Brazil and the latter from Madeira. They may be propagated either from seeds or cuttings. They grow only 2 or 3 feet high, and bear berries about the size of cherries. It is uncertain how they came by the name Jerusalem.
Revised by Charles E. Bessey.

Jervis, Sir John, Earl St. Vincent: naval officer; b. at Meaford, England, Jan. 9, 1734; ran away to sea when ten years of age; became post-captain in 1760; captured the French ship Pégase off Brest harbor in 1782, and was made K. C. B.; became full admiral in 1795. He distinguished himself in several naval engagements, chief among which was the celebrated action in which he defeated a Spanish squadron of greatly superior strength (Feb. 14, 1797) off Cape St. Vincent. In reward for this Jervis was created Earl of St. Vincent and received a pension of £3,000. A few months after this victory he further distinguished himself by suppressing a mutiny in his fleet. He was first lord of the admiralty 1801–04, and instituted vigorous and successful measures of reform. D. Mar. 13, 1823.

Jervis, John Bloomfield, LL. D.: civil engineer; b. at Huntington, N. Y., Dec. 14, 1795. In 1817 he began his professional career as axman during the locating of the Erie Canal, and in 1819 was appointed resident engineer of a portion of the middle division. From 1825 to 1830 he was principal assistant and chief engineer of the Delaware and Hudson Canal and Railroad Company; from 1830 to 1836 was superintendent of construction of the railway from Albany to Schenectady: from 1836 to 1843 was chief engineer of the Croton aqueduct for the supply of New York city. The Croton dam, the Sing Sing bridge, High Bridge (see Aqueduct), and the Forty-second Street reservoir, are monuments of his professional skill. Later he was consulting and chief engineer of the Cochituate waterworks in Boston, of the Hudson River Railroad, of the Chicago and Rock Island Railroad, and of the Pittsburg, Fort Wayne and Chicago Railroad, retiring from active duty in 1866. He invented and had built in England in 1832 a locomotive called Experiment, having the four-wheeled swiveling truck in front. He was the author of *Railway Property* (1866), *Labor and Capital*, and of several papers and lectures. In 1868 he was elected an honorary member of the American Society of Civil Engineers. In 1878 Hamilton College conferred upon him the degree of LL. D. He died Jan. 12, 1885. Mansfield Merriman.

Jer'vois, Lieut.-Gen. Sir William Francis Drummond, R. E., G. C. M. G.: military engineer; b. at Cowes, Isle of Wight, England, in 1821; was educated at the Royal Military Academy at Woolwich; entered the Royal Engineers in 1839; served in Africa (1841–48), in the Kaffir war (1846–47). Made captain in 1847, he received the brevet of major in 1854; in 1856 he was appointed assistant inspector-general of fortifications, and subsequently deputy director of fortifications. In this capacity he prepared in 1858 a memoir relating to the general defense of the country, in which a system of fortifications for the security of the vital points was proposed in detail and a plan for the defense of London was suggested. These were carried out. The eventful combat between the Monitor and Merrimack in Hampton Roads, Mar. 8, 1862, shook the public confidence, in Great Britain, and a royal commission was assembled to report on the defenses of Spithead, for which Parliament had made heavy grants of money; and a special committee on the same subject, of which Maj. Jervois was also secretary, reported in 1864. The result of these reports was the adhesion of the British Government to the principles contained in the first report. Promoted to be lieutenant-colonel in 1862, Jervois became a full colonel in 1867. As a member of the special committee on the application of iron to defensive purposes (1861–64) he took a prominent part in these important questions, and was active in designing and superintending the execution of works of fortifications both at home and abroad. In 1863 he was nominated a Companion of the Bath, in 1874 Knight Commander of the Order of St. Michael and St. George, and in 1878 grand commander of the order. He was governor of the Straits Settlements 1875–77, and during his term of office quelled an insurrection in the Malay Peninsula; was governor of South Australia 1878–82, and of New Zealand 1882–89. Revised by C. K. Adams.

Jesi: a town of Italy. See Iesi.

Jessamine: See Jasmin.

Jesse, John Heneage: historical writer; b. in England about 1815; held an office in the secretary's department of the admiralty at Whitehall, and wrote numerous volumes of memoirs illustrating English history during the seventeenth and eighteenth centuries. *Memoirs of the Court of England during the Reign of the Stuarts* (1839–40); *Memoirs of the Court of London from the Revolution of 1688 to the Death of George II.* (1843); *George Selwyn and his Contemporaries* (1844); *Memoirs of the Pretenders and their Adherents* (1845); *Richard III. and his Contemporaries* (1861); *Mem-*

... the Life and Reign of King George the Third (1867), besides several other works. D. July 7, 1874.

Jesso: an occasional form of the name of the northern island of Japan. See YEZO.

Jessopp, AUGUSTUS: clergyman and author; b. at Albury Place, in Herts, England, 1824; graduated at St. John's College, Cambridge, and received the degree of D. D. from Worcester College, Oxford. He was active in educational work, and became select preacher before the University of Oxford in 1870 and before that of Cambridge in 1888; but he is best known by his writings, among which are *Norwich School Sermons* (1864); *The Fragments of Parables, Interpretations and Confessions of Faith Contained in the Writings of the New Testament* (1872); *One Generation of a Norfolk House, a Contribution to Elizabethan History* (1878); a volume of social papers called *Arcadia, for Better or Worse* (1887), which has passed through several editions; and *Coming of the Friars, and other Historical Essays* (1888). He has written some important articles in the *Dictionary of National Biography*. F. M. COLBY.

Jessor': district and town of Bengal, British India; on the delta of the Ganges. The area of the district is 2,276 sq. miles. Pop. 1,600,000. The country is flat and wet and the climate bad. The town is the capital of the district, and is 50 miles N. E. of Calcutta (see map of N. India, ref. 7–I). Pop. about 10,000. M. W. H.

Jessup, HENRY HARRIS, D. D.: missionary and educator; b. at Montrose, Pa., Apr. 19, 1832; graduated at Yale College (1851) and Union Theological Seminary (1855). He was a missionary in Tripoli, Syria, 1856–60, and has since taken a leading part in the missionary work centering in the Presbyterian station and college at Beyrout. While on a visit to the U. S. in 1879, he was elected moderator of the General Assembly at Saratoga. He has published *Women of the Arabs, and Syrian Home Life* (New York, 1873); a translation into Arabic of Mosheim's *Church History* (Beyrout, 1876); *Missions to Oriental Churches* (*Evangelical Alliance*, 1873); Arabic lectures on *Homiletics and Pastoral Theology* (Beyrout, 1879); *The Mohammedan Missionary Problem* (Philadelphia, 1879); *The Greek Church and Protestant Missions* (New York, 1891); and many illustrated Arabic books for children. C. K. HOYT.

Jester, Court: See LICENSED FOOL.

Jesuits [*Jesuit* is from Fr. *Jésuite*: Span. *Jesuita*: Ital. *Gesuita*, from Mod. Lat. *Jesui'ta*; *Jesus*, Jesus + *-ita*, -ite]: There are in the Roman Catholic Church different religious bodies known as monks, mendicants, clerks regular, societies, congregations, etc. The monks instituted in the earliest centuries had for their purpose the praise of God in common prayer and their own sanctification by study and labor. The mendicant friars (brothers) instituted in the thirteenth century added to the praise of God exemplary personal life, the following of the gospel counsels, and preaching to the people. The clerks regular, instituted principally since the sixteenth century, were neither monks nor friars, but priests living in common and busied with the work of the ministry. The Society of Jesus (Jesuits) is one of the orders of clerks regular. It is not the first in date, having been preceded by the Theatines and others, but it is the first in renown. It was founded by St. Ignatius Loyola and approved by Paul III. (1540). After St. Ignatius's death, his successors, especially Lainez and Aquaviva, improved the organization given to the order by its founder.

The order consists of four classes of members: the brothers or temporal coadjutors, the scholastics who teach the humanities in colleges before being ordained priests, the coadjutors spiritual, who are priests under the three vows of chastity, poverty, and obedience, and the professed, who add to the three vows a fourth one. These latter alone have anything to say in the government of the society. The purpose of the society over and above the personal sanctification of the members is (1) preaching and missions, (2) education of youth.

The golden age, the time of highest prosperity, of the Jesuits lasted about one century. Within that period it produced (1) a great number of saints—Ignatius, Xavier, Aloysius of Gonzaga, Stanislaus Kostka, Francis Borgia, and many others; (2) many learned men of the highest order (*a*) in exegesis, such as Maldonatus, Bonfrère, Salmeron, and a Lapide; (*b*) in dogmatic theology, such as Bellarmin, Suarez, Vasquez, Ruiz, Petavius, and others; (*c*) in moral theology, such as Sanchez, Lessius; (*d*) in history, the Bollandists; (3) numerous and zealous missionaries who preached the Gospel in Europe, America, India, China, and Japan.

In point of doctrines there are two theories which are more or less closely identified with the society: one dogmatic, on grace and predestination (Molinism, Congruism, see MOLINA), whereon the Jesuits had long and arduous controversy with the Dominicans; the other moral (probabilism), though the theologian who first formulated this theory was not a Jesuit, but a Dominican.

The Reformation was already solidly established in Northern Europe before the Jesuits were founded, and before they began to exercise a wide and powerful influence. The honor of the first battles between the Reformed Church and the Roman Catholic Church belongs to the University of Louvain. In the Council of Trent the influence of the Jesuits was small, owing chiefly to their recent institution, though Lainez distinguished himself among the theologians of the council; but in the Catholic reaction that followed the Council of Trent they played a pre-eminent part, especially in Germany, where Flemish Jesuits directed the Catholic movement. In the matter of Jansenism they fought persistently for the true doctrine of the Church; but it must be confessed that in this fight they did not produce intellectual champions equal to their adversaries. In the struggle of the Church with the Anglo-French rationalism of the eighteenth century their influence was comparatively weak.

The decline of the society begins to become evident from the middle of the eighteenth century. Interior dissensions weakened it, and many causes from without contributed to spoil it of its power. Some of these causes were: (*a*) Though a lax moral teaching was by no means the exclusive monopoly of the society, yet there was a marked tendency in that direction. Even in 1607 the general of the society, Vitelleschi, warned its members that they were in danger of harming the Church and ruining the society by reason of their moral teaching. Later several propositions concerning moral theology were extracted from the Casuists, mostly Jesuits, denounced by the Jansenists, referred by the University of Louvain to the holy see, and condemned by the bishops of France and Popes Alexander VII. and Innocent XI. (*b*) Dogmatic controversies on grace alienated from them the Dominicans and most all the other religious societies. (*c*) They fell into numerous difficulties with bishops and universities.

The foreign missions of the society, both before and after the suppression, were extensive, and carried on with much devotion and prudence. St. Francis Xavier landed at Goa in 1542, and preached the faith to the inhabitants of Travancore, the fishery coast, and Madura. By 1549 he had established a flourishing Church in Japan, and was only prevented by death in 1552 from evangelizing China. The century of Jesuit missions in Japan is one of the most edifying and romantic pages of Church history, marked by brilliant success, changing fortunes, and cruel martyrdoms until their final extinction in 1643. Before the death of Aquaviva (1615) the Jesuits had penetrated into China in spite of almost insuperable obstacles. The efforts of Valignani and Spinola in Japan were soon outdone by Ricci, Ruggieri, Verbiest, Schall, and others, who knew how to engage the favor of the monarchs, propagate the faith, and increase at the same time the literature of China. The unfortunate discussion on the Malabar rites crippled their endeavors in the eighteenth century. In 1841 the Chinese mission was revived, and the Jesuits now administer the missionary fields of Kiang-nan and Chih-li. The most distinguished of the Jesuit missionaries in India was that extraordinary man, Robert de' Nobili, the nephew of Bellarmin, whose conduct in becoming a high-caste Brahman, in order to win the proud and stubborn order, was the cause of much criticism. In a few years he had converted 100,000 of the hitherto inaccessible caste, and Gregory XV. in 1683 decided that the head-mark of yellow paste and the girdle of 800 threads might be tolerated if blessed by the hand of a priest. De' Nobili died in 1656, at the age of seventy-nine. He had worthy companions in Fernandez, de Vasconcellos, and de Andrada, the first apostle of Tibet. (See Marshall's *Christian Missions*, 4th ed. New York, 1880.) The missions of India are yet supplied with laborers from Belgium, Great Britain, and France, although the establishment of the Indian hierarchy (1886) has placed that Church on a more regular basis. In that year four Jesuit bishops and about 250 Jesuit priests were laboring around the centers of Mangalore, Madura, Calcutta, and Bombay. See for the general

statistics of those missions, *Orbis Terrarum Catholicus*, by O. Werner, S. J. (Freiburg, Baden, 1890, 4to).

The American missions of the Jesuits embraced the entire New World. The mission of Brazil was opened by St. Ignatius himself, who sent de Nobreza thither in 1549, where he reformed the colonists and founded many Christian communities of Indians. Tolosa and Anchieta, Vieyra, and many others, followed in the same regions during the sixteenth and seventeenth centuries, while at the same time Chili, Peru, and Mexico received the light of faith from other heroic members of the society. By the beginning of the seventeenth century the "reductions" of Paraguay were founded. They will ever remain a monument to the devotion of the Jesuits, who trained the Indians of those vast plains and trackless forests to live in communities, and withstood the avarice of Europeans. Barsena, Angula, Maceta, Cataldino, and de Espinosa are honorable names. The Jesuits of these missions rendered great services to the natural sciences by the introduction into Europe of valuable botanical knowledge, medicinal plants and substances, etc. Baraza, de Mouroy, de Torres, Falconer, and others distinguished themselves as men of faith and science. "Nothing," says Buffon, "ever honored religion so much as the fact of having civilized these nations, and founded an empire with no arms save those of virtue."

The jealousy of the Portuguese and the false or exaggerated accusations of the ex-Capuchin Norbert eventually brought about the undeserved fall of the society's establishments in Paraguay, which in 1717 numbered 120,000 Christian Indians; with the suppression of the society the missions fell into decay. The efforts of St. Peter Claver (d. 1654) for the poor Negroes of New Granada rank among the most philanthropic services ever rendered to the black race.

The labors of the Jesuits in North America have been described by an American Protestant writer "in a tone generally fair and almost sympathetic." In 1625 we find them at Quebec; the conversion of the Hurons soon followed, and their attempts to convert the Iroquois, in which Lallemand, Daniel, and Brébeuf suffered martyrdom. Rasles in Maine and Jogues in New York were the pioneers of Christianity among the Indians; Marquette discovered the Mississippi; and in general one may say with Bancroft that "the history of their labors is connected with the origin of every celebrated town in the annals of French America; not a cape was turned, not a river entered, but a Jesuit led the way." In 1697 they landed in California, and for a long time labored among the Indians, winning them by their musical skill, and teaching them the arts of civilized life.

The suppression of the society took place in 1773 by the bull "Dominus ac Redemptor Noster" of Clement XIV., after long hesitation, and "on the ground of the numerous complaints and accusations of which the society was the object, without declaring on their guilt or innocence." The Encyclopædists, free-thinkers, and Jansenists, with the parliament in France, and the universities, were hostile to them. Their influence and wealth, real or imaginary, made them the object of manifold envy; the indiscretions of individuals furnished pleas and pretexts, and the society formally fell, after a partial civil suppression, in France and Portugal (1759), and Spain (1767). With it fell many ecclesiastical interests of great importance. They suffered much cruelty and oppression, but submitted, and, as a rule, entered on missionary and teaching work as diocesan ecclesiastics. Frederick the Great and Catharine of Russia sheltered them in their domains, where they taught and received novices, until in 1814, after some partial restorations, Pius VII. restored them by the bull "Solicitudo omnium ecclesiarum." By decree of June 7, 1774, Clement XIV. allowed the *statu quo* in Russia. He attempted to obain the execution of the bull in Prussian Silesia, but failed. Pius VI. in 1775 left Frederick free to maintain the society in his states. In 1828 their colleges were closed in France. After a period of difficulties they obtained fair play. Under the second empire they enjoyed freedom, but in 1880 they were again suppressed by order of the republic, which denied them the right of corporate existence. The war of the Sonderbund (1846) caused the destruction of their university at Freiburg, in Switzerland, and their banishment from the confederacy.

In many European and some South American states they are yet forbidden to associate or teach publicly, while in others they enjoy absolute freedom. The vast majority of the society is occupied at present in missionary or teaching work, with a certain number devoted to purely scientific occupations. Their generals in this century have been Thaddeus Brzozowski (1814–20), Aloysius Fortis (1820–29), John Roothan (1829–53), Peter Beckx (1853–84), Anton Anderledy (1884–92). The present general, Father Martin, is a Spaniard, elected in 1893, after a lengthy vacancy, and is counted as the twenty-fourth in the series, including the founder.

Statistics of the Society.—It began with 7 members in 1534, and in 1680 counted 10,581 in its ranks; about a century later (1759), just before its suppression, it numbered 22,589. It gradually increased in the nineteenth century, until in 1889 there were 12,306 members, in 23 provinces and 3 missions. Of these, 5,534 were priests, 3,640 scholastics or students, and 3,312 lay brothers. There were in England 803, in Ireland 380, in the U. S. 1,258, and in Canada 284.

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II. *General Histories of the Society.*—The classical works on the society are the *Historia Societatis Jesu* (Antwerp and Rome, 1540–1633), by N. Orlandini, F. Sacchini, J. Jouvence, and J. Cordara. The apologetic work by J. Crétineau-Joly, *Histoire de la Compagnie de Jésus* (6 vols., Paris, 1844–46; 3d ed. 1859), is the best known among modern works. Ranke, Hübner, Janssen, and modern writers of the political history of the seventeenth and eighteenth centuries, may also be consulted. The polemics against the society have begotten an extensive literature. Among other books may be mentioned A. de G. Saint-Priest, *Histoire de la chute des jésuites, 1750–82* (Paris, 1844); S. Sugenheim, *Geschichte der Jesuiten in Deutschland, 1540–1773* (Frankfort-on-the-Main, 1847); and the writings of von Schulte, Huber, and Döllinger. For the literary life of the Jesuits of the eighteenth century, consult the *Journal de Trévoux* (265 vols., Paris, 1701–67). Their missionary enterprises are described in the *Lettres Édifiantes et Curieuses* (14 vols., Lyons, 1819) and in the *Relations des Jésuites* (3 vols., Quebec, ed. 1858). Their activity in the missions of North America is the subject of F. Parkman's *Jesuits in North America* (Boston, 1868) and his *La Salle and the Discovery of the Great West* (1869). T. Marshall's *Christian Missions* (3 vols., London, 1862), J. G. Shea's *History of the Catholic Church in the United States* (4 vols., New York), and Pierre Margry's *Mémoires et Documents pour servir à l'histoire des Origines françaises des pays d'Outre-Mer* (Paris, 1879, *sqq.*) contain much valuable original material. The bibliography of the Jesuit missions in America is found in Justin Winsor's *Narrative and Critical History of America*, vol. viii., p. 249.

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Biographical Dictionary of English Catholics from 1534 to the Present Time (London, 1885, *sqq.*); Charles Dodd and M. A. Tierney's *Church History of England* [from 1500 to 1688] (5 vols., London, 1839–43).

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VI. *On the Suppression of the Jesuits.*—A. Theiner, *Histoire des Pontificat de Clément XIV.*; G. X. D. de Ravignan, *Clément XIII. et Clément XIV.* (2 vols., Paris, 1852); A. Weld, *The Suppression of the Society of Jesus in the Portuguese Dominion* (London, 1877); S. Zalenski, *Les Jésuites de la Russie Blanche* (Paris, 1886, 2 vols.); C. Riffel, *Die Aufhebung des Jesuitenordens* (Mainz, 1845). Cf. also Sanguinetti, S. J., *La compagnia di Gesù e la sua legale esistenza nella Chiesa* (Rome, 1882).

VII. *General Bibliography.*—A. de Backer, *Bibliothèque des écrivains de la Compagnie de Jesus* (3 vols., fol., Paris, 1869–76); C. Sommervogel, *Dictionnaire des ouvrages anonymes et pseudonymes publiés par des religieux de la Compagnie de Jésus* (Paris, 1884). JOHN J. KEANE.

Jesuits' Bark: See CINCHONA.

Jesulmir', or **Jaisalmir**: tributary state and town of Western Rajputana, India. It has on the N. the Punjaub, E. Bekanir and Marwar, S. Marwar, and W. Bombay Presidency and the Punjaub. Area, 16,447 sq. miles. It occupies the central part of the Thar, or Indian Desert, and offers a monotonous country of drifting sands, with a few natural and artificial oases. The climate is extreme and of the desert type, a severe winter following a torrid summer. The most of the inhabitants are Jats, who live in villages, raise cattle, and cultivate barley and millet. The ruling race is the Rajput clan of Bhatti, who live for the most part in the capital. This town is also named Jesulmir, and includes a full third of the population of the state. It is a regularly built and attractive town, on a considerable lake which permits the formation of a large oasis. There are many ancient Jain monuments near the town. Pop. of state, 110,000. MARK W. HARRINGTON.

Je'sus Christ [Lat. *Jesus*: Gr. Ἰησοῦς, from Heb. *Yĕshū'a* or *Yōshū'a* (whence Eng. *Joshua*), shorter forms of *Yehōshu'a*, liter., Jehovah his salvation, or salvation of Jehovah; Christ is from Lat. *Christus* = Gr. Χριστός, Anointed One (deriv. of χρίειν, smear, anoint), transl. of Heb. *Māshiyah*, anointed of Jehovah]: literally, Jesus the Christ, or Jesus "the Anointed," Jesus being the proper name, and Christ the official designation. The name Jesus is applied to several persons in the Scriptures, and probably was not uncommon.

Into the theological questions connected with the person of Jesus Christ it is not the purpose of this article to enter, nor will any attempt be made to interpret his words, or to discuss disputed points in regard to the relative authority of the several Evangelists. Those seeking information on these points will consult those writers who have fully discussed them. We assume here the substantial accuracy of the Gospels. There is, and doubtless will continue to be, much difference of opinion among harmonists in regard to the chronological order of events in his life, but there is general agreement as to the most important facts.

Birth.—Jesus was born in Bethlehem, a small Judæan town, already famous as the birthplace of King David, and about 5 miles S. of Jerusalem. The home of his mother, Mary, was Nazareth in Galilee, but she had come to Bethlehem with her husband, Joseph, a descendant of David, in obedience to a decree of enrollment and taxation which seems to have required Joseph's presence at the original home of his family. Mary is thought to have been, like Joseph, descended from the royal house of Judah. The date of the Nativity is uncertain, but we accept as probable that he was born in Dec., 749 of Rome, or 5 B.C. See CHRISTMAS.

Infancy and Youth.—Jesus was born miraculously of a virgin mother, by the power of the Holy Ghost. On the eighth day after his birth he was circumcised, and on the fortieth day he was taken to the temple, when the customary offerings of purification were made by his mother. The visit of certain "wise men," or Magians, who came probably from Persia, to the infant at Bethlehem, with gifts proper for a king, and the inquiries made by them previously at Jerusalem for a newly born king of the Jews, excited the jealousy of Herod, then ruling over Judæa and the neighboring territories under the protection of the Romans, and he issued orders for a massacre of young children at Bethlehem. Jesus was taken by divine direction to Egypt in time to escape the destruction which threatened him, and the holy family remained out of Herod's jurisdiction until his death, a short time after. Joseph seems to have intended to rear the child at Bethlehem, as the city of David, but another warning from Heaven caused him to return to Nazareth, probably in 4 B. C. Twelve years later, 8 A. D., Joseph and Mary took Jesus with them to Jerusalem to keep the Passover, and he then showed that he was already conscious of a divine mission. He lived at Nazareth, however, for eighteen years longer, and probably assisted Joseph at his trade, that of a carpenter. Joseph is not mentioned again in the Gospels, and is supposed to have died before Christ entered on his public labors.

Public Ministry.—When Jesus was about thirty years old (26 A. D.) his kinsman, John, the son of Zacharias, began to announce the near approach of the kingdom of God, and to call his countrymen to prepare for it by a moral reformation, and by accepting baptism at his hands as a sign of the remission of sin. Jesus appeared among the throngs which gathered about John the Baptist at the Jordan, and insisted on being baptized by him. This was probably early in 27 A. D. After John had reluctantly administered the rite to one whom he felt by a kind of prophetic instinct, as it would seem, to be holier than himself, he was shown by a supernatural sign that Jesus was the Messiah, the Son of God. After his baptism Jesus withdrew, under a divine impulse, into the wilderness—where is uncertain, but it may have been on the western shore of the Dead Sea—where he encountered and overcame a series of temptations addressed to him by Satan. He returned to John, who just before his return had been visited by a deputation of priests and Levites from Jerusalem, inquiring by what authority he baptized, to whom he testified that the Messiah had come. He repeated this testimony the next day to his own disciples, some of whom visited Jesus and accepted him as the Messiah, and soon after went with him to Galilee. The first of his miracles was wrought at Cana, a few miles from Nazareth, where water was changed into wine. Soon after he began his public ministry, in the proper sense, in Jerusalem, at the Passover, Apr., A. D. 27. He announced himself to the heads of the nation there as a messenger of Heaven by expelling from the temple-court those who had been allowed to carry on traffic in it for the convenience of worshipers. One member of the Sanhedrin, Nicodemus, became at this time a secret adherent of the new prophet.

Judæan Work.—For a few months Jesus carried on a work in Judæa similar to that in which John the Baptist was engaged, and seemed to be co-operating with the latter in the effort to bring about a national repentance. The object of this ministry in Judæa, mentioned only by John in his Gospel, was to present himself to the nation in its heads as the Messiah. Not till rejected there could he begin his work in Galilee. From the first the rulers at Jerusalem arrayed themselves against him. Attempts being made to create dissensions between his followers and those of John, he retired to Galilee. It is probable that some time was now passed by Christ in comparative seclusion, and that his disciples were for a while dismissed. The latter are not said to have been with him when he next presented himself at Jerusalem, on the occasion of a feast. If, as is probable, though many think otherwise, this feast was the Passover (A. D. 28), it marked the close of the first year of Christ's ministry, during which he had constantly in view an impression to be made on the men of influence and authority at Jerusalem. At this feast Jesus raised an issue with the Jewish hierarchy by disregarding the traditional interpretation of the Fourth Commandment, and healing an impotent man on the Sabbath day, and offended them still more by the way in which he spoke of his own relation to God. From this time, at any rate, he had a body of powerful and implacable enemies in Judæa, who never ceased to watch and oppose him.

Near the time of this second Passover, John the Baptist was imprisoned by Herod Antipas, whom he had rebuked for his adulterous marriage with his brother's wife, Herodias, and John's effort to bring Israel to repentance ended.

Work in Galilee.—Jesus now entered on a new stage of his work, to be carried on in Galilee. The Synoptists all

begin their narratives with the Galilæan ministry, wholly omitting the Judæan. The ground of this is that, being rejected by the people of the first Covenant, Jesus began to gather in Galilee disciples who should serve as the foundation of the new Covenant, and it was, therefore, his work in Galilee that specially interested them. After meeting a repulse at Nazareth, he fixed his residence at Capernaum (May, 28 A. D.), on the Lake of Tiberias, and from that point made a series of circuits through Galilee. His old followers rejoined him, and he at once began to add to their number, while by his discourses and miracles he speedily attracted crowds of more or less appreciative hearers. In close connection with the most famous of the Galilæan discourses, the Sermon on the Mount, Jesus chose twelve of his disciples to be, under the name of apostles, his constant companions, and by degrees his associates in labor.

Choice of Apostles (summer of 28 A. D.).—Proofs were multiplying of the indisposition of Israel as a whole to profit by the mission of Jesus of Nazareth. Emissaries of the Judæan priesthood were busy in Galilee, and gradually formed a hostile party there. Jewish beliefs and prejudices were also operative in the minds of those who were attached to his person. His own relatives misapprehended him, and even John the Baptist sent a message from his prison which expressed his perplexity at the course which Jesus was pursuing. Nevertheless the end of his work in Galilee was practically secured. He had a body of faithful adherents, who loved and trusted if they did not understand him, and whom he was educating for future service. For their encouragement, and to show the nature of his future kingdom, he was transfigured.

Private Instruction of the Apostles.—As the next Passover (A. D. 29) drew near, John the Baptist was put to death by Herod at the instigation of his wife. From this time Jesus began to withdraw as much as possible from public notice in Galilee, and to devote himself to the instruction of the twelve apostles. Entire seclusion was out of the question, and some great miracles were wrought during this period. In the month of October, or about six months after the death of John the Baptist, Jesus began his second and final attempt to gain a hearing from the representatives of the nation at Jerusalem. He appeared somewhat suddenly at the Feast of the Tabernacles (October, A. D. 29), and by miracles and discourses, as well as by the angry opposition which he excited, he at least succeeded in awakening new interest in his movements, and in fixing the attention of the nation upon himself during the rest of his career. It may be inferred that after the feast he returned to Galilee, and set about arranging what had in some sense the air of a royal progress to Jerusalem.

Sending of the Seventy.—Seventy disciples were sent (late autumn of A. D. 29), two by two, to the various towns which he designed to visit, and he followed them, preaching and working miracles, as he had been accustomed to do in Galilee. The scene of these new labors must have been Peræa, the country E. of the Jordan, through which lay the longer but safer route from Galilee to Judæa. It bordered on the latter province for a considerable distance, and whatever excited general interest in Peræa would soon be known across the river. That intense excitement did follow Christ's appearance in a region which hitherto, so far as we know, he had scarcely visited, is clearly indicated in the Gospels. In December, at the Feast of the Dedication, Jesus was again at Jerusalem. He was met by questions about his Messiahship, which showed that his claims were undergoing eager discussion, but his answers only provoked fresh hostility, and he narrowly escaped being stoned as a blasphemer. His home during these visits to the ecclesiastical capital was probably at the house of Lazarus at Bethany, 2 miles E. of the city. Lazarus and his sisters must before this time have become disciples and intimate friends of Christ.

Work in Peræa.—On his return to Peræa, Christ, instead of going from place to place as before, fixed his abode at Bethabara (or Bethany), near the scene of his baptism. Hence he was summoned to Bethany in Judæa, early in 30 A. D., by the dangerous illness of Lazarus, and arriving after the latter had been four days dead, he wrought the greatest of his recorded miracles by restoring his friend to life. This great miracle led the Hebrew council, or such of its members as were under the influence of the high priest Caiaphas, to resolve formally and finally on the destruction of the Galilæan prophet. Whatever he was, he could not be the Messiah, and he might become the occasion of popular tumults, which would draw upon the nation the vengeance of their Roman masters. Jesus now for a time concealed himself, taking refuge in a town called Ephraim, 20 miles N. E. of Jerusalem.

Another Passover approached (Mar.–Apr., 30 A. D.), and Jesus prepared to attend it in such a way as publicly to assert his Messianic character. He seems to have gone northward and joined one of the companies of Galilæan pilgrims then moving eastward, near the Samaritan border, in order to go to the feast by the ordinary Peræan route, crossing the Jordan near Jericho. The suburbs of Jerusalem were reached probably on the evening before the Sabbath, or on Friday, Mar. 31. Christ and his followers stopped at Bethany, where Simon, the leper, made him a feast, at which Lazarus was present. On the first day of the week, Apr. 2, and evidently in pursuance of arrangements previously made, Jesus entered the Holy City, riding on an ass never before used, and surrounded by an intensely excited throng, composed largely, no doubt, of pilgrims from Galilee and Peræa. The multitude hailed him as "Son of David" and "King of Israel," and he distinctly sanctioned their acclamations. On the following day (Monday) he went to the city again, and repeated the act by which he had announced himself and his mission three years before—the cleansing of the temple. The third day (Tuesday) was also spent in the temple, but was devoted to teaching and to answering the questions of his enemies. As Jesus and his apostles returned each evening to Bethany, they may be supposed to have paused for prayer in the Garden of Gethsemane, at the western base of the Mount of Olives. After leaving the temple for the last time on Tuesday afternoon, he seated himself on the Mount, and foretold to some of the apostles the course of events till his return. The next day (Wednesday) seems to have been passed in retirement. Meanwhile Christ's enemies, not daring publicly to arrest one who was for the time so popular, resolved to get him into their power in some clandestine manner, and after the feast should be over. The treachery of an apostle prepared the way for an earlier accomplishment of their purpose. Judas Iscariot bargained with them for the possession of his Master's person, and watched for the first opportunity to betray him.

Paschal Supper, Arrest, and Trials.—On the evening of Thursday Jesus kept the Passover with his disciples, coming once more to Jerusalem for the purpose. While they were at the table he indicated to Judas, as also to John and Peter, his knowledge of the intended betrayal, and Judas hastened to the priests to bid them act at once. At the close of the paschal supper Jesus instituted the Christian feast of bread and wine commemorative of his own impending death, and the company set out on their return to Bethany. On the way they turned aside to the garden of Gethsemane, where Jesus passed through a fearful inward struggle in view of the sorrows before him. The struggle was scarcely over when the sorrows began. Judas entered the garden, guiding a band of armed men, with some members of the council and their attendants, and probably a crowd of hostile citizens from the streets of Jerusalem. Jesus was arrested probably a little after midnight, and led back to the city for trial before the Sanhedrin. Before the trial began he was subjected to a preliminary examination before Caiaphas, the high priest. The charge was blasphemy, but in the absence of trustworthy witnesses no evidence was produced on which the party of the high priest, themselves wholly unscrupulous, could call for an unfavorable verdict from the majority of the council. The prisoner was then virtually put under oath and required to criminate himself. When solemnly appealed to by the high priest, he not only avowed his Messiahship, but asserted that he was the Son of God, and the future judge of the world. The Sanhedrin then unanimously condemned him as a blasphemer, though two members of it, at any rate, Joseph of Arimathea and Nicodemus, were no doubt absent. After the formality of a fresh trial at daybreak, held in order to make the proceedings legal, the priests led Jesus to the Roman procurator, Pontius Pilate, probably about sunrise, to obtain authority for the execution. Pilate resided at Cæsarea, the political capital of the province, but was now at Jerusalem for the sake of maintaining order at the feast. The procurator made several efforts to rescue Jesus without exasperating the Jews, and sent him to Herod as ruling in Galilee, who mocked him and sent him back; but he was at last intimidated by the danger of a riot, and the implied threat of accusing him to the emperor as in disloyal sympathy with a pretender to the Hebrew throne. He then gave the order for the death of Jesus by crucifixion.

execution. The sentence was promptly executed, and for six hours, or from about nine in the morning until three in the afternoon of Friday, Apr. 7, Jesus endured the punishment allotted to the worst and basest criminals, with a convicted felon on either side of him. From time to time he spoke briefly, uttering, first his feelings in behalf of others, then his consciousness of his own bodily and spiritual anguish. He died in the act of commending his soul to God. The body was given by Pilate to Joseph of Arimathea, and, aided by Nicodemus, he wrapped it in spices and laid it in a tomb prepared for himself in a garden which he owned outside the walls, near the place of crucifixion. The site of the sepulchre is still in dispute. The claims of a hill just N. of the Damascus gate to be the place of crucifixion have been made prominent, but they have no real basis.

Resurrection.—On the day but one succeeding, or Sunday, Apr. 9, some of the Galilæan women went to Joseph's garden to do their part in honoring the body of their Master. As they approached they saw that the tomb had been opened, and one of them, Mary Magdalene, hurried away to tell John and Peter. These two apostles had probably taken lodgings in Jerusalem, where John had friends. In the meantime the other women saw a vision of angels, who told them that the Lord was risen, and bade them instruct his friends to meet him in Galilee. It is reasonable to infer that most of the apostles continued to lodge at Bethany, where they would feel far safer than in Jerusalem. While the message was on its way across the Mount of Olives, Mary came with John and Peter. They carefully examined the tomb and returned, leaving Mary behind them. There the Lord "appeared first" to her, and intrusted her with a message respecting his ascension. As she went to deliver it, her late companions, still on their way to the place where the greater part of the Galilæan disciples were to be found, saw their Lord coming toward them. He renewed the charge which the angels had given them. Five distinct appearances are recorded as occurring on this day, the last being to the ten apostles at evening. Jewish theories about the Messiah had made no provision for what had actually taken place—his death and resurrection—and the disciples were so far under the influence of those theories that it was hard to convince them that he had risen. The unbelief of the apostle Thomas delayed for a week their return to Galilee. To convince him the Lord appeared the second time to the assembled apostles, Thomas being with them; and soon after they all went to Galilee, where he several times appeared to them. One of these is detailed by John as taking place at the Sea of Galilee. His principal appearance, and that for the sake of which he had summoned them to Galilee, is supposed to have taken place in the presence of the whole body of disciples, more than 500 in number.

Ascension.—After a few weeks the apostles went again to Jerusalem, and on the fortieth day after his resurrection, the Lord Jesus, having led them forth to the Mount of Olives, as if for another visit to Bethany, left them for the last time, not vanishing, as before, but passing visibly upward till a cloud concealed him from their sight. While they looked after him, two men brought them another message—that he should "so come in like manner." The ascension was on Thursday, May 18, A. D. 30.

Among the modern works on the life of Christ accessible in English, are Ullmann, *The Life of Jesus Christ*; Lange, *Life of Jesus*; Strauss, *Life of Jesus*, and *A New Life of Jesus*; Renan, *Life of Jesus*; Elliott, *Historical Lectures on the Life of our Lord Jesus Christ*; Hanna, *Life of Jesus*; Farrar, *The Life of Christ*; Crosby, *Life of Jesus*; Eddy, *Immanuel*; Beecher, *Life of Jesus the Christ*, vol. i.; Abbott, *Jesus of Nazareth*; Geikie, *Life and Words of Christ*; Stalker, *The Life of Jesus Christ*; Vallings, *Jesus Christ, the Divine Man*; Edersheim, *The Life and Times of Jesus, the Messiah* (2 vols.); Caspari, *Chronological and Geographical Introduction to the Life of Christ*; Keim, *Jesu von Nazara*; Weiss, *The Life of Christ* (trans.); Beyschlag, *Leben Jesu*; Père Didon, trans. *Life of Jesus*; de Pressensé, trans. *Life and Times of Christ*; Abbé Fouard, *The Christ, the Son of God*; Andrews, *Life of our Lord upon the Earth*, a new and wholly revised edition, 1891, in which will be found the reasons for the chronological order followed in the foregoing article.

S. J. Andrews.

Jesus Maria, hā-zoos'maă-ree'ăa: a city of Colombia; in the department of Santander; 10 miles S. W. of Velez; on a ridge near the small Rio del Valle, which flows to the Magdalena; 6,322 feet above the sea. It is noted for its charming situation, and is a place of some commercial importance. Pop. (1892) about 10,000. H. H. S.

Jesus, Society of: See Jesuits.

Jet [from O. Fr. *jet, jayet*, earlier *gayet* < Lat. *gagates* Gr. γαγάτης, jet, so called from Γάγας, Gagas, a town of Lycia]: a perfectly black mineral, capable of high polish; sometimes a kind of pitch-coal or albertite, and sometimes a very black lignite. It comes from various geological strata in the Asturias, Spain, in Aude, France, from Whitby, Yorkshire, from the Baltic regions, etc. It is extensively employed for mourning ornaments for ladies' use.

Jet'sam [earlier *jetson, jettison*, from Anglo-Fr. *getaison* < Lat. *jactatio*, a throwing, throwing away, deriv. of *jactare*, throw repeatedly, throw, freq. of *jacere*, throw, hurl]: goods which are jettisoned and do not float or come to land. Their ownership is unaffected by the jettison, as this act of necessity can not be construed into a renunciation of his property by the owner. At common law such goods belonged to the crown if not duly claimed by the owner; but at present their net proceeds are paid into the imperial treasury. In the U. S. the net proceeds appear to belong to the federal treasury, in case the property is not claimed by the owner. If the property is cast by the sea upon the land, it is then called "wreck," and is subject to State law. *Peabody* vs. *Proceeds of Twenty-eight Bags of Cotton*, 2 *American Jurist*, 119 (1829); United States Revised Statutes, § 3,755; *Murphy* vs. *Dunham*, 38 *Federal Reporter*, 503.

Francis M. Burdick.

Jetties [plur. of *jetty*, from O. Fr. *jetee*, a throw, thing thrown, jetty, orig. fem. past partic. of *jeter*, throw < *jactare*, freq. of *jacere*, throw, cast. See Jetsam]: piers or dikes built out from the land into the water for the purpose of improving a harbor or river, or of deepening and maintaining a channel across a shoal by compelling the water flowing over the shoal to pass through a narrower channel. The principles involved in the jetty system may be thus briefly stated: First, the current is caused by the fall of the water from a higher to a lower level, which fall is indicated by the slope or inclination of the surface of the water. Second, the friction of the bed over which the water flows is the chief force opposed to the current. Third, the current will be increased by either increasing the slope of the surface or the volume of water passing through the channel, or by lessening the friction. Fourth, the friction of the bed controls the velocity of the current, just as the brakes of a train going down grade without the aid of the engine regulate the velocity of the train. Fifth, friction increases just as the width of the bed increases, i. e. if the bed of the channel be twice as great, the friction will be twice as great. It does not increase with the weight or depth of the water, but with the square of its velocity. Sixth, the power of water to transport sand increases with the square of the velocity of the water; hence if the velocity be doubled it can transport four times as much sand.

The slopes of the sandy shores of the sea assume angles of inclination or repose that are determined by the gravity and form of the solid particles composing them and by the various currents which sweep over them. The slope assumed by the sides of a normal channel is therefore the result of an equilibrium between these opposite forces. Hence it is called the "angle of repose." On the seacoast these angles are usually very low. They involve, therefore, even for moderate depths, great width of channel.

The tidal waters flowing in and out of a harbor over a shoal, or the floods of a river flowing through alluvial deposits, will maintain a channel through such shoal or deposits, the cross-sectional area of which will be proportional to the volume of water passing over them. Hence, if the width of the channel be lessened, the abnormal increase of current produced by such contraction will wash out the bottom through the narrowed channel until it recovers in depth the area of cross-section necessary to restore the normal velocity.

The first effect of contracting the channel will be to increase the slope of the surface of the water through the contracted part at each change of the tide or flood of the river. A more rapid current will result, and as the channel deepens the basin will be filled and emptied more quickly, and the slope through the channel will be lessened. But when it has resumed its former inclination, the velocity will still be greater than before, because by narrowing the channel the friction which formerly retarded the flow will

have been lessened. Hence the deepening will continue until the enlargement permits the tide to enter and leave the basin more rapidly than ever, by which a still less slope reduces the velocity so much that the current no longer moves the particles composing the shoal, and thus a new condition of stable equilibrium is established. Among the permanent results which will follow will be—first, a deeper channel through the jetties; second, less frictional resistance to the flow of the water; third, less surface-slope; fourth, greater volume of discharge through the channel; and, fifth, greater tidal oscillations in the basin.

The most notable jetties are at the mouths of the Mississippi, Danube, Oder, Pregel, Maas, Memel, and Vistula. Many river-mouths on the Atlantic and Pacific coasts of the U. S., as well as on the Great Lakes, have been jettied. At Sulina the mouth of the Danube was deepened, by Sir Charles A. Hartley, from 9 feet to 21 feet by this means. Afterward the mouth of the Mississippi was deepened by James B. Eads from 8 feet to 30 feet. The channel of 21 feet depth, obtained in 1869 at the mouth of the Danube, has been kept without any extension of the piers seaward and without resorting to dredging. Neither has there been any advance of the bar seaward in the direction of the issuing current, although there has been considerable sediment deposited in advance, but on the flanks of the jetties, the Danube being essentially a sedimentary river in times of flood. At the mouth of the Mississippi a channel of over 30 feet in depth has been maintained since 1879. In 1874 Mr. Eads examined many European rivers and obtained official information in reference to the original and the then existing depth. One of the most convincing arguments for improving the mouths of rivers by jetties appears in the facts given in the following table:

TABLE OF DEPTHS AT MOUTHS OF SEVEN GERMAN RIVERS IMPROVED BY JETTIES.

NAMES OF RIVERS.	Original depth.	Depth, 1874.	Depth, 1891.
Persante	4 feet	15 feet	16·5 feet
Wipper	4 "	13 "	12 53 "
Warnow	6 "	13 "	17 16 "
Trave	7 "	18 "	18 81 "
Niemen	10 "	23 5 "	23 1 "
Oder	7 "	24 "	24 75 "
Pregel	12 "	20 "	23 1 "

Several of these works and others in Europe were executed prior to 1850, some of them at a more distant period, and yet all of them have maintained the depth at first secured, with only an occasional resort to dredging. The writer was engaged to make the plans and to superintend the works of improvement at the mouth of the Brazos river in Texas, situated about 40 miles W. of Galveston, and also at the mouth of the Panuco river at Tampico, Mexico, situated about 150 miles N. of Vera Cruz. The original depth at the former place was 5 feet in 1889. It is now 18 feet. At Tampico 8 feet was the original depth. The depth is now about 23 feet. Neither of these works is completed. The predicted depths of 23 feet at the Brazos and 24 feet to 26 feet at the Panuco are quite sure to be obtained and to be maintained.

The Jetty System as Applied to the Mississippi.—The first appropriation for improving the mouth of the Mississippi river was made in 1838, and was followed at various intervals by others; but until 1877 the principal method relied upon was that of dredging. In May, 1873, Mr. Eads urged its improvement by the jetty system, and in Jan., 1874, made a formal proposition to the Government to deepen the Southwest Pass bar to 28 feet by that method, but it was not until 1875 that an act was passed authorizing the work. Work was begun in June of that year, and in nine months the bar had been deepened from 8 feet to 13 feet. In July, 1879, 30 feet were secured, and the channel has been considerably improved in width and depth since then.

The work was begun by driving a single line of guide-piles, spaced 12 feet apart, from the land's end of the east bank of the pass, curving slightly to the south, 2¼ miles long, over the bar to the 30-feet water beyond it. A second line of piles, 1,000 feet W. of the first one and parallel to it, formed the line of the west jetty. The west shore extended 4,000 feet farther into the sea, and the west jetty was therefore 4,000 feet shorter than the east jetty. These lines of piles were driven simply to guide the sinking of the willow mattresses which were to form the chief portion of the jetties, and were not intended to give strength to the completed works. The mattresses were usually made 100 feet long, from 2 to 3 feet in thickness, and from 20 to 50 feet wide, according to their location in the works. These were built upon inclined platforms or launching-ways located on the banks of the pass a short distance above the bar. Pine-plank strips 6 inches wide and 2½ inches thick were laid flatwise on the ways parallel to the current and to each other, 4½ feet apart; 1¼-inch holes were bored through these planks every 4½ feet. Hickory pins, with each end turned to fit these holes, were securely fastened into them by wedges driven into the pins after insertion. The length of the pins determined the thickness of the mattress, which was in most cases 2 feet. The willows were used in branches just as they were cut from the tree, green and with the leaves on them. No branches were permitted to be used having butts thicker than 2½ inches in diameter. The branches averaged about 15 feet in length. Sometimes young trees 2½ inches in diameter were used with all their branches on. A sufficient number of these were laid across the strips of plank to make a thickness of 6 inches when pressed down by the weight of the workmen. The bushy ends of the branches were projected 3 or 4 feet beyond the outer plank. A second course of willows was then laid at right angles to the first course and parallel with the plank, of the same thickness as the first course. On this a third course was laid at right angles to it, and a fourth course parallel with the plank strips finished the willow work of the mattress. Other plank strips, with holes bored to match the upper ends of the pins, were then laid on top of the willows and at right angles to the bottom plank. These top strips were pressed tightly down on the willows until the pins came through them. The end of each pin was then split with a chisel, and a hardwood wedge was driven into it, after which the projecting end of the pin was cut off flush with the plank. The mattress was then ready for sinking. A rope fastened to it from a steam-tug pulled it into the water, and it was then towed down to one of the lines of piles before referred to. A ton or two of stone placed evenly upon it caused it to sink, and a few loops of rope around some of the piles guided it to the bottom, where it rapidly filled with sediment, and soon became immovable.

In this way one mattress after another was sunk from the land's end out through the entire lengh of each jetty, each mattress joining its neighbor, and the whole forming a continuous carpet on the bottom of the sea 35 feet wide, 2 feet thick, and 2¼ miles long on the east jetty, and about 7,800 feet long on the west jetty. This course constituted the foundation of each jetty; but as their sea-ends were approached other mattresses were laid on each side of this course, by which the width of the foundations was greatly increased, the tend of the east jetty foundation being at least 200 feet and the west one 130 feet wide. After the foundation-course was laid, a second course, 30 feet wide and 2 feet thick, was placed on top of it, and on the top of that another course, 25 feet wide, was placed. The thickness of the frame or planking and the stones used for sinking the mattress increased the thickness of each course about 6 inches. The greater portion of the length of the east jetty was constructed in water about 10 feet deep at average flood-tide. Consequently, four courses of mattresses brought the work to the surface. The sediment carried by the water rapidly filled the interstices of the willows, and caused a compression and solidification of the mattresses and necessitated the placing of additional ones upon the work on account of this settlement, which continued to occur through two or three seasons. Where the mattresses were much exposed to the sea-waves iron bolts ⅝ inch in diameter were used to secure the outer plank strips of the mattresses instead of hickory pins. Where the water was deeper than 10 feet wider mattresses were used, the top course always being 25 feet in width. Each course was placed against the piles, and on the river side of them. Consequently, the sea side of the jetty was vertical; and against this side, except near the sea-ends, the sea-waves rapidly banked up the sediment, which was carried through the jetties or over the tops of them into the shoal water on their sea sides. A revetment of stone, several feet thick, was afterward placed all over the willows where they were not imbedded in deposit. About three-quarters of a mile of the east jetty and half a mile of the west jetty were exposed to severe storms, and the mattress-work was so placed on these portions of the two jetties as to give them a slope on each side of the jetty of one vertical to three or four horizontal. These slopes

are thoroughly revetted with stone. The interstices of this rubble-stone are filled with macadam and gravel. A number of palmetto cribs filled with stone constitute the extreme end of the jetties.

After a thorough settlement of the willow-work, and its solidification by the sediment with which it is filled, the jetties were further consolidated by a thoroughly substantial capping of concrete blocks. This capping covers three-quarters of a mile of the sea-end of the east jetty and about half a mile of the sea-end of the west jetty. The width of this capping is 13 feet at the sea-end on the east jetty and 11 feet on the west jetty. The blocks are composed by measure of 3 parts of best American Portland cement, 15 parts of macadam stone, 4·38 parts of gravel, and 8·28 parts of sand, the three latter materials being thoroughly cleaned and the gravel being only such as was rejected by a sieve having 324 meshes to the square inch. This concrete, thoroughly dry, weighs 149 lb. per cubic foot. The blocks were mostly 20 feet in length, and were made in position on the jetties. They vary in depth from 3 feet toward the land to 5 feet toward the sea. The three blocks at the sea-end of the east jetty are each about 50 feet in length, and weigh respectively 140, 160, and 180 tons of 2,000 lb. The base of the blocks is at the level of mean low tide, the average range of the tides here being only 15 inches, and there being only one tide per day. Before the making of each block, gravel was placed over the mattress, and was thoroughly worked down into it by crowbars thrust down among the willows until the gravel rested on the sedimentary deposit in the willows, which was usually found within 2 or 3 feet of the surface of the water. The bottom of the mold was made of inch boards well battened. The sides and ends of the mold were of strong plank joined to the bottom, so as to make it almost water-tight. They were so contrived that they could be disengaged from the bottom after the block had sufficiently hardened, the bottom remaining under the block. Over the entire extent of each jetty thus covered there was constructed a railway-track about 10 feet above high tide. A strong wharf on the same level was built 1,600 feet from the sea-end of each jetty, and on this steam-engines and machinery were placed for mixing the concrete materials. About 4 tons of these were placed in the mixer at once, and were discharged, after mixing, into a sheet-iron railway car, which was then hauled by a small locomotive over the mold that was to be filled, and there dumped into it. The manufacture and delivery of the concrete into the molds was so rapid that four blocks, each 20 feet long, 9 feet wide, and 4 feet deep, could be made in one day of ten hours. The vertical fall from the bottom of the car into the mold was 8 to 12 feet, and insured a better state of contact and compression among the particles composing the concrete than could be obtained by ramming. In the course of two weeks the blocks were sufficiently hardened to endure the severest battering of the waves, and the sides of the molds were usually taken off about that time. In 1889 the concrete wall of the east jetty was rebuilt, as it had become disarranged by some severe storms, and had settled considerably by the compression of the mattress jetty beneath it. See Mississippi River, and Corthell's *History of the Mississippi Jetties.*

The System as Applied to Other Rivers.—The method of construction adopted at the mouth of the Brazos, but particularly at the mouth of the Panuco, varied considerably from that at the mouth of the Mississippi. It was important both for the rapid execution of the works and for economy, to be independent of the waves of the sea, which often delay and increase the cost of works carried on by floating equipment, and a trestle-work or pile bridge was built out from the shore on the line of the works, and the mattresses were built under the floor of this trestle and suspended from it by ropes. The trestle was built of sufficient height to allow a mattress of from 3 to 5 feet in thickness to be hung under it, clear of the waves underneath.

At Tampico, where this method could be more completely carried out, the procedure was as follows: A double-track trestle, from 10 to 12 feet above the surface of the water at mean high tide, was built out from the shore, the center line of the trestle corresponding with the center line of the work to be built underneath. The brush for the mattresses was brought to the work by a barge, or on cars running on the trestle, the track having been connected with the railway on the shore. The frame-work forming the upper and lower surfaces of the mattress was connected through the mattress by means of iron rods, and the whole mass, often 6 to 7 feet in thickness, was closely bound together by levers, so as to make a compact mass of brush. These mattresses were suspended by ropes, and when completed the ropes were instantaneously let go, and the mattress dropped into the waves. In the meantime several car-loads of suitable riprap stone were brought upon the double track of the trestle immediately over the mattress, and this stone was thrown upon the mattress as it was floating in the water. Two or three minutes usually was sufficient time to sink the mattress to the bottom. Near the ends of these jetties, which were about 7,000 feet in length, and the water from 15 to 24 feet in depth, the mattresses were often 84 feet in width. It was possible to build them of this great width by widening out the trestle, and by extending the caps which rested on the piles by outriggers of timber. The work was carried through without any difficulty or accident, and the body, or hearting, of mattresses was then covered with very heavy stone of large size, in sufficient amount and with proper slopes to protect the work against the waves, to which the north jetty particularly was greatly exposed.

Jetties are in process of construction (1894) by the U. S. Government at several points on the Atlantic, Gulf, and Pacific coasts, notably at Charleston, S. C., mouth of the St. Johns river, Florida, Galveston, Tex., and at the mouth of the Columbia river, in Oregon. It is not possible closely to predict final results. At Charleston the jetties converge from two islands to a width of 3,000 feet, and are then parallel out to the sea-ends. The total length, when completed, will be about 15,000 feet. It was decided to locate the jetty channel where only 11½ feet of water existed, and not in the channel used by shipping. The present least depth on the sea-bar is about 12 feet on the center line between the jetties, this point of least depth being in advance of the work. The works when completed are expected to establish and maintain a channel 21 feet deep at low water across the bar; the action of the current to be assisted, if necessary, by dredging.

At the mouth of the St. Johns river it is expected that the works will increase the depth from 7 feet on the sea-bar to 15 feet at mean low water. The tidal range is $5\frac{8}{10}$ feet. This is to be accomplished by concentrating and directing the flow of the river by two long jetties, starting from opposite sides of the entrance and converging until, near their outer extremities on the bar, they shall be 1,600 feet apart. These jetties are built of riprap stone on mattresses of log or brush, and the work is to be suitably capped. The works were begun in 1880. The total lengths in 1894 were 8,293 feet on the south jetty and 10,991 feet on the north jetty. Only a portion of the works are at present raised above the water to the full height contemplated. The minimum depth in the south, or best, channel is 12 feet. At Galveston the results of the works, which have been under construction since 1875, have not been commensurate with the large amount of money expended, principally for the reason that there has been no concentration of the tidal flow (no fluvial flow existing) upon the sea-bar, as at no time have there been maintained two jetties. The plan still contemplates two parallel jetties, with an expenditure of about $6,000,000 under an act of Congress. The depth on the bar has increased somewhat, being now about 14½ feet, 12 feet being the original depth. At the mouth of the Columbia river one slightly curved mattress and stone jetty, about 4¾ miles in total length from the land, has been built from the land into the sea. The plan was adopted in 1884, and work begun at that time under an appropriation from Congress. The high-water discharge of the Columbia river is about 600,000 cubic feet per second; the mean tidal ebb discharge about 1,000,000 cubic feet. The range of the tides is about $6\frac{2}{10}$ feet. The general method of constructing the work is somewhat similar to that at the mouth of the Brazos and Panuco rivers, namely, from an overhead trestle. The result of the work has been the deepening of the bar from 21 feet (with 19 feet only over an inner bar) to 29 feet, with a good prospect of over 30 feet. The single jetty in this case conserves the strong force of the great floods of the river, which were formerly wasted on the side where the jetty is built; and this jetty directs this force against the bar in the sea. Other quite successful jetties have been constructed on the Pacific coast at Yaquina Bay, 115 miles S. of the mouth of the Columbia river; at Wilmington, to the N. of San Diego; and works are in process of construction at Humboldt Bay, California, and at Coos Bay and the mouth of the Coquille and Siuslaw rivers in Oregon.

E. L. Corthell.

Jettison [< Lat. *jactatio*, a throwing]: the throwing overboard of goods for the preservation of the ship, its cargo, crew, or passengers. "Goods" includes not only the cargo, but the ship stores, its cables, anchors, boats, sails, masts, tackle, and portions of the ship itself necessarily sacrificed. Even the grounding of the ship has been dealt with as a jettison. (*Rathbone* vs. *Fowler*, 6 Blatchford 294.) The right of the owner of jettisoned property to contribution from the owners of the ship, freight, and cargo is discussed under AVERAGE (*q. v.*). There remains for consideration the right of such owner against the one making the jettison.

Not only the master of the vessel, but any member of the crew or any passenger may jettison property without incurring liability to the owner, when he does this to save the ship, the cargo, or human life from imminent peril. This right is not based on contract, but on a rule of law as old as the maritime code of Rhodes. It is even justifiable to throw goods overboard to make room for persons picked up from a wreck. If the peril is due to the act of the person making the jettison, or of one for whose conduct he is responsible, he will be liable to the owner for the injury to the property; but where the ship master has caused the danger, as by overloading the vessel, a passenger may still be justified in sacrificing the property of another in order to secure his own safety. It is not necessary that the master should consult with his officers or the crew before casting the property away; nor is he bound to show that the jettison was actually necessary to the safety of the ship or its contents. It is enough that he acted with reasonable discretion and in good faith. This rule applies not only to his determination of the question of peril, but to that of the kind of goods to be jettisoned, and the order in which they shall be thrown overboard. While the peril must be imminent, it need not be immediate. Accordingly it has been held that where a heavy boiler and chimneys, stowed on deck, had proved a source of danger during a storm, they were properly jettisoned in the calm weather that followed. (*Lawrence* vs. *Mintusa*, 17 Howard (U. S.) 100.)

If property is loaded on deck, without the consent of the owner, the carrier will be liable for its loss or injury by jettison. Such improper stowage will be deemed the cause of the damage. Whether the owner, who consents to deck carriage, can recover anything from the carrier has been differently decided. It seems to be the prevailing view in England that he can not. His consent to such extra-hazardous stowage is treated as an assumption by him of the risk. In the U. S. the weight of authority supports the rule that the shipper who assents to deck stowage thereby waives his right to entire compensation in case of jettison, but does not lose his claim to contribution from the ship-owner. (*The Watchful*, 1 Brown's *Admiralty Reports* 469.) It is generally agreed that if stowing goods on deck is in accordance with well-defined usage, the owner has the right of contribution against the ship-owner. Gourlie on *General Average* (Philadelphia, 1881); Lowndes, *Law of General Average* (London, 1888). FRANCIS M. BURDICK.

Jev'ons, WILLIAM STANLEY: philosopher and political economist; b. in Liverpool, England, in 1835; a grandson of William Roscoe, the historian. He was educated at University College, London; held an appointment in the Australian royal mint at Sydney 1854–59; returned to England; became fellow of his college in 1864, and was appointed in 1866 Professor of Logic, Mental and Moral Philosophy, and Cobden lecturer on Political Economy in Owens College, Manchester. He removed to London in 1876. He was drowned Aug. 13, 1882. His chief works are *Principles of Science* (2d ed. 1877); *Studies in Deductive Logic* (2d ed. 1884); *Theory of Political Economy* (3d ed. 1888); *Money and the Mechanism of Exchange* (4th ed. 1876); *Letters and Journals* (1886). Revised by C. H. THURBER.

Jewel, or **Jewell**, JOHN, D. D.: bishop; b. at Buden, Devonshire, England, May 24, 1522; studied at Oxford, and during the reign of Edward VI. was admitted to holy orders. In the reign of Mary he was expelled from Oxford by the Romanists; went to Strassburg at the invitation of Peter Martyr, and engaged in teaching. Returning to England after the accession of Elizabeth, he aided in all the measures for the re-establishment of the Church of England as independent of Rome; was made Bishop of Salisbury in 1560, and was the most eloquent defender both in the pulpit and with the pen of the English Reformation. Besides many controversial pamphlets against the Roman Catholic champion, Dr. Thomas Harding, he wrote in Latin his famous *Apologia Ecclesiæ Anglicanæ* (1562), esteemed a classic of the Anglican Church, a copy of which was placed by order of Queen Elizabeth in every English church. D. at Monkton-Farleigh, Sept. 22, 1571. Revised by W. S. PERRY.

Jew'elry [*jewel* is from O. Fr. *jouel*, *joiel* (> Fr. *joyau*), dimin. of *joie*, joy. The form *jouel* is by analogy of *jouer*, play—as if plaything]: jewels collectively. In a restricted sense, jewels are precious stones, including pearls, set in gold or silver, and worn as personal ornaments, but the term is more generally applied to such ornaments made of the precious metals, or even of the baser metals. These may be either plain or embellished, as by being engraved, chased, enameled, or the like. The use of jewelry goes back to very remote times. It is probably a development of a still earlier custom of using seeds, berries, shells, animal teeth, and bright perforated pebbles, by way of personal adornment.

In the Orient there has been but little change in form or variety of workmanship for more than 2,000 years, as is attested by the jewelry of India, which has preserved its ancient character to the present time. Many of the bracelets, earrings, and other objects of modern times are ornamented with minute gold beads, filigree wires, quaint chainwork, etc., in the very same way as those taken from Cypriote or Etruscan tombs. It is probable that the Etruscan people and those of ancient Greece obtained many of their motives at that early date from India. Sir George Birdwood has shown that active trade was carried on with the Orient by the Phœnicians 2200 B. C.

Herodotus mentions three goldsmiths of Samos—Phœcus, his son Telectes, and the latter's son Theodorus. Theodorus lived in the seventh century B. C., and was the favorite jeweler of Crœsus, who offered many magnificent gifts to the oracle of the temple of Delphos. The Minerva of Phidias, executed about 438 B. C. for the Parthenon, is believed to have been one of the greatest examples of goldsmith's work of any time, being a combination of gold, silver, ivory, bronze, stone, etc., called *chryselephantine*.

The jewelry found by M. Mariette in Egypt in 1859, in the coffin of Queen Aah-Hotep, now in the Bulak Museum, was of the highest character, the hammering, piercing, chasing, and the setting of colored stones being quite equal to the work of a much later period. The ornaments found by Schliemann at Mycenæ, and what he termed ancient Troy, showed a remarkable variety of ornamentation and a high standard of workmanship. The wonderful finds on the island of Cyprus, as for example those preserved in the di Cesnola collection at the Metropolitan Museum of Art in New York city, and the Etruscan objects, many of which are in collections at Rome and elsewhere, are for delicacy and beauty of workmanship equal to anything made in any period. The Merovingian jewelry of the fifth century, and that of the Anglo-Saxons of a later date, is noted for the beauty of the goldwork and the utilization of slabs of garnet set in plates of gold, resembling cloisonné enamel. Very beautiful ancient jewelry of gold and enamel has been found in different parts of Ireland, and reproductions of the best pieces were shown at the World's Columbian Exposition.

Benvenuto Cellini, Albrecht Dürer, and the two Jamnitzers were among the greatest jewelers of the period of the Renaissance. The class of jewelry they produced was remarkable for profuse ornamentation, scrolls, figures, etc., beautifully interwoven and set with table-cut diamonds and gems cut *en cabochon*, nearly always combined with white and colored enamels. With the introduction of rose diamonds in the sixteenth century, and the brilliant cut gems in the seventeenth, jewelry was made lighter, more delicate, and remarkably graceful, the gems being frequently set in silver. Some pieces were of large size, notably the enormous bow-knots, stomachers, and other magnificent ornaments made in France during the reigns of Louis XIV., Louis XV., and Louis XVI. Dinglinger in about 1700 mounted grotesque pearls, combined with gold and enamel, in figures of dwarfs, ostriches, and quaint animals.

Nowhere are so many personal ornaments used as in India, where they are worn on the fingers, the back of the hand, and the wrists, on the neck, in the hair as combs, in the ears, as nose-rings, toe-rings, anklets, girdles, surah-holders, and in a great variety of other ways.

During the nineteenth century jewelry has been manufactured in greater quantities than ever before, and certain cities have become noted for the production of special kinds of jewelry. The finest jewelry is made in London, Paris, and New York. The manufacture of imitation jewelry is a

great industry in France. Nearly all of the medium-quality jewelry of England comes from Birmingham. In Germany, Hanau and Pforzheim produce immense quantities of jewelry of all grades, but principally the cheaper kinds. At both these places there are government schools for special instruction in jewelry making, as also at Turnau in Bohemia. Nearly all of the garnet jewelry of the world is manufactured in Prague and one or two other Bohemian cities; from Vienna come the so-called rococo styles, in which enamel, turquoise, and garnet are used; from Venice, filigree, and from Florence and Rome mosaic jewelry; and from Königsberg and Dantzic most of the amber jewelry of commerce manufactured. In Whitby and vicinity in England jet or mourning jewelry was for years manufactured in great quantities. This has been almost entirely superseded by the so-called black onyx—a dyed chalcedony—which, as well as all of the agate of commerce, is produced in the duchy of Oldenburg. (See AGATE.) The products of the coral fisheries of the Mediterranean and on the African coast are sent to Naples and other Italian cities, where they are manufactured into jewelry for shipment. Enameled jewelry, generally of silver, consisting either of filigree, enamel, silver with transparent cloisonné or an inlaying of niello (an alloy of silver, sulphur, and antimony), is extensively made in Russia, Norway, and Denmark. Gold and silver filigree is manufactured in great quantities in Venice, Malta, Mexico, and in other Mexican cities. Rings embellished with zodiacal signs are peculiar to the West Africa coast, where they are made by the inhabitants of Dahomey. Steel jewelry is made in immense quantities in both France and Germany, and has entirely replaced the so-called marcasite jewelry, which was made out of small faceted iron pyrites; ivory jewelry in France, Germany, and Great Britain; tortoise-shell jewelry chiefly in Florence, Rome, and Naples in Italy.

More than 100,000,000 francs' worth is sold in Paris annually. All jewelry not of the grade required to obtain the official stamp, "Poinçon," must bear a printed label, "Imitation." In Great Britain all jewelry must bear the official hall-mark. In the U. S. there is no guarantee other than the name of the place where purchased. Reliable firms, however, usually stamp their jewelry with their name and the fineness of the gold.

The largest jewelry manufactories are in the U. S., the number of firms, according to the census of 1890, being 783, with a capital of $22,246,508. The number of employees was 15,761, the value of material used $16,110,219, and the value of articles produced was $34,761,458. In Jan., 1894, there were 1,600 manufacturing firms, of which 900 were wholesale, and 18,000 retail jewelers. From June, 1892, to June, 1893, more than $15,000,000 worth of diamonds and other precious stones was used in manufactures. Providence, R. I., the chief manufacturing city, in 1893 had 200 firms, employing 10,000 operatives, besides 5,000 engaged in chasing. Newark, N. J., and Attleboro, Mass., are also important manufacturing centers. Providence and Attleboro produce most of the imitation jewelry made in the U. S.

During the nineteenth century great improvements in machinery have assisted in the manufacture of jewelry, so that where things are made in great quantities dies, drawplates, stamps, etc., are used, frequently resulting in a degeneration of the designs, although, on the other hand, it may safely be said that no finer ornaments, in the cutting of the stones, enameling and setting of the goldwork, have ever been produced than some of the jewelry made and shown by the jewelers of the U. S. at the Paris Exposition in 1889, and at the World's Columbian Exposition in 1893.

Collections of Jewelry.—The "gold room" in the British Museum contains a remarkable collection of antique Greek, Etruscan, Roman, and other fine gold ornaments, as well as one of the finest known collections of antique gems. The same museum owns the Castellani collection of Italian peasant jewelry. The finest collection of Celtic gold ornaments belongs to the Royal Irish Academy, and is exhibited at the Science and Art Museum, Dublin; Norse and Viking gold ornaments are to be seen in immense quantities in the Museum at Copenhagen; beautiful articles wrought from Indian and Persian gold, as well as the jewels of King Thebaw of Burma, are in the Indian Museum, South Kensington; the quaint ornaments of Dinglinger, court jeweler of August II. of Saxony, and many superb gems are preserved in the Green Vaults at Dresden; the magnificent jewels of Marie Theresa and other Austrian monarchs at the Schatzkammer Hofburg, Vienna; old Byzantine, Persian, and Russian jewelry, notably crowns of gold and silver, and jewels of the czars from the thirteenth century to the time of Peter the Great, at the Ourajina Palato in the Kremlin, Moscow; the jewels from the time of Peter the Great down to that of the present czar in the Winter Palace at St. Petersburg; the jewels of the Ottoman empire at Constantinople; the Persian jewels, besides many fine articles from the loot of India, at Teheran, Persia. The German empire and Prussian crown jewels are kept at the old Schloss at Berlin. The crown jewels can be seen daily at the Tower in London. The model only of the Koh-i-nur is shown there, the true gem being at Windsor Castle. The crown and sword of St. Louis, two Mazarin diamonds, and the Regent diamond are in the Galerie d'Appolon in the Louvre. In the Assyrian and other galleries of the same palace are the collections of the various epochs represented. In the Salle Chinoise, at Fontainebleau, is some magnificent jeweled Siamese goldwork. In the Museum für Volkerkunde, at Berlin, is the Wissmann collection of goldwork from Central Africa; in the Metropolitan Museum of Art, New York, the di Cesnola collection of Cypriote jewelry and other jewels, including the King collection of antique gems and rings. The Pitti Palace in Florence has magnificent collections of antique and Renaissance gems.

GEORGE F. KUNZ.

Jewett, MILO PARKER, LL. D.: educator; b. at St. Johnsbury, Vt., Apr. 27, 1808; graduated at Dartmouth 1828, and at Andover Theological Seminary 1833; was a professor in Marietta College, Ohio, 1835–38. Having adopted Baptist principles he resigned his professorship, founded (1839) the Judson Female Institute in Marion, Ala.; returned North to Poughkeepsie in 1855; established there a seminary for girls; suggested to Matthew Vassar the idea of an endowed institution for the higher education of women, and in 1862 became first president of Vassar College. He resigned the presidency in 1864, and in 1867 settled in Milwaukee, Wis. Author of *Baptism* (1840); *Relations of Boards of Health and Intemperance* (1874); *The Model Academy* (1875); and other pamphlets. D. June 9, 1882. C. H. THURBER.

Jewett, SARAH ORNE: story-writer; b. at South Berwick, Me., Sept. 3, 1849. She has resided mainly at her native place and in Boston. Among her books are *Deephaven* (1877); *Old Friends and New* (1880); *The Mate of the Daylight* (1883); *A White Heron* (1886); *The King of Folly Island* (1888); *Strangers and Wayfarers* (1890); *A Native of Winby* (1893). These are tales of provincial life in New England, told with great fidelity and delicacy. H. A. B.

Jewfish: a name given to several large fishes of the family *Serranidæ*. One species, the *Promicrops guttatus*, found along the Florida coast, sometimes attains a weight of 700 lb. Among other large jewfishes are *Epinephelus nigritus*, found in the Gulf of Mexico, and *Stereolepis gigas* of the Californian coast.

Jewish Literature: the literature produced by the Jews. The term is especially used to denote the post-biblical productions. (See BIBLE, APOCRYPHA, and PSEUDEPIGRAPHY.) It is almost wholly of a religious nature, or at least connected in some way with the religious life and thought of the people, and is written chiefly in Hebrew, Aramaic, and Arabic. When the Jews began to enter into the life around them, they began to write also in the languages of the people among whom they dwelt. Works written in these languages engage our attention here only to a small degree.

This literature may be divided into four periods: I. From the completion of the Bible up to the time when the Jews settled in large numbers in Europe. II. From this settlement up to the expulsion of the Jews from Spain in 1492. III. From the expulsion up to the time of Mendelssohn. IV. From the time of Mendelssohn to the end of the nineteenth century.

FIRST PERIOD.—With the acceptance of the Bible as the religious and social basis of the communities formed after the Babylonian Captivity, the mental efforts of the Jews were largely directed into one channel. The application of the laws contained in the Bible created a new science, the *Halacha*, the two chief literary productions of which are the Mishnah and the TALMUD (*q. v.*). With the completion of the Talmud in the sixth century A. D., a new basis was offered for the further development of this religio-legal science. The want of order and of a clear principle in the arrangement of the various parts of the Talmud called forth compendia and *résumés*, two of which are worthy of mention as belonging to this period. Simeon of Kahira (eighth century) laid the foundation of the *Halachoth Gedoloth*

(Chief Halachas), a compendium of all the decisions contained in the Talmud. A contemporary of his, Achai of Shabchā, made a similar compendium, *Shaʾālōth* (Questions), in the form of question and answer, arranged according to the order of the books of the Pentateuch.

The Haggadah.—The Bible was also the religious and moral guide. As such it gave rise to the *Haggadah*, or homiletical exposition and amplification of the biblical word. Many of the early Haggadahs are to be found in the Apocryphal and Apocalyptical literature, in the TARGUM (*q. v.*) and in the Talmud. But separate collections of such Haggadahs were also made, of which the dates can only be approximately fixed. These *Midrāshīm*, as they were called, generally followed the order of the biblical pericopes read in the synagogue. The expository Haggadah is represented in this period by the *Midrash Rabbōth* (Great Midrash) in ten books, composed between the sixth and the twelfth centuries, the *Pesikta* of Rabbi Kahana (eighth century), the *Pesiqta Rabbāti*, and the *Tanchuma*, which was composed in the ninth century. The purely ethical Haggadah is seen in the treatise *Derech Eretz*, containing a system of ethics, and the *Seder Eliyāhū*, in which moral instruction is put in the mouth of the prophet Elijah. The historical Haggadahs, such as the *History of Abraham*, *Chronicle of Moses*, *Midrash of Goliath*, etc., belong under the rubric of Apocalyptical literature. Of history there is but one representative, Flavius Josephus, whose *Wars of the Jews*, at least, was originally written in Aramaic or Hebrew. (See *Preface*, § 1.) In philosophy Philo Judæus finds a place rather in Greek than in Jewish literature.

SECOND PERIOD.—This extends from about the tenth century to the fifteenth, and is decidedly the golden age of Jewish literature. Its home is Italy, Spain, France, and Germany. The Jews came in contact with Arabic science, from which they learned form and method. Through Mohammedan writers they became acquainted with some of the master minds of antiquity—Plato, Aristotle and his commentators, Galen, Ptolemæus, etc. While the forms of literary activity mentioned in the first period continued to be cultivated, new disciplines were added. Philosophy became an object of study. Poetry brought forth its most beautiful flowers. An attempt was made to write history. Continued contact with Christian scholars inaugurated a whole literature of polemics, which was increased by the secession of the KARAITES (*q. v.*) from the great body of Rabbinical Jews.

Halachic Science.—Halacha continues in this period, up to the fourteenth century, to exercise the minds of many great scholars. The productions follow largely upon the lines met during the first period. Thus Chefetz ben Yatzliach (Kairowan, 1000–1050) compiled a *Sefer hammitzwōth* (Book of Commandments); Isaac Alfasi (Lucena, 1013–1103) a compendium of Talmudic decisions, and Moses Maimonides (d. 1204) his *Mishnah Thōrāh* (Second Law), the most systematic of all such compendia. Another *Sefer hammitzwōth* was compiled by Moses of Coucy (1236); and a more pretentious work, *Arba Tūrim* (Four Rows), by Jacob ben Asher (Toledo, 1339), which, devoting itself only to the Halacha in vogue at that time, became the basis of the *Shulchan Aruch* (see below).

The scientific study of the Talmud as a purely literary production dates from this period. With such an end in view, Nissim ben Jacob (Kairowan, eleventh century) wrote a *Maftēach* (Key), Joseph ibn Aknin (1220) an Arabic work on Talmudic methodology, and Samuel Hanagid, who occupied a high position at Granada 1050, an *Introduction*. Maimonides also wrote an introduction, and prefixed it to his commentary on the Mishnah. Commentaries on the Talmud now began to appear in large numbers, of which those by the following authors may be mentioned: Chananēl (Kairowan, 1050), Nissim Gerondi (1350), Joseph Chabib (1400), Solomon ben Adereth (Barcelona, 1300), and Rabbenu Gershon (France, eleventh century). The greatest of all such commentators was Solomon ben Isaac (Troyes, 1040–1105), called Rashi, renowned for the lucidity and simplicity with which he handles his text. He founded a school of exegetes, whose work called *Tosāfōt* (Additions), lasted from the twelfth century to the fourteenth.

A new department of Halachic science now grew up called *Questions and Answers*, based upon the decisions of learned rabbis in religious and legal questions of actual occurrence. This literature has grown to an enormous extent, and is valuable as historical material. Of the many authors it is sufficient to mention Solomon ben Isaac, Meir of Rothenburg 1285, and Joseph Mitz, Venice, 1508, as writers of such collections. See Frankel, *Entwurf einer Geschichte der [illegible] Responsen* (Breslau, 1865).

Philology and Biblical Exegesis.—The interest in the Bible itself was also marked by a more scientific study than was accorded it under the influence of the Haggadah. Saadyah ben Joseph (928) translated the Scriptures into Arabic, and commented them. The minute care with which the text was handled, and the introduction of vowel-points and accents into the MSS., called forth the school of the Masorites, which, beginning in the Talmudic period, extends well down through the first half of this second period. (See Harris, *Rise and [illegible] Jewish Quarterly Review*, i., 120, *seq.*) The tenth and eleventh centuries were especially fruitful in purely philological works, to which an impetus had been given by the industry of Karaite scholars. (See KARAITES.) Beginning with Saadyah Gaon, the list of writers includes such names as Juda ben Koreish (Tahart, 900), Dunash ben Labrat (950), Menachem ben Saruk (Tortosa, 950), Abraham ibn Ezra [illegible], Kimchi (Provence, 1160), and David Kimchi (Provence, thirteenth century). They wrote both in Hebrew and in Arabic. The great dictionary of the Talmud by Nathan ben Yechiel (Rome, eleventh century) is a thoroughly scholarly work. See Jastrow, *Jewish Grammarians in the Middle Ages* (*Hebraica*, iii., *seq.*).

Such scientific studies naturally influenced the Bible itself, and prepared the way for an intelligent understanding of its contents. Solomon ben Isaac (Rashi) clearly distinguishes between the old and the new methods. He is excelled in this by his grandson, Samuel ben Meir (France, 1100). Ibn Ezra and David Kimchi disassociated themselves almost completely from the Haggadah. Mention should also be made of the commentaries of Levi ben Gershon (Perpignan, 1327) and Don Isaac Abravanel (Spain, 1500).

Philosophy.—The first systematic writer on philosophy was Saadyah ben Joseph. Taking his cue from the Arabic *Mutekallimin* (Scholastics), and with the purpose of demonstrating the errors of the Karaites, he composed his *Emunōth Wedēōth* (Beliefs and Opinions). For him there are three sources of knowledge: Scripture, tradition, and speculation. He endeavors to bring reason into harmony with revelation; but his whole interest is more theological than philosophical. Solomon ibn Gabirol or Avicebron (Saragossa, 1050) in his *Mekōr Chayyīm* (Fountain of Life) leans more to the side of philosophy, and was, for this reason, all but forgotten by later writers. Bachyā ben Joseph (Saragossa, eleventh century) set up a scientific system of ethics in his *Chobhōth Hallebhabhōth* (Duties of the Heart). In Juda Hallevi (Spain, 1140) philosophy retrogrades. His *Kusari* is an attempt to prove that revelation is all-sufficient. It was reserved for Moses Maimonides (Cordova, 1135–1204) to make the proper synthesis between philosophy and religion. The Peripatetic philosophy comes well to the foreground in his *Moreh Hanebhuchīm* (Guide of the Perplexed, French by Munk, 1861; English by Friedländer, 1885). According to Maimonides, Aristotle is to be limited by revelation only in divine things. His work called forth a storm of controversy, which lasted until the end of the thirteenth century. Levi ben Gershon goes even further. In his *Milchamōth Hashēm* (Wars of the Lord) he calls the philosophy of Aristotle absolute truth. The Peripatetic philosophy itself was a great object of study, and the Jews did good work as translators and commentators from the Arabic into Hebrew and Latin. Joseph Albo's (1425) *Ikkārīm* (Principles of Faith) is a return again to theology. Nearly all the works mentioned above were written in Arabic. For the mystical philosophy of the time, see CABBALA. See S. Munk, *Mélanges de [illegible]*, Paris, 1859; trans. into German by B. Beer, Leipzig, 1852); Eisler, *Vorlesungen über die [illegible] Philosophie des Mittelalters* (Vienna, 1870).

History.—The science [illegible] was [illegible] cultivated by the Jews. They seldom progressed beyond the writing of chronicles. Their own Josephus was entirely forgotten; and in his place an historical romance called *Josippon* was current, compiled from the most varied sources. It was written by Joseph ben Gorion in Italy in the tenth century. A similar compilation is found in the *Sefer hayāshār* (Book of the Just), written in good Hebrew during the twelfth century. The purer chronicle is represented by the *Sefer Yuchasin* [illegible] 1160, the work of a pupil of Rashi. Abraham ben David (Toledo,

1161) marks the high-water of this epoch in his *Sefer Halakkoth* (Book of Traditions). More readable, however, are the *Memorial Books* and *Catalogues of Martyrs*, which give more exact information, and are written in elegant prose, interspersed with elegies. It suffices to mention the work of Eliezer bar Nathan (Mayence, 1130) on the persecutions of the first crusade (1096), and of Ephraim bar Jacob (Bonn, 1177) on the persecutions of 1146. See Neubauer and Stern, *Hebr. Ber. über die Judenverfolgungen während der Kreuzzüge* (Berlin, 1892).

Travels.—A few of the many travelers who were led by feelings of piety to visit the East have left us accounts of their travels. Benjamin of Tudela (1160) is especially worthy of mention. Petachyāh of Ratisbon (1170) and Obadiah di Bertinoro (1500) are of less account. The fabulous reports given to the world by Eldad the Danite (900) are of interest only to the student of folk-lore. See Zunz, *Geographische Literatur der Juden*.

Characteristics of Hebrew Poetry.—Hebrew poetry is generally of a serious character, following in this the life led by the Jews during the greater part of the Middle Ages. It is only in Spain and Italy that, during periods of repose, Hebrew fancy worked in other channels. The form is somewhat monotonous. The most common is that based on the acrostic of the author's name, or of the letters of the alphabet (already in Psalms and Lamentations). During this period rhyme also begins to appear, especially in the Spanish school. In this Hebrew poetry followed Arabic models. It was not until the end of the tenth century that meter was introduced by Dunash ben Labrat. This was also founded upon Arabic models. The usual number of different meters in use is given as nineteen; one writer mentions as many as fifty-two. From Spain the use of these meters spread into Provence and Italy. From Arabic literature came also the rhymed prose—a more artificial form than any of the preceding. As regards subject-matter, Hebrew poetry is distinctly divided into two classes, liturgical and worldly poetry. In its liturgical form, it was the direct result of the needs of the synagogue service. The origin of the Jewish prayer-book goes back into Talmudical times. Beginning with the seventh century, poetical additions were made which continued to be inserted until the end of the sixteenth century. We have to distinguish *Piyyūṭīm* (ποιηταί), songs for festivals; *Selīchōt*, penitential psalms; *Kīnōt*, elegies; *Hoshannas* for the seventh day of Tabernacles; and *Bakkāshōt*, petitions. The tendency to versification was so strong that even the 613 precepts of the Law were put into verse by Saadyah ben Joseph. The *Kēther Malkūth* (Crown of Kingship), by Gabirol, is said to be a versification of Aristotle's *De Mundo*. Two schools of these religious poets are clearly distinguished. The Spanish authors wrote under a poetic inspiration; the Franco-German simply with a view to supply the demand of the synagogue. Zunz was acquainted with as many as 1,816 *Selīchōt* by 400 different authors, and with more than 3,000 *Piyyūṭīm*. See Zunz, *Die synagogale Poesie des Mittelalters* (Berlin, 1855); *Literatur geschichte der synagogalen Poesie* (Berlin, 1865); and the *Index* to this last work by Ad. Gestetner (Berlin, 1889).

The first and the most renowned religious poet is Eleazar Kalir. Unfortunately, nothing is known of his life; not even the century in which he lived. The best authorities place him in Palestine in the eighth or ninth century. At times even unintelligible, he uses the Hebrew language as no one before or after him has done—forcing it into forms and expressions which disclose a thoroughly independent mind. The school of Kalir lasted well into the fourteenth century, and drew a host of writers after its leader, such as Solomon Hababli (Greece, tenth century), Joseph ibn Abitur (Cordova, tenth century), Meshullam ben Kalonymos (Lucca), Benjamin ben Serach (1058). In Spain, however, there arose a certain opposition to the Paitānīm of Kalir's style. This showed itself in a return to the pure Hebrew of the Bible, and was fostered by Chisdai ben Isaac (950), minister to the Caliph Abderrahman III., of Cordova. Of these Spanish Paitānīm we mention Dunash ben Labrat (Cordova, 950), Solomon ibn Gabirol, Moses ben Ezra, Juda Hallevi (Cordova, 1086), and Abraham ibn Ezra (Toledo, 1093).

Hebrew poetry is not wholly religious in character. The same poets who expressed the sublimest aspirations of the synagogue sang also of the feelings which bind man to man. Though often light, and full of wit and satire, there is a moral earnestness which pervades even these productions. It was especially in Southern Spain that the great poets sang their worldly songs. The purity of the Hebrew which is remarked in their religious poetry is seen here also. The Bible remains the model, so that many poems are mere mosaics of biblical verses, ingeniously applied and strung together. The three stars mentioned before must be mentioned again. We possess *Dīwāns*, or collections of such poems, by Moses ben Ezra (chiefly love-songs), Juda Hallevi (descriptions of nature), and Solomon ibn Gabirol. The celebrated Arabic *Makamas* of Hariri were imitated by Juda Alcharizi (1218) in his *Tachkemoni*, and by Emanuel of Rome (1320), the cynic who attempted to copy his friend Dante's *Divina Commedia*. His collection bears the title *Machberōth*. In addition to these, two others deserve mention: Abraham ben Ezra, who drew inspiration from his extended travels, and Joseph ibn Sabara (Barcelona, 1200), who in his *Sefer Shaäshuīm* (Book of Delight) has written a sort of Hebrew *Thousand Nights and a Night*. Poetry was cultivated to such an extent as to become mere exercise of skill. Abraham Bedarshi (Provence, 1280) composed a poem of a thousand words, each beginning with the first letter of the alphabet. Even grammatical, physical, and astronomical works were done into poetry.

Nor was the scientific side entirely neglected. In order to facilitate the writing of poetry, lexicons of rhymes, homonyms and synonyms were composed, as well as treatises on rhetoric and poetics. Most of these works are the product of the Spanish school, and show Arabian influence. In Italy, Messer Leon (1451–90) wrote a rhetoric based on Cicero and Quintilian.

Fables and Stories.—The Jews were also active in propagating the collections of fables and stories which, through Arabian channels, had come from India. Of the Arabic they made Hebrew and then Latin translations, which latter became current in Europe. This was the case with *Kalilah wa Dimnah*, *The Fables of Bidpai*, *Barlaam and Josafat*. They even composed such works themselves. Isaac ibn Sahula (Spain, 1281) wrote *Tales of the Olden Times*, in order to counteract the influence of *Kalilah wa Dimnah*. Berachyāh Hanakdan (1260) is also cited as a writer of fables. See the introduction in Jacob's *Fables of Bidpai* (London, 1888).

Sciences.—Of the sciences, strictly so called, astronomy undoubtedly claimed the most adherents among the Jews. It had numerous points of contact with the Halacha. The Moors in Spain were here, too, the masters; and they had drawn largely upon their Greek predecessors. Astrology also found votaries; medicine even more, for the Jews were very prominent as physicians in the Middle Ages. See Carmoly, *Histoire des Médecins Juifs* (Brussels, 1844); Schleiden, *Die Bedeutung der Juden für Erhaltung . . . der Wissensch. im Mittelalter* (Leipzig, 1879).

Third Period.—This is a period of marked decline—in part a natural result of the great mental efforts of the preceding period, but due also to outward conditions of existence. The center of activity had moved from Spain into Italy, Holland, Germany, and Poland. Arabic influence had passed. Jewish writers came under the influence of other and various civilizations. There is a marked increase in the number of works written—due largely to the rapid spread of printing; but the language is poor—a later development of the mixed Talmudic which afterward degenerates into Judæo-German. The works produced are largely compilatory in character.

Halacha.—After, and in consequence of, the expulsion of the Jews from Spain, Portugal, and France, the chief interest centered in the Halacha, as that form of scientific and practical inquiry which was peculiarly their own. Several commentaries to the Mishnah were written—by Obadiah di Bertinoro (Palestine, 1500), Lippmann Heller (Prague, 1600), and Jacob Chagis (Leghorn, 1680). Glosses to the Talmud appeared in large numbers, the chief authors being Meir Lublin (1600), Solomon Luria (1611), and Elia Wilna (1790). The different compendia of the Talmud were eagerly studied and commented upon. By far the most important work of this kind was the *Shulchan Aruch* of Joseph Karo (Safed, 1556). Based upon the *Arba Tūrīm* of Jacob ben Asher (Toledo, 1339) and written in the form of a law-book, it soon threw all the other compendia into the shade, and became the practical guide of those Jews who wished to live according to the Law. It drew in its wake a host of commentators who degenerated into hair-splitting casuists. The literature of the *Questions and Answers* also grew apace. As each important teacher made such a collection, an idea may be formed of the growth of this form of literature.

Philology and Biblical Exegesis.—Here also a decadence can be seen. This period can not compare in originality with the preceding. It was an epoch of translations and super-commentaries. Settled in so many different lands, the Jews began to feel the need of having the Bible done into the vernaculars of the people among whom they lived. Translations were made into Modern Greek, Tartar (Karaites), Turkish, Polish, and Spanish (for the Spanish exiles in the South and East). Long before Mendelssohn's time translations were made into German, but printed in Hebrew characters and not in German itself. Thus the Psalms were rendered by Eliakim ben Jacob (Amsterdam, 1703), the whole Bible by Jekutiel Blitz (Amsterdam, 1676). Mixed with selections from the Haggadah, Isaac ben Samson Cohen (Prague, 1608) originated the *Teutsch Chummash*, a kind of translation which became very popular with women. A similar work, *Zeëna Ureëna*, was composed by Jacob ben Isaac (Janow, seventeenth century). Pure exposition was largely devoted to explaining the works of previous commentators. Elia Mizrachi (1520) wrote a super-commentary to Rashi. The Cabbala found its way even into this literature, as did also the hair-splitting casuistry of the Halacha. A few names may be mentioned: Johannan Allemano (Italy, 1500), Meir Arama (Salonichi, 1505), Solomon ben Melech (1548), Solomon Duran (Africa, 1437), and Ephraim Lenczie (1608). Moses Chefetz (Venice, 1711) composed a philosophical commentary on the Pentateuch. The old homiletical exposition (Haggadah) claimed its share of attention. Abridgments and collections were popular. The most famous are the *En Yakōb* of Jacob ibn Chabib (Turkey, 1566), and the *Yalkūt Reūbeni* of Reuben Hoshker (1681). Independent commentaries were written by Samuel Edels (Poland, 1596), Meir Benvenisti (Salonichi, 1560), etc.

Of a more scientific character are the collections of the Masora made by Elia Levita (Venice, sixteenth century), Jacob ben Chayyīm (sixteenth century), and Solomon Norzi (Mantua, 1626), whose *Minchat Shai* laid the foundation for all future studies. Of the grammarians of this period only Elia Levita deserves mention. His grammar was the basis of all Christian studies of the Bible up to the middle of the seventeenth century. The vernacular languages entered also into the Hebrew dictionaries of this period. There is one in Judæo-German by Anschel (Cracow, 1534), in Italian and Latin by de Pomis (1587), Portuguese by Solomon de Oliveyra (Amsterdam, 1602), Hebrew and Arabic by Manasse ben Israel (Amsterdam, 1650). Benjamin Muasafi (1650), however, made critical additions to the great dictionary of Nathan of Rome.

History and Geography.—In this one field alone this period evidences a certain advance. Means of communication had been largely extended, and the interest the Jews felt in the history of other nations as well as their own was deepened. A number of histories and chronologies appeared, which, though containing much that is legendary and unsound, are indispensable to the student of Jewish history. Complete chronicles were written by Abraham Zakkuth (*Book of Genealogies*, 1505), Joseph Cohen (*A History of France and of the Ottoman Empire*, Avignon, 1554), David Gans (Prague, 1592), and Joseph Sambary, on Mohammedan and Jewish history (1672).

Literary histories of Hebrew authors were composed by Samuel Algazi (*Generations of Man*, 1553), Gedalyah ibn Yachyāh (*Chain of Traditions*, Constantinople, 1589), David Conforte, on the learned men in the East and South during the sixteenth and seventeenth centuries (Salonica, 1677), and Yechiel Heilpern, on Talmudical chronology (Minsk, 1728). Chayyīm Asulai (Leghorn, 1807) was the first to write a bibliography of Jewish authors.

There are many special treatises on the different persecutions and on individual events. Of such, the *Rod of Juda*, by Juda ibn Verga (Seville, 1554), is worthy of mention. Much of this literature is to be found in the poetry of the time and in the ethical wills left by distinguished scholars. See Neubauer, *Mediæval Jewish Chronicles* (Oxford, 1887, preface; Isidore Loeb, *Le Folk-Lore Juif dans la Chronique . . . d'Ibn Verga* (*Revue des Études Juives*, xxiv., p. 1).

The study of geography went hand in hand with that of history. The Jews traveled largely and became interested in the doings of their brethren all over the world. The whereabouts of the lost ten tribes largely interested learned men, though they were often misled by such writers as David Reubeni (1522). (On the whole subject, see Neubauer, *Where are the Ten Tribes?*, in *Jewish Quarterly Review*, i., 14, *seq.*) Moses de Parvia gave an account of the Jews in Cochin-China; Pedro Texeira (seventeenth century) journeyed to India and Persia in search of information; Chayyīm Pheivel (Tarnigrod, 1772) wrote a geography of Palestine, and Sabbatai Bass (Prague, 1680) a handbook for travelers in Judæo-German.

The discovery of America had made a profound impression on Jewish writers, and several references are found in the contemporary literature. (See Kohut, *Menorah Monthly*, 1892, p. 403.) Joseph Cohen made a Hebrew abridgment of Lopez de Gomara's *Historia de las Indias* and *Conquista de Méjico*. As an example of the interest Jewish writers began to take in archæological studies, Azariah de Rossi (Mantua, 1550) may be mentioned, who, in his *Meor Enayīm* (Light of the Eyes) discusses historical and literary questions with some show of criticism.

Philosophy and Ethics.—In these departments this period is void of great names. The thought of the time ran almost completely into the Cabbala. When it did not, it found expression in commenting upon older writers. Joseph Halevi wrote a commentary upon the *Guide of the Perplexed* of Maimonides; Juda Moscato (1573) upon the *Kusari* of Judah Halevi. Smaller treatises were composed in Dutch, Spanish, or Italian. Manasse ben Israel (Amsterdam, 1625) is a representative theologian, but his *Conciliador* and *Esperanza de Israel* were meant for non-Jews. Most of the treatises on ethics were in Judæo-German, as, e. g., the *Zierspiegel* of Elchanan Cohen (Prostiz, 1693) and the *Braut Spiegel* of Moses Henoch (1602).

Poetry.—Religious poetry follows the same lines as in the preceding period. Though the prayer-book was now in the main a canon, still *Piyyut* and *Selichah* continued to be composed for special and local occasions. Different rites began to branch off and become hard-bound. Unfortunately, the mystic Cabbala penetrated even here, and filled the liturgies of certain rites with fantastic and unintelligible productions. Of the many poets, Israel Najara (Palestine, 1587) is said by Zunz to have been the most fruitful. As many as 470 productions from his pen were printed. Isaac Mandil (Algiers, 1540) stood in high repute in North Africa. The difficulty of understanding the old as well as the new hymns was so great that many commentaries had to be composed, especially in the seventeenth century.

In worldly poetry the decadence from the great Spanish poets is marked. Of the many who wrote poetry in Italy, Germany, and Russia a few names deserve a place here: Menachem Lonsano (1572), Moses Abudiente (Hamburg, 1633), Isaac Cantarini (Padua, 1720), and Joseph Penço (Amsterdam, 1663), who wrote the first drama in Hebrew—*Asirē Tikwah*. The free exercise of the poetic genius was gone. Everything was turned into verse. Thus Elia Levita in his *Pirke Shira* versifies grammar, as well as a treatise on chess (Mantua, 1549). Translations of the masterpieces of other literatures began to fill the void caused by the lack of independent material. One can now read in Hebrew all the great productions of the world's literature.

Amid all the dreariness of their outward circumstances the Jews still cultivated wit and satire. The feast of Purim gave, in a great measure, the occasion for such productions. The number of these Purim farces is very large. Steinschneider calls them sacred dramas. The *Maäse Buch* (Book of Tales), in Hebrew and German, delighted many. There is also a *Baba-Buch*, by Elia Levita (1507), and *Arthurs Hof*, by Joel Witzenhausen (1683)—these last two in Judæo-German.

Science.—Astronomy and astrology still continued to occupy the attention of earnest scholars. The fixing of the calendar gave an interest to these studies. Medicine claimed even more votaries, and an immense literature was produced. This, however, belongs to the history of medicine.

Fourth Period.—This is the most difficult of the four periods to characterize. It is dominated by two movements, both of which tended to make a distinctively Jewish (or Hebrew) literature impossible. During the first half of this period the attempts at emancipation from the thraldom of the Middle Ages which are seen in the political and social life of the Jews are manifested also in their literature. During the second half the results of this emancipation are evident. Jewish scholars eagerly acquired the spirit of scientific inductive inquiry which was making itself felt particularly in Germany. This method they applied to their own history and literature, but the language they used was no longer Hebrew. It was that of the countries in which they lived. As such, their historical literature belongs to the

except in those countries. In philosophy they range themselves with one or the other of the great writers of the nineteenth century. Like their own life, their poetry has no national characteristics, though its subjects may be taken from Jewish history. A few words will suffice to characterize these movements and those who stand still in the former period.

Moses Mendelssohn.—One figure stands out prominently on the threshold of this epoch. Clinging with a wonderful tenacity and love to the old ideas, Moses Mendelssohn (1729–86) entered fully into the new life in which he found himself. One might almost call his a dual personality. As the friend of Lessing and as the author of *Phädon*, he takes no mean rank in the list of German authors. He has no less a place in Jewish literature. No one was so well fit as he was to lead his brethren in Germany from the slavery of the old to the freedom of the new *régime*. His masterly translation of the Pentateuch into pure German gave the deathblow to the Judæo-German which was current. His rational commentary (*Biür*) counteracted the effects of a casuistical exegesis. On both lines he was successful. He gathered around him a number of followers, who helped to usher in the new era. As such may be mentioned David Friedländer, Herz Homberg, Ahron Wolfssohn, Lazarus Bendavid, Marcus Herz and his wife Henriette Herz. Hebrew was still largely used, but there was a further return to a pure and simple diction. Periodicals were founded to propagate the new ideas: the *Measse* (Collectors) by a society in Königsberg (1783), *Bikkure Haïttim* (First-fruits of the Times) in Germany, and the *Bikkure Ṭoẓfot* in Amsterdam. A further impulse was given to literary productions by the establishment of a Hebrew printing-house in Berlin by Isaac Satanow (1772), and in Rödelheim by Wolf Heidenheim (1799).

Poetry.—A few poets still held aloft the torch as it was burning to the end. In Italy Moses Chayyim Luzzatto (Padua, 1740) wrote psalms after the model of the biblical ones; but in his drama *Layesharim Tehillah* he endeavors to combine classical and biblical forms. In Germany Naphtali Wessely (Hamburg, 1800) renounced altogether the forms in which Spanish-Jewish poetry had found expression, and returned to the freedom of biblical verse. In his *Shirē Tifereth* (Mosaide) the influence of German poetry is clearly seen. In the Netherlands Samuel Mölders followed in the footsteps of David Franco. Isaac Erter (Przemysl, 1792–1851) was a poet and satirist of no mean order.

Philosophy.—Of Jewish philosophers there is only Nachman Krochmal (Galicia, 1800) to be mentioned. In his *Guide of the Perplexed of the Time* he attempted a philosophy of Jewish history—an attempt too great for the time in which he lived. See Schechter, *Rabbi Nachman Krochmal* (London, 1889).

The second half of this period is ushered in by a few men, among whom Leopold Zunz is *facile princeps*. He was the founder of a school, writing in German, which had as its object historical and literary researches in the wide field of Jewish science. Though Krochmal is a worthy forerunner, Zunz's *Gottesdienstliche Vorträge der Juden* is justly considered the starting-point of these researches. The signature of the time was modern research in the spirit and language of the day. The school which thus grew up contains a long list of names of men who have done pioneer work. Steinschneider, the bibliographer, Rappaport and S. D. Luzzatto, the critics, Graetz, the historian, Geiger, the founder of modern Jewish theology, Phillipson, the *littérateur*, Z. Frankel, the historian of the Halacha, Fürst and Levy, the lexicographers, S. Munk, M. Joel, and Kaufmann, the historians of philosophy, are among the most prominent. Several journals have been founded in the spirit of this time—Geiger's *Jüdische Zeitschrift*, Frankel-Graetz's *Monatsschrift für Geschichte und Wissensch. des Judenthums*, Moses Lyon and Abraham's *Jewish Quarterly Review*, and the *Revue des Études Juives*.

Of late years there has been a revival of Hebrew literature in the Slav countries, due to peculiar conditions which existed there. It has produced a very large literature in all branches, which is still increasing. Such novelists as Mapu and Smolensky—poets as Lebensohn, Gordon, Dolitzkey—have made the old Hebrew speak once more; but it can only be a passing vision. Even its most ardent adherents can not hope that it can be permanent. See Schach, *Eine auferstandene Sprache* (Berlin, 1893).

Literature.—Graetz, *Geschichte der Juden* (11 vols.); Jost, *Geschichte des Judenthums* (Leipzig, 1859); Steinschneider in the *Encyclopædia* of Ersch and Gruber (vol. xxvii., p. 357, *seq.*; English trans. *Jewish Literature*, London, 1857; with the *Index* to the same, Frankfort, 1893); Zunz, *Gottesdienstliche Vorträge der Juden* (2d ed. 1892); Karpeles, *Geschichte der jüdischen Literatur* (Berlin, 1886); Winter and Wünsche, *Die jüdische Literatur* (Trier, 1891–94); Delitzsch, *Zur Geschichte der jüdischen Poesie* (Leipzig, 1836); Steinschneider, *Hebräische Bibliographie* (21 vols., 1858–82); *Catalogus Librorum Hebraicorum in Bibl. Bodl.*, etc. (Berlin, 1860); G. B. de Rossi, *Histor. Wörterb. des jüd. Schriftstellers . . . übersetzt von Hamberger* (Bautzen, 1838).

Richard Gottheil.

Jewish Sects: The oldest sects of the Jews were the Pharisees and Sadducees (*qq. v.*). In the time of Jesus were the Essenes (*q. v.*), and, in the belief of some, the Therapeutæ (*q. v.*), although the existence of the latter is denied, and apparently with good reason, as they have no contemporary mention outside of Philo's treatise *On a Contemplative Life*. In the eighteenth century arose the Chasidim (*q. v.*), a revival more in name than in spirit of those puritans of the post-exilic time, who strenuously resisted Hellenistic innovations. In the Middle Ages the Jews belonged to either one of two schools, Rabbanite, holding the traditional orthodoxy, or Karaite, holding the innovation, literal interpretation of Scripture, discarding Talmud and Midrash. These were the progenitors of the present Jewish sects, the Orthodox and the Reformed. The Orthodox Jew cherishes the old hopes of a temporal Messianic kingdom and the restoration of the temple rites; he puts the Talmud alongside of the Bible as the source of religious knowledge and obligation, and punctiliously observes the prescribed rites and ceremonies. The Reformed Jew, on the contrary, discards the Talmud, acknowledges the vanity of the old national hopes, denies even that the Old Testament, when rightly interpreted, gives any support for such views, and in private and public worship departs widely from the traditions, nearly abrogating the ceremonial law and adopting in some synagogues, e. g. in New York city, such distinct approaches to Christian ideas as uncovering his head in the synagogue, having family pews, vernacular services, even services on Sunday, Sunday-schools, and the observance of Christmas.

The division of Jews into Ashkenazim and Sephardim is not doctrinal; the former are the Polish and German Jews, the latter the Spanish and Portuguese. They have different synagogues and a slightly different ritual, but agree in doctrine.

Samuel Macauley Jackson.

Jews [M. Eng. *Jeu*, from O. Fr. *jueu* (> Fr. *juif*) < Lat. *Judæus* = Gr. Ἰουδαῖος, Jew, liter., Judean, deriv. of Ἰουδαία, Judea, Judah, from Heb. *Yehūdāh*, Judah]: a people of Semitic origin, known also as Hebrews and Israelites. While the designation "Hebrews" may be conceived as a purely racial one, and "Israelites" as describing the same nation more from the side of their religious faith, the name "Jews" would seem, in modern usage at least, to cover both of these distinct features of the life of this remarkable people. Each of the names, moreover, has its origin in a different period of its history. The name "Hebrew," first met in Scripture, Gen. xiv. 13, "Abram the Hebrew," is interpreted by the Jewish traditional version of the Septuagint to mean "the one who belongs across yonder, the foreigner" (ὁ πέρατος), in allusion to Abram's immigration into Canaan from beyond the Euphrates. Joseph already speaks of Canaan as "the land of the Hebrews" (Gen. xl. 15), while the daughter of the tyrant Pharaoh recognizes in the infant Moses one of the subject race, "one of the Hebrews' children" (Ex. ii. 7). They are called "Israel" (descendants of the patriarchs who received that name in memory of a certain mighty struggle "until the breaking of the day") when permission is asked to hold a religious festival to their God (Ex. v. 1), and "the people of the children of Israel" (Ex. i. 9), also "children of Israel" when the religious phase is not so distinct.* Of far later usage is the name most current to-day—"Jews"—which as a designation for the whole people may be said to have been rendered possible only after the disappearance of the sister kingdom of Israel (720 B. C.) left the surviving kingdom of Judah the sole representative in civilization of this people: Jews = descendants of the subjects of the kingdom of Judah.

Destiny of the Jews.—The peculiar destiny of this people is outlined in the early words of Genesis (xviii. 18), in which the Bible describes God as saying: "Abram shall become a great and mighty nation, and all the nations of

*So, at a later period, when the faith triumphed and brought about the Maccabean independence, the coins of the period bear the inscription "Israel," the religio-national name.

the earth shall be blessed in him; for I have known him [or revealed myself to him], because he will command his children and his household after him to keep the way of the Lord, to do righteousness and justice." For the conservation of this religious idea thus revealed to Abraham, the spiritual nature of a supreme and only God, this "foreigner's" family was marked out, to be peculiar from all other peoples, distinct from all other nations, as the deliverers to them in all generations of this sacred revelation. The history of Israel is thus the history of this religious concept, the Unit-Spirit God. Jewish tradition unanimously states that Terah, Abraham's father and a descendant of Shem, was an image-maker in Mesopotamia, and it abounds with legends of his son's early attempts to preach the new conception.

The Patriarchs in Canaan.—In obedience to God's command, and seeking lands where more success might await him than in his own familiar home, Abram (afterward Abraham) leaves Mesopotamia with his wife Sarai (afterward Sarah) and nephew Lot, and finally settles in Canaan, where he busies himself, as far as his mission is concerned, in building altars to the Spirit-God called Jhvh (pronounced "Adonai" by Jews), in preaching the doctrine of an invisible, intangible Supreme Deity, who, while accepting animal sacrifice as an exhibition of man's devotion, rejects human sacrifices, a practice then common in the world. The appearance (Gen. xiv. 18) of Melchizedek, King of Salem, a priest of El Elyon, "God the Supreme," as friend and ally of Abraham, would show that his preaching makes distinguished converts. His migrations take him to Egypt and to Philistia. He is repeatedly promised that the land of his activity shall in the course of time come to be the possession of such of his children as should propagate his especial religious teachings. Their preliminary servitude in a land not theirs is foretold to him in a function of extraordinary solemnity, the "covenant between the parts" (Gen. xv.). In pursuance of these divine promises, two children are vouchsafed unto him, Ishmael, by an Egyptian concubine Hagar, and Isaac, by his wife Sarah, and from these respectively descend the two great lines of Abrahamic race, Arabs and Jews, with their distinct phases of the original idea, as expressed in Islam and Judaism. The elder son is soon removed by circumstances from the parental home; Isaac remains in his father's house, receives his instruction, and in due time takes his place as the exponent, though seemingly a more passive one, of his father's creed. Abraham is buried in the cave of Machpelah in Hebron, which he purchases from the Hittites on Sarah's death. The history of Isaac and of Jacob, his son, is sufficiently well known and contains so little of religio-national moment that we mention only the episode of the mysterious midnight encounter by the river Jabbok, wherein Jacob received the name of "Israel," or "mighty wrestler," the name of distinction by which his descendants prefer to be known. Equally familiar is the life of Joseph, Jacob's favorite son. Circumstances lead to his sale as a slave by his brethren and his bondage in Egypt, followed by his accession to unexampled power in that land, which power he ultimately employs toward bringing his father and brothers to Egypt. Jacob is most graciously received by Pharaoh, and he and his family are assigned to a district in the delta-land of Goshen, where they may follow their shepherd vocation without offense to the religious feelings of the Egyptians, who despised shepherd-folk.

The Israelites in Egypt.—Jacob dies in Egypt, his body is carried with much pomp to Machpelah, the tribal burial-place. Joseph, who marries an Egyptian princess, by whom he has two sons, Manasseh and Ephraim, continues as the protector of his brothers; before his death he reminds them of the hereditary promise, made to Abraham and faithfully conserved in the family, that God would in time lead their descendants back to Canaan and give them possession of their old home. Then the first portion of the revelation made at the "covenant between the parts" goes into effect, the enslaving of these Hebrew guests and sojourners by a new Egyptian dynasty which "knew not Joseph." Severe measures are devised to diminish the natural increase of the teeming "children of Israel," grown by this time to be formidable in numbers, and to grind them out with excessive labor enforced with rigor. The deliverer is born in the person of the third child of Amram, a descendant of Levi; exposed by his mother, Jochebed, in an ark on the Nile, instead of being thrown, as required by the law, into the water, the mother's wit is rewarded by the princess's commiseration for the helpless infant and her adoption of the same as her son, to whom she gives the name "Mosheh" (Græcized "Moses"). Moses is reared in all the learning of the Egyptians under his adopted mother's care, but, actively resenting the harshness exercised toward his brethren by their Egyptian taskmasters, he slays one of the latter and flees the country. In neighboring Midian he tends the flocks for Jethro, whose daughter Zipporah he marries, and in the solitude of his pastoral life in the Sinaitic peninsula receives the call to go back to Egypt and become the means of his brethren's deliverance. In natural modesty he shrinks from the task, but every objection is met, and, being joined by his brother Aaron, an abler orator, the heroic brotherly pair appear before Pharaoh and demand not only the release of the national serfs, but their freedom to observe the traditional customs of their own religion. Such demands, at a court politically so mighty and in face of a religious system so absolutely powerful, meet with scorn. The Israelites' sufferings are increased; God shakes Egypt to its core with a series of "plagues," calculated to demonstrate both the impotence of human might and the subservience of even the most sacred things of the Egyptian cult to the supreme God Adonai (properly Jhvh*) whom Pharaoh "did not know."

The Exodus.—Shattered in pride, wounded in religious conviction most keenly by such open defiance of Egyptian religious notions as the slaughter of the lamb, so sacred to Egyptian ideas, the eating of its flesh as the "Passover" sacrifice, and the sprinkling of its blood ostentatiously on the doorposts of the Hebrew dwellings, Pharaoh thrusts them forth at midnight of Nissan (April) 15, 1495 B. C. The Israelites march eastward to the Red Sea. Daylight seems to bring reconsideration to the Pharaoh, however—most probably King Menptah of the monuments—who orders out an army to pursue the fugitives and drive them back to their tasks again. Overtaken at the very shore of the sea, the Hebrews take advantage of a temporary drying up of the ocean bed by a "strong east wind" at some point of its narrow extent, but the pursuing Egyptians are caught in the returning waters and drowned. Thus Israel's descendants, grown now to the number of 2,000,000 or 3,000,000—there are 600,000 men of fighting age—are once again on Asiatic soil, well repaid for their enforced slavery by the "vessels of gold and silver" which they demand of their panicstricken taskmasters, and with signal proof yet ringing in their ears of the impotence of Egyptian idolatry in contrast with the might of Him who, though unseen, had fulfilled the olden promise treasured among them, and at last "brought them out of the land of Egypt, out of the house of bondage." The anniversary of their redemption from Egypt becomes thus naturally the first great festival of Judaism, the Passover, "for that He passed over the houses of the children of Israel in Egypt when He smote the Egyptians."

Education in the Desert.—Unprepared for warfare with the neighboring Philistines, the course of the emancipated slaves is directed southward along the eastern shore of the Gulf of Suez, and upward into the mountain fastnesses of the Sinaitic peninsula with their intersecting fertile *wadys*. There, seven weeks later, the formulated and written foundation of a religious national existence is revealed, the Decalogue, the "Ten Words," which, in a condensed form, brands the practices of neighboring nations as forbidden by God, and lays the basis for all civilization in those prohibitions of idol-worship (Second Word), blasphemy (Third Word), murder (Sixth), adultery (Seventh), violence (Eighth), slander (Ninth), and covetousness (Tenth). In addition, the recognition of God's active and merciful intercession in human affairs (First Word), the indispensable benefit of Sabbath rest (Fourth), and the paramount duty of filial respect as the foundation of all government (Fifth), are enforced—all in such manner, amid the smoking cliffs of Sinai, as never to fade from the memory of the beholders, their children and children's children unto remote generations. By divine direction Moses provides a portable temple or tabernacle, to serve as a temporary seat of worship while the doctrine of the spiritual nature of Jhvh is thereby enforced again and again, as its successive demolitions and re-erections in their various camping-places show the absence of any image or sacred animal, such as an Egyptian temple would contain. The natural disposition to bring sacrifice, familiar to the people in their former home, is recog-

* The proper pronunciation of the unspeakable name of God is not known; the Jews paraphrase it as Adonai

nized and abundant provision made for its expression; restrictions are enforced as to the victims being "clean" animals, and the substantial portion of each sacrifice is assigned for the support of the hereditary priests, descended from Levi.

But the people, with all the care taken for their physical and spiritual wants, prove ungrateful; murmurings and rebellions repeatedly mark their journey, culminating at last in a positive refusal, when on the very borders of Canaan, to enter the land to fight against the powerful people whom their spies describe as being in possession of it. The Hebrews are accordingly led back into the Arabian wilderness until that cowardly generation should die out and their places be taken by a freer, desert-born population. At the end of this period, spent, no doubt, in the gradual education of the people for a worthier national existence, various opposing nations are encountered in battle and defeated. The Midianites, however, counseled by Balaam, a Syrian prophet, whose own account of the episode seems incorporated in the book of Numbers, seduce Israelites to their immoral idolatry, upon which disease and pestilence rapidly follow. Moses, who in a moment of anger has himself forfeited the privilege of entering the Promised Land, appoints Joshua his successor, and allows the tribes of Reuben, Gad, and half of Manasseh, who are rich in cattle, to take the valuable pasture-lands on the east bank of the Jordan, just conquered from neighboring opposing tribes. Calling Israel together for a farewell address (the book of Deuteronomy), he then recapitulates their history, recounts God's blessings in the past, promises continuance of the same in the future if the people shall prove worthy of it by fidelity to their mission, of being a "kingdom of priests and a holy nation." He rehearses the chief points of the Law, delivers it to the priests, and dies, with vigor unabated, at the age of 120, in the year 1455 B. C. Buried in some mountain-pass in Moab, no man knoweth of his sepulchre unto this day; but his best monument is that immortal Law which rendered the highest ideals possible to a nation of earth-ground serfs, and so rough-hewed the workers in Egypt's brick-fields into the fathers of poets, prophets, psalmists, and sages.

Conquest of Canaan.—Under Joshua the conquest of Canaan proper is begun. Jordan is crossed in the spring of 1445. Bethel, Ai, and other towns are captured, and the greater portion of the land is subjugated and partitioned out among the remaining nine and a half tribes; forty-eight cities are set apart for the Levites. Before his death Joshua too exhorts the people to fidelity to the ideals of Judaism, contrasting so strongly with the intensely sensual rites of Canaanite idolatry.

Rule of the Judges.—On his demise the lack of firm guidance makes itself felt in dissensions and public scandals, one of which leads to the almost complete extinction of the tribe of Benjamin. (Judges xix.–xxi.) Various neighboring chiefs overrun the newcomers and render them tributary, a condition being acceptance of idolatry and relinquishment of the anti-idolatrous Jewish faith. Now and again deliverers, "judges," appear who regain their independence. There seems to be as yet little community of feeling between the tribes, owing to diversity of interests. A king of Hazor is defied by a woman-judge, Deborah, who inspires Barak to lead several of the tribes against him, and in a terrific contest at Megiddo the oppressor is defeated, his fleeing general, Sisera, assassinated by a friendly Kenite woman, Jael, and "the land has rest for forty years." The political distress under which the land labors, the faintheartedness of certain tribes in grasping arms, the valor of others, the battle of Megiddo, Jael's deed, and the anxiety in Sisera's home are most graphically described by the heroine Deborah in a spirited epic (Judges v.). Midian is the next oppressor; its kings, Zeba and Zalmunna, are defeated by Gideon in the Plains of Jezreel, and pursued across the Jordan with great slaughter. There is quiet again for forty years, while the victorious Gideon refuses the proffer of royal honors from the grateful people. His son, Abimelech, less scrupulous, slays his numerous brothers and proclaims himself king in Shechem, despite the cutting taunts of his youngest brother, Jotham, who escapes the general massacre, and in the parable of "the trees selecting a king" describes how the valuable olive, fig, and vine refuse kingly dignity while the worthless bramble grasps it only too eagerly (Judges ix. 7). A succession of such judges rule in Israel, some no doubt finding only local recognition; the most famous of them is the physically powerful, dull-witted, but humor-loving Samson, whose dramatic history has stirred the genius of notable poets. A thorn in the side of the oppressing Philistines for several years, he falls a victim to a Philistine woman at last, and dies amid a scene of calamitous destruction wrought by himself upon his life-long enemies. Eli, a priest, is the next recognized judge; located at the sanctuary in Shiloh, he is reverenced, but his sons disgrace their priestly office in diverse ways. A little lad, Samuel by name, born under peculiar circumstances, is dedicated by his grateful mother, Hannah, to the service of God. Being placed under Eli's care, he becomes his successor, after the disgrace brought upon Israel by Eli's sons has culminated in the capture of the sacred ark of the sanctuary on the battle-field, whither they had unlawfully taken it. Samuel's activity is on the whole a peaceful one; in the "schools of the prophets" instituted by him he seems to have cared for the supply of adequately trained teachers to foster the people's religious growth and keep them faithful to the service of Jhvh-Adonai. He judges Israel all his life, and goes from year to year in circuit to Bethel, Gilgal, and Mizpah. (1 Samuel vii. 15, 16.) The irony of fate darkens his last years with the same disgrace which clouded his master Eli's closing life; his sons, Joel and Abiah, "walked not in his ways, but turned aside after lucre, and took bribes and perverted judgment."

Israel a Monarchy.—The disgusted people demand a king to rule them; Samuel objects, and forcibly describes the evils of setting a monarch over them; but the people insist, and he has to yield, anointing as Israel's first king Saul, the son of Kish, a Benjamite (about 1098 B. C.). Saul, well favored in person, vigorous in act, as shown immediately by his prompt assistance to the men of Jabesh-Gilead who are hard beset by the Ammonites, does not continue to demonstrate his fitness for King of Israel; he becomes superstitious, formal in religious observance, disobedient ("To obey is better than sacrifice," he is told by the reproving Samuel), and is warned that the sovereignty therefore can not continue in his family, but another must be selected. That other is David, youngest son of Jesse of Bethlehem, then a stripling, tending his father's flocks, whom Samuel, just before his death, secretly anoints. He is introduced to Saul as a skillful harpist, whose art can chase away the growing melancholy which now beclouds the king; and again also as the victorious assailant of a giant, Goliath of Gath, in one of the interminable wars with the Philistines. This valiant deed brings David such acclaim at the hands of the people as rouses Saul's jealousy. Nevertheless he gives him his daughter Michal to wife, after subjecting him to a dangerous exploit, and sees how his brave son Jonathan becomes David's beloved friend. Saul's jealousy reaches the point of attempting David's life, and the latter has to flee, pursued in a desultory way by Saul and his troops. Through all this persecution David shows himself magnanimous and even respectful of "the Lord's anointed"; living in the wilderness of Southern Judah, he supports himself as chief of a band of free-lances, defending the country against Philistines and Amalekites, and has his headquarters in the cave of Adullam. Still pursued by Saul's soldiers, he finds refuge with Israel's enemies, the Philistines, and serves in their army, though not in their campaigns against Israel. Saul is hard pressed by these foes; superstitious to the last, he summons his former censor, Samuel, from the spirit-world, and learns that on the morrow he must die. The battle is fought on Mt. Gilboa; Israel is defeated, the lion-hearted Jonathan and other of Saul's sons are slain, Saul in despair falls upon his own sword. His body is found by the conquering Philistines, is exposed in dishonor on the walls of Beth-Shan, but rescued thence by the men of Jabesh-Gilead in grateful remembrance of his prompt succor, and by them is buried in their town.

David, King and Psalmist.—David is now recognized as king, first by his own tribe, presently on the death of Saul's son, Ishbosheth, by the whole people (1051). He conquers Jerusalem from the Jebusites, makes it his capital, and henceforth the most celebrated city in the world. Of a pious turn of mind, he gives his thoughts to the worthy housing of the ark of God, and after sundry delays brings it to Jerusalem with great pomp and rejoicing, thus giving his capital its first claim to be called "the Holy City." He is anxious to enshrine it in a costly temple, but is dissuaded by the prophet Nathan, for his hands are stained with the blood of his numerous wars; he contents himself with collecting the materials for the temple, to be erected by his son and successor. Of a devout disposition, as proved by his beautiful Psalms, which, with all their intensely martial, al-

most cruel, spirit at times, breathe the true fervor of enthusiastic piety, their constant vein of sorrow for sin committed and of passionate prayer for pardon, betrays the fact that his conduct was by no means uniformly virtuous. The blackest spot upon his record is the affair of Bathsheba, wherein to secure possession of the woman he loves he compasses the death of Uriah, her brave husband, one of his best generals. His last years are embittered by severe domestic troubles; these are the seduction of his daughter Tamar by her half-brother Amnon, his murder by Tamar's brothers, the banishment of his beloved son Absalom, the latter's plot against his father, resulting first in the flight of the aged monarch into the wilderness, and finally in the death of this unnatural son at Joab's hand, to the father's unbounded grief. At the age of seventy he dies (1018), and is succeeded by his son Solomon, born of Bathsheba.

Solomon's Magnificence.—Solomon completes his father's design for a temple of Adonai's worship; the immense resources of his power and wisdom are devoted to the rearing of a magnificent shrine upon Mt. Moriah in Jerusalem, which is expressly dedicated to the use of all men regardless of creed or race, in the worship of the Unit-Spirit God (1 Kings viii. 41), a liberality of conception which marks Solomon at once as a true son of Abraham and Moses. This king devotes himself to science and literature; his knowledge of natural history is celebrated far and wide, as also his sagacity; while the biblical books Proverbs, Ecclesiastes, and Song of Songs are ascribed to him. His ships bring the treasures of India from the East, of Spain from the West; money is so plentiful that "silver was in Jerusalem as stones." The temptations of his harem wean his heart from the pure service of Adonai to the heathen cults of his women; he publicly renders adoration to the sensual gods of idolatry.

Division of the Kingdom.—On Solomon's death, 978, his son Rehoboam is successfully opposed by Jeroboam, who wins the allegiance of the ten northern tribes, and of them forms the "kingdom of Israel"; while but two tribes, Judah and Benjamin, remain faithful to the house of David under Rehoboam in Jerusalem, and are known as the kingdom of Judah. These kingdoms coexist side by side with frequent warfare and occasional alliances between them; capitals of the northern kingdom are in succession Shechem, Tirzah, and Samaria. Israel has twenty kings from 978 to 720 B. C., who, casting loose from the Jerusalem shrine, embrace idolatry; notable are Jeroboam I. (978–956), who introduces calf-worship in Dan and Bethel; Ahab (919–897), who, under the domination of his Phœnician consort, Jezebel, maintains the worship of Baal on a grand scale in spite of the fiery zeal of the prophet Elijah; Jehu (883–855), who destroys all Ahab's family, roots out the Baal-worship, but is unsuccessful in war against Hazael, King of Syria, who captures Gilead from him, the land E. of Jordan; Jeroboam II. (823–783), a successful warrior, recovers Gilead, and conquers Damascus and Chamath. His reign is marked by great luxury and consequent diminution of piety and right-living, as evident from the zealous denunciations of the prophets Hosea, Joel, and Amos. Menachem (771–761) succumbs to the growing might of Assyria, and buys peace with heavy tribute; Pekah (759–739) joins the King of Syria in war against Judah, whose king then appeals for aid to Assyria. Israel is accordingly overrun by Tiglath-pileser; Naphtali and Gilead are conquered, and their population deported as captives; Hosea (729–720), murderer and successor of Pekah, foolishly hopes to have Egypt's aid against the Assyrians, with the end that Samaria, his capital, is vigorously besieged by Salman-Assar, captured, and the remaining population of the land transported to unknown Assyrian and Median districts. They thus become the "ten lost tribes." The history of the kingdom of Israel thus exhibits the calamitous results foretold for disobedience to the high ideals of the faith, and which the prophets of the time vainly strive to recall to their sinful contemporaries' minds.

Kingdom of Judah.—The history of the southern kingdom makes rather a better exhibit: no doubt the possession of the Jerusalem temple, with its traditional and stately service, tends to keep Judah somewhat more faithful. Some of her twenty kings are reverently pious—e. g. Asa (958–917), his son Jehoshaphat (917–892), Joash (876–835), Hezekiah (723–693); especially Josiah (637–608). In the reign of the last-named the finding of an authentic scroll of the law of Moses occasions great rejoicing and a solemn pledge of religious observance. Political troubles break upon the land with the rise of Babylonian power; the prophets vainly essay to guide the monarchs aright. Zedekiah (597–586) arrays himself against King Nebuchadnezzar, leading to the capture of Jerusalem, the destruction of the temple (ninth day of the month Ab, 586), and the deportation of the people to Babylon. There is a chance of the restoration of independence under the good and wise Gedaliah, whom Nebuchadnezzar leaves as governor in Mizpah, but he falls a victim to seditious intrigues and is slain. So ends the kingdom of Judah, 134 years after the sister kingdom; the respite afforded being seemingly without much effect in inciting Judah to greater obedience to God's law than Israel had shown. Judah's prophets, no less than Israel's, are constant in eloquent reproof of the national infidelity, and of the baseness of forsaking the worship of Adonai for heathen obscenities, or, worse still, of being outwardly faithful to religious precept and practice in the temple, while frequenting the heathen groves and high places as well. The inimitable Isaiah, grandest of all the Hebrew poets, the forceful Jeremiah, are the chief of the orator-zealots who mourn their contemporaries' weakness and wickedness.

The following table gives a list of Hebrew sovereigns from Saul, the first king, to Zedekiah, the last ruler of the house of David:

KINGS OF ISRAEL BEFORE THE DIVISION.

Saul	about 1098 B. C.
David	1051
Solomon	1018

KINGS OF ISRAEL.	B. C.	KINGS OF JUDAH.	B. C.
Jeroboam I.	978	Rehoboam	978
		Abijam	961
		Asa	958
Nadab	956		
Baasha	955		
Elah	932		
Zimri	931		
Tibni	931		
Omri	931		
Ahab	919		
		Jehoshaphat	917
Ahaziah	897		
Jehoram	895		
		Jehoram	892
Jehu	883	Ahaziah	883
		Athaliah	882
		Joash	876
Jehoahaz	855		
Joash	839		
		Amaziah	835
Jeroboam II.	823	Uzziah or Azariah	806
(Interregnum 11 years.)			
Zechariah	772		
Shallum	772		
Menahem	771		
Pekahiah	761		
Pekah	759		
		Jotham	754
Hosea	729	Ahaz	738
		Hezekiah	723
		Manasseh	693
		Amon	638
		Josiah	637
		Jehoahaz	608
		Jehoyachim	608
		Zedekiah	597

Rebuilding the State.—Judah's exile proves an excellent school of remorse. By the waters of Babel the tears flow freely over their past national folly, and though comfortable enough as far as worldly affairs go, the Judeans (henceforth Jews) are glad of the permission given by Cyrus, King of Persia, who overthrows the Babylonian supremacy in 536, to return to their ancestral country. Forty-two thousand return to their desolate homes under Zerubbabel, of royal lineage, and Joshua, a high priest. The Samaritans, a mongrel population placed in the northern kingdom by the Assyrian conqueror, put forward a claim to be considered Jews, too, and to participate in the rebuilding of the temple. On refusal, they malign the returned exiles at the court of Persia, and the work has to stop until, under Darius Hystaspes (520), the Jews, animated by their prophets Haggai and Zechariah, take up the work again, and the temple is rededicated (516) with great rejoicing. Colonies of returning Jews stream back to Judea continuously, the leader of one of them, Ezra (458), leaves his mark upon Jewish legislation by his determined reforms of abuses that had crept in (intermarriage with heathen women, etc.). He works ardently for the full observance of the Mosaic Law, and many wise regulations are attributed to him. He is traditionally credited also with the settlement of the canon of Scripture, the introduction of the present square charac-

ter for Hebrew, and the establishment of a religious synod or Sanhedrin. In the same pious spirit Nehemiah worked (444), combating the desecration of the Sabbath and the greed of the wealthy, but distinguishing himself specially by the completion of the Holy City's fortifications. About this time perhaps the events narrated in the book of Esther take place in Persia. The Samaritans, still refused recognition, complete their opposition to Israel by erecting a counter-temple on Mt. Gerizim, the animating spirit being Manasseh, son of a high priest, who had married the daughter of the Samaritan chief. The succeeding period is wrapped in obscurity. Tributary to Persia, the Jews are ruled immediately by their own high priests, one of whom entertains Alexander the Great on his conquering progress toward Persia with great solemnity (332).

Judea under the Ptolemies.—On Alexander's death Judea falls under the rule of the Ptolemies, Kings of Egypt, for about a century. Many Jews had settled on the Nile, notably in Jeremiah's time; now there was a large, wealthy, and cultured colony, especially in Alexandria. They have their own temple, built by Onias at Heliopolis, near Memphis, rivaling that at Jerusalem in magnificence. A rich and influential literature arises here, of which the Septuagint, a Greek translation of the Scriptures, is a product; also the system of religious philosophy—Philo, its chief exponent—which underlies Christianity.

Syrian Domination.—With the ascendency of the Syrian power, however, which takes Judea from Egypt, the generally liberal rule of the Ptolemies is followed by the harsh tyranny of an Antiochus IV., "Epiphanes." Nothing less than the complete extermination of the national faith is determined upon by him; all Jewish rites are proscribed under pain of death, the temple is defiled, and an image of Jupiter set up there for adoration. Troops patrol the country to enforce the worship of Greek idols. After years of mute suffering, the first blow of resistance is struck by the aged priest Mattathias of Modin, of distinguished family, and the revolution begins. Driven to the mountains, Mattathias and his five brave sons gather strength, and under the leadership of Judah, the third son, surnamed "Maccab" or "Hammer," engagements in the field against the Syrians prove successful. Lack of numbers and discipline the Jews replace by enthusiasm. Judah is a capable general, and (164) cuts his road to Jerusalem, purifies the temple, and in a joyous eight-day festival of dedication (Chanukah) institutes an annual rejoicing for the triumph of Judaism over Greek profanity.

Independence Restored.—The apocryphal "books of the Maccabees" contain the account of this war. Judah dies a hero's death on the field, and is followed in command by his brothers Jonathan and Simon successively; the latter ends the long war (143), establishes the independence of Judea, and is appointed hereditary high priest and prince by the grateful people (140). Many coins from this period are still extant. Simon is assassinated (135), and is followed by his brave son Jochanan (John) Hyrkanos. Assuming the title of king, he conquers Gilead, subdues the Edomites, compelling them to embrace Judaism *en masse*, destroys the Samaritan temple on Mt. Gerizim, and acquires possession of the seaport Joppa. Obtaining the recognition of Rome for all his conquests, he may be said to have brought later Judea, in the thirty years of his reign, to the pinnacle of its power. His peace, however, is embittered by the growing dissensions of the religious sects, the Pharisees and Sadducees, the latter, favored by Hyrkanos, are the more liberal and wealthy class, while the Pharisees are rigid interpreters and enforcers of the law, nationalistic and pietistic often to excess. The Essenes, a third sect, are devoted to a mild community of life, practicing ascetic rules and simple living.

John Hyrkanos is succeeded by his sons Aristobulus (106-105) and Alexander Jannai (105–79). The latter, a most enterprising but unsuccessful soldier, shows great cruelty in his long reign, earning the cordial hatred of his people. On his death-bed he exhorts his queen, Salome, to affiliate herself with the Pharisees (he had sided with the Sadducees), which she does, and governs the kingdom for nine years with great circumspection and success.

Roman Influence.—On her death (70 B. C.), fatal feuds arise between her two sons, Hyrkanos, a weak, slow man, and Aristobulus, an energetic soldier. Referred to Rome, the supremacy is assigned to Hyrkanos, and Aristobulus, with his sons, sent captive to Rome, after Pompey had besieged Jerusalem and captured him there. Hyrkanos falls into the power of the crafty Antipater (an Edomite, and one of his great namesake's forced converts to Judaism), and is completely ruled by him, with the result that Antipater's son Herod, who has married Hyrkanos's granddaughter, the beautiful Mariamne, follows him upon the throne as King of Judea (37). Currying favor with the successive powers which rule the Roman world, these Edomites, father and son, manage to give Judea a halo of splendor at home and abroad. Herod rebuilds the temple with great magnificence (20), erects amphitheaters and public works, but is a cruel and detested tyrant withal, who murders his innocent wife for suspected infidelity, his brothers-in-law for suspected treason, and dies, heartily and reciprocally hated by his subjects, in the year 4 of the Christian era. The kingdom, at Rome's dictation, is divided among his sons, their power being merely nominal. Rome is the real ruler of the land, and her procurators take up residence there, to appoint and depose, to collect taxes, and overawe the people. These procurators, whether in ignorance or malice, continually offend the religious susceptibilities of the Jews, besides grinding them into the dust with taxation.

Insurrections.—Various insurrections are crushed, the last taking place when Gessius Florus is procurator (65 A. D.). It assumes such dimensions that Vespasian and his son Titus take the field against the Jewish forces. The defense of Galilee is intrusted by the Jews to Joseph ben Mattathias, the future historian "Josephus," of the war, and after a brave and manful resistance, the remains of his army are driven in on Jerusalem by the conquering Romans. He himself escapes to Vespasian and makes his peace with him. Siege is laid to the metropolis by Titus. It is thorough and disastrous. Famine completes the work of decimation left undone by party strife within the walls.

Fall of the State.—At length, in an attack in the year 70 (ninth day of the month Ab), a flaming brand, flung into the temple, ignites the shrine, and, in the resulting consternation and despair, the Romans capture the stronghold. The temple is destroyed and Judea is conquered, never again to be called Judea. Thus once again Judaism has been shown that a religion of ritual sacrifices will degenerate into formalism and the true religious and moral elements decay; sacrifices themselves, suffered only as relics of a barbarous piety, pass now from Judaism.

Growth of Legal Study.—Deprived of political existence, the Jews henceforth throw themselves with ardor into the culture of their religious patrimony. Already, under the Maccabean kings, the study of the Law and the interpretation thereof had thriven. Numerously attended colleges had flourished under the guidance of such sages as Shemayah and Abtalion, Hillel and Shammai, the elder Gamaliel, and other noted presidents of the Sanhedrin. It is reserved for the rabbi Jochanan ben Zakkai, during the intensity of the siege of Jerusalem, to take the step which secures the survival of Israel's lore over Israel's nationality. Carried from the beleaguered city as a corpse in a coffin, he flees to Jamnia near by, and there opens a college for the study of Judaism, receiving later the acquiescence of the Romans in his educational activity so long as it eschews all political endeavor. The oral and traditional exposition of the Law of Moses here taught is called Mishnah (learning); its teachers are Tannaïm (teachers). A long succession of earnest and learned rabbis take up the task of instruction, prominent among them Akiba (120); he espouses, however, more or less secretly, the cause of the valiant Barkochba, who raises the standard of insurrection against the oppression of the Emperor Hadrian (117–133), and fights fifty battles against the Romans. Barkochba's rebellion proves abortive, he is defeated at the bloody siege of Bethar; and the insurrection is stamped out with excessive cruelty, the temple-site plowed over, Jerusalem renamed "Ælia Capitolina," and Jews forbidden to settle there.

Once again study is resumed and Judaism becomes a phase of religious life. Judah "Hannasi" (the prince), also called "Hakkadosh" (the saint), descendant of the famous Hillel, is chief of the Sanhedrin, with his residence in Tiberias and Sepphoris (190–220), and he edits the whole of the extant traditional Law in the present form of the Mishnah (see Talmud), with its six books or sections. The reverence paid to religious life is strikingly portrayed in this devotion to the study of religious jurisprudence, and in the esteem in which those learned in the Law were held, regardless of wealth or social standing.

Jews in the Orient.—The generally tolerable circumstances of the Jews, now scattered through the Roman empire, change for the worse when the zealot Constantine

ascends the throne, and forces Christianity upon his subjects. His harsh measures of repression (among others the substitution of Sunday, "the Lord's day," for the Sabbath of the Decalogue as the day of rest) lays the foundation for the bitter sufferings of the Jews in succeeding ages. His successors from time to time display his spirit, with infrequent fluctuations of favor toward "God's people." The code of Justinian excludes them from all public offices, but holds them strictly to all the duties of citizenship. The focus of religious learning among the Jews meanwhile naturally shifts eastward back to Babylon, where important academies flourish, at Nehardea, Susa, Pumbeditha, and Machuza; the teachers there are called Amoraïm (traditionalists), and the body of their discussion is at length reduced to writing, forming the Babylonian Gemara, or, with the Mishnah incorporated, the Babylonian Talmud (about 500; see TALMUD). The political head of this Babylonian community is known for centuries as "Resh Galutha," Chief of the Captivity. The Jews' position in the Orient being a comparatively happy one, even when the Sassanides reach the throne and overthrow the reigning religion, though some sovereigns are zealously moved against them, as Jesdijered II., who forbids Sabbath observance, etc. (455–460), and Feruz, his son, who extends his harsh measures. About this time, it is said, a colony of Jews reached the Malabar coast and then settled in Cochin-China. In Persia they take active part in the political troubles of the time, and under Chosroes II. join in the invasion of Palestine by the Persians and help expel the Romans from the "Holy Land." The Persian empire giving way to triumphant Islam, Jews who had settled in Arabia in large colonies and had brought the knowledge of their law and Scriptures thither, are instrumental in furnishing Mohammed with much of his religious philosophy, notably the horror of idols. Regard for the "people of the Scripture" is repeatedly enforced by the prophet of Islam upon his followers. The ecclesiastical or educational chiefs of the Jews (the successive Gaonim —"excellencies") receive the respect of the caliphs and the veneration of the whole community. Notable Gaonim are Saadia (892–942), born in Egypt, an able philosophical writer, his chief work *Emunoth ve-Deoth* (Faith and Morality); Sherira, on Talmudical topics, and his son Hai (1038). Soon after the increased attention paid to literature and commerce, under the conquering Arabs, seems to have worked the decay of the Babylonian academies of Jewish jurisprudence. We hear little more of them. The attention of scholars is paid now more to philosophy and Bible criticism, and we have to this age to look probably for the foundation of that great body of textual criticism on the Hebrew Bible which has survived in the Massorah. In the middle of the eighth century the sect of the Karaites (*Kara*, Scripture) is founded, traditionally by a certain Anan ben David. These, relying simply upon the text of the Pentateuch, reject all traditional interpretation, and so separate from other Jews in such matters as festival observance, Sabbath laws, and dietary restrictions.

JEWS IN EUROPE.—*Moorish Spain.*—In Europe, meanwhile, the Jews have been made to realize the growing power of the Church. Dagobert of France (seventh century) gives them the alternative of baptism or death. In Spain, under the Visigoths, they are more happily situated, on terms of perfect social equality, and even of intermarriage, until in 590 King Reccared embraces Catholicism and issues harsh edicts against them, forbidding them to hold office, own slaves, or intermarry with Christians. Sisebut in 612 banishes them from the kingdom entirely. Readmitted by his successor, they are banished again by Chintila in 638, and once again readmitted; but they suffer gross injustice: their oath is not accepted in a court of law, while those who embrace Christianity are placed under the strictest surveillance. This unhappy state is ended by the overthrow of the Visigoths by Tarik and his conquering Arabs (711), and the Jews become their allies in the conquest of Spain. The captured fortresses are placed in their hands as custodians; they are accorded full religious freedom, independent jurisdiction, and pay simply a small poll-tax to the crown. Under the Crescent the horror of the Cross is forgotten in a period of happiness and prosperity, a golden age of Judaism. While Christian Europe is steeped in barbarism Arabs and Jews feed the flames of science; medicine, mathematics, astronomy, poetry, and philosophy are brought to a pitch of excellence to which the Jews contribute no small share. In statesmanship they especially commend themselves to kings and princes. In the tenth century Chisdai ibn Shaprut becomes the trusted counselor and finance minister of the caliphs Abderrahman III. and Alhakim, in Cordova (961–976); in the eleventh century Samuel Hannagid ("the Prince") becomes *Kalib*, or secretary of state, to Habus, King of Granada, besides being a great Talmudist and patron of learning (d. 1055). Ibn Hassan, in Saragossa, and Isaac Albalia, in Seville, are equally beloved by their respective monarchs.

A Golden Literature.—This is a golden age for Jewish literature, too, the most distinguished names being Solomon ibn Gabirol (1050), poet and philosopher, long miscalled "Avicebron"; Isaac Alfazi (1103), renowned Talmudist; Judah Halevi (1140?), the pearl of Jewish poets, author also of the *Kusari*; Moses ibn Ezra, poetologist; Abraham ibn Ezra (1168), philologist, Bible critic, philosopher, and mathematician; the greatest of all, Moses Maimonides (1204), philosopher and jurist, author of the philosophical *Moreh Nebuchim* (Guide to the Perplexed, in Arabic), the *Mishneh Torah*, a digested compendium of Jewish law, civil and religious (Hebrew), a *Commentary* on the Mishnah (Arabic), besides numerous smaller works; David Kimchi, grammarian and lexicographer (1230); Solomon Alcharizi (1230), satirist and poet.

In Christian Provinces.—The good example of these benign Arab rulers spreads to Christian Spain. In Castile, all discrimination against Hebrews being removed, they serve their Christian lieges with fidelity and success as ambassadors and as soldiers, and when the Arabs, in the middle of the twelfth century, begin to proselytize their Jewish subjects, many pass over to Christian Spain. In Toledo they become numerous, wealthy, and respected. In Aragon the monk Peñaforte essays to convert "the lost sheep." In Barcelona, 1263, a famous public disputation, four days long, is held between the Dominicans and Moses Nachmani, a noted Talmudist and commentator, of course with no other result than to intensify the spirit of persecution. Toward the end of the fourteenth century the growing jealousy of the Catholic Church results in open restrictive measures for Jews, compelling them to reside in ghettos, wear distinctive badges and the coarsest clothing. A public disputation at Tortosa (1414) converts none, and feeling is correspondingly embittered. With the establishment of the Inquisition at Seville (1480), the beginning of the end draws near. The fanatical Ferdinand and Isabella foster the horrible "holy office," and thousands of Jews are burned at the stake in Seville and other towns, after suffering torture. When Torquemada becomes grand inquisitor (1483), and, with the fall of Granada, all Spain becomes Christian, the doom of Spanish Judaism is spoken. Expulsion is decreed, and Aug. 2, 1492, several hundred thousands of Spanish subjects, representing Spanish literature, art, science, patriotism, and commerce in no inconsiderable degree, shake from their feet the dust of an ungrateful country which hates them for their religion's sake. Robbed of all their belongings, they find refuge in Portugal for a few years, and, after bitter suffering there, too, resort to Africa and the East.

The comparative ease which the Jews of France and Germany enjoy during these centuries is rudely disturbed by the crusades. See JEWS, PERSECUTIONS OF.

In Italy and France.—In Italy and the south of France the Jews enjoy comparative tranquillity. Many Talmudical and poetical productions testify to their ease of mind. Under Charlemagne and his successors the Jews are prosperous; only as the priesthood gains power under the early Carlovingian and Capetian kings their persecution begins. The best-known author of this period is Solomon ben Isaac, called "Rashi," the prince of Hebrew commentators on Bible and Talmud (1105). In Germany, Frederick Barbarossa makes them *Kammer-knechte*, slaves of the imperial chamber, thus insuring them imperial protection—rarely accorded, however, but claiming supreme disposition of their persons and possessions. Excessive taxes are laid upon them; they are considered as aliens, and must pay to live—even to live wretchedly in ghettos, and subject to constant humiliations, restrictions, and penalties. Louis IX. of France claims that the Talmud reviles the Christian religion, and burns whole cart-loads of copies of the work and banishes the Jews, soon to call them back, however.

In Germany, England, and France.—Circumstances in Germany become unbearable, and a grand emigration to Palestine is planned, in which the learned Rabbi Meir, of Rothenburg, takes part (1286). Reaching Lombardy, they are arrested, and Meir flung into prison, where he dies (1293). John of England lacking money continually,

squeezes it from his Jewish subjects; sharp persecutions take place, the Dominican monks sedulously fanning the flame of hatred, and in 1290 Edward I. banishes the Jews from Britain. The history of the Jews in Germany is a history of their persecution for their religion's sake, as refusing to accept Christian dogmas. In 1394 they are banished from France by Charles VI.

The Middle Ages close in gloom for the children of Israel; hunted from land to land, esteemed nowhere as citizens, excluded by law from professions, handiworks, and agriculture, they are compelled to become small traders and money-dealers. Christianity, they allege, is represented only by a cruel Church, superstitious and immoral priests, avaricious princes, barbarous nobles, bigotry, and ignorant common people.

In Turkey and the Levant.—No wonder, then, that the domain of the Crescent once more invites them, and Turkey feels the new pulse of life, injected by the immigration of Jews, in such places as Constantinople, Salonichi, Smyrna, etc. Under Selim II. Joseph Nasi (d. 1579) is appointed Duke of Naxos in return for active service rendered; Cyprus, too, is promised him if he can conquer it for Turkey, in which attempt he fails, however. His wealth, culture, and public spirit, as also that of his distinguished mother-in-law, Doña Gracia Mendes, give him European reputation; his widow, Reyna, first establishes printing in a suburb of Constantinople. A writer of far-reaching religious influence is Joseph Karo (b. in Spain, lived in Turkey and Palestine, d. 1575), author of the *Shulchan Aruch* (Prepared Table), a compendium of Jewish ritual and civil law, which is for Orthodox Jews the authoritative code to-day. The mysticism of the Cabala attracts such writers as Moses Cordovero, Isaac Luria, etc.; a noted traveler and romancer is David Rubeni. Shabbatai Tsevi (b. Smyrna, 1626), remarkably gifted in person and mind, allows himself to be styled a divine Messiah, and is banished from Smyrna by the ecclesiastical authorities; his fame as a wonder-worker nevertheless spreads all over Europe. In 1666 he goes to Constantinople, where the divine honors paid to him by his followers lead to his imprisonment; his fanatical believers raise such violent and continuous disturbances in his favor that the sultan compels him, by threat of instant death, to abjure Judaism altogether; he embraces Islam, and is made a royal doorkeeper. Unstable in his profession, he is banished to Albania, where he dies; but the popular belief in his supernatural powers long survives him.

Persecution in Italy.—Italy shares in the cultured impulse given by immigration of Jews from Spain. Isaac Abravanel (d. 1508), diplomat; Samuel de Leon, finance minister at the court of Naples, and the honored center of a circle of cultured Jews and Christians; de Lates and Sarfaty in medicine, Elia Levita, a German (1549), and Asaria dei Rossi (d. 1578) in philology; Moses C. Luzzatto in poetry and Cabala, are men of note. With the introduction of the Inquisition and the rise of the Jesuits, however, learning and Judaism in Italy receive severe blows; Talmud and Talmudical writings are burned in cart-loads by fanatical popes, and Hebrew printing-offices closed. In Venice a ghetto is set apart for Jews to dwell in (1516); Rome, Padua, Mantua, etc., follow the evil example. This mournful change finds expression in such works as Joseph Haccohen's *Emek Habbacha* (Vale of Weeping), and Samuel Usque's *Consolations* (Ferrara, 1552).

In Poland.—Poland at first pursues a liberal policy toward the Jews; agriculture, trade, and skilled workmanship are the better for the Jewish enterprise thrown into them. The rabbis are allowed to exercise civil jurisdiction over their own people; flourishing congregations grow in Posen, Cracow, Lemberg, Lublin, etc. Talmudic law becomes then the one object of study for Polish Jews; eminence therein is held to constitute true nobility. But with the insurrection of Chmelniecki against the Polish republic a sad change begins; the introductory disturbances cause the death of many defenseless Hebrews in the frequent political riots, but from 1649–58 Chmelniecki and his Cossacks are estimated to have slain 250,000 Polish Jews. The resultant exodus from Poland sends Jews in thousands westward to Germany and Holland, eventually to England, where Manasseh ben Israel, a highly learned Dutch Jew of Spanish descent, pleads with Cromwell for their readmission (1655). Though not at first successful, the Puritans no doubt came to look with favor upon the proposed settlement of "Israel" among them, and if not the front door, at least a side entrance is left ajar for them. Free Holland welcomes them; the commerce of Amsterdam and other cities soon feels the benefit of their trade connections and enterprise, while the Jewish community of Amsterdam, 400 families strong, comprising refugees from Spain and Portugal, becomes one of the most influential in Europe; in its atmosphere Spinoza is born and reared. Refugees from Poland, standing on a lower social scale, as it were, than their less oppressed brethren from Spain, establish their own separate community.

Controversy over the Talmud.—In Germany, while the circumstances of the Jews still remain continuously wretched, interest is excited by the fierce literary battle waged for and against the Talmud, stimulated by one Pfefferkorn, an apostate Jew, who declares the work to be full of blasphemy against Christianity. The Emperor Maximilian takes the matter up. On his request the famous scholar, John Reuchlin, investigates, reports such charges wholly groundless, and rebukes the false accuser. Pfefferkorn and his associates reply in a series of fierce pamphlets, which call forth replies from other scholars. The monks of Cologne, in rejoinder, petition the emperor for the destruction of every copy of the Talmud, and for the destruction of the Hebrew Bible, to be replaced by the Vulgate, the Church translation of the Bible into Latin. Reuchlin's championship of truth and learning entails continuous persecutions and Church trials upon him; the latter decided eventually in his favor. The Jews themselves sensibly take no active part in the turmoil. Even the Reformation agitation is not interfered with by them; it brings no change of heart in their lieges' treatment of them, persecutions still being frequent and severe. A notable instance is the rising in Frankfort-on-the-Main against them (1614), instigated by a villain named Fettmilch. Before he meets his deserved punishment of hanging and quartering, thousands of Frankfort Jews are massacred, outraged, and plundered, and the whole community banished, to be recalled two years later. A student riot in Vienna, 1668, leads to their banishment from Austria in 1670. Many emigrate to the rising state of Prussia, subject there, however, to continuous annoyances, to which bribes alone can bring even temporary cessation. The Jews of Germany are persecuted for the sake of what can be extorted from them. Love of money—money greed—is thus forced upon them as the sole condition of unharassed existence; traffic and lucre form their atmosphere, learning and literature are suffocated in it.

Moses Mendelssohn. — Shut in among themselves, even the language of their Christian neighbors becomes a strange tongue to them. It is Moses Mendelssohn (1729–86) who arouses German Judaism from this dying torpor. With a circle of educated friends, he infuses new life into Jewish culture by his philosophical works, and leavens the ignorance of the whole people by means of his noble translation of the Pentateuch into a pure, cultured German, which not only introduces the Jews of the fatherland to correct diction, but throws open to them the vast field of German literature, of which they immediately avail themselves. He is thus the father of modern culture among German Jews. The growth of culture being, however, a slow process, not unnaturally Mendelssohn's immediate descendants seek culture among Christian circles, and become estranged from Judaism in their love of refinement.

The Era of Liberality.—To France belongs the credit of striking the first blow at the inhuman treatment of the Jews which prevails all over Europe. In the first years of the Revolution the Legislative Assembly declares all Jews who take the citizen's oath free and equal before the law (1791). Napoleon organizes a convention (1806), to which he propounds certain questions for the reassurance of the Christian world, and establishes a continuous Sanhedrin (1807), together with a system of recognized government for the synagogue, supported by the state, which still exists. Prussia follows in 1812, decreeing all Jews citizens with citizens' rights. Jewish soldiers thereupon are not slow to show their bravery, in recognition, on the numerous battle-fields of the age. Circumstances prevent the full application of this liberal policy until 1850, when over all Germany all restrictions and distinctions are removed, and the state takes henceforth no note of religious conviction as debarring from civic rights. In Great Britain in 1855 the last shred of mediævalism disappears when a Jew is elected to Parliament, and after much opposition is allowed to sit, without having to add to the oath of allegiance the words, "on the true faith of a Christian."

In America the rights of Jews have never been impugned

to any considerable extent. The oldest settlements were on the coast of Brazil (from Spain), Cayenne, and Surinam (from Holland); on the northern continent, Newport, R. I., New York, Philadelphia, Savannah, and Charleston are the oldest congregations, all still in existence. New York, owing to the influx from the Russian persecutions of 1882, numbers now probably 250,000 Jews in her limits, and is the most influential community in the U. S. There are possibly 150,000 more scattered all over the country, with over 300 organized congregations, monumental and model charities in all the large cities; benevolent orders (Bnai Berith, etc.) and agricultural colonies (Alliance, N. J., the first and most successful one, founded in 1882 by a few public-spirited New York Hebrews; Woodbine, N. J., founded by the princely munificence of Baron de Hirsch); two seminaries for Jewish ministers—one in Cincinnati, founded 1873, one in New York, founded 1886.

The following table shows the distribution of Jews in the world:

Europe:		
Austria-Hungary	1,500,000	
Belgium	2,000	
Danubian principalities	200,000	
Denmark	1,500	
France	65,000	
Germany	600,000	
Great Britain	100,000	
Greece	2,500	
Holland	70,000	
Italy	55,000	
Russia	2,500,000	
Sweden and Norway	2,000	
Switzerland	7,000	
Turkey	75,000	
Total		5,183,000
Asia:		
Arabia	15,000	
Central Asia	25,000	
Persia	16,000	
Turkey	110,000	
Total (including Palestine, 25,000 to 30,000)		166,000
Africa:		
Egypt	10,000	
Morocco	350,000	
Tripoli	100,000	
Tunis	60,000	
Other parts	15,000	
Total		535,000
America:		
United States	400,000	
Canada	10,000	
Other parts	20,000	
Total		430,000
Australia		50,000
Grand total		6,364,000

From the above rapid *résumé* of their history it would appear that the religious activity of the Jews during all the centuries of oppression has been thus a conservative one, directed toward the preservation of the treasures of the Mosaic Law and the rabbinical interpretations and reconstructions of it, finding in this devotion to God's Word some solace for man's harshness. It was not until this pressure was removed that Judaism was free to resume its natural growth. Under the name of "reform," progress has eliminated from worship and ritual practically all relics of superstition, introduced by ghetto and prejudice, which have suffered thus the fate of sacrifices and priestly offices; minute ritualia and over-lengthy prayers have almost disappeared from reformed Judaism. Instead, reform has introduced orderly worship, instrumental music, collocation of the sexes at divine service, with other smaller details. Extremist congregations—for there is perfect autonomy in modern Judaism—have added customs, such as prayers in the vernacular in place of Hebrew, bared heads, vernacular hymns, modeled after those of Christian neighbors; this is the so-called "radical reform" wing. The resultant tendency seems to be to-day toward a middle course, so-called "conservative" Judaism, which, eschewing such radicalisms, avoids the customs and standpoints of the days of oppression. All this difference in Judaism, however, is simply in matters of worship; in fundamentals of belief all classes—radicals, conservatives, and orthodox—look forward to the gradual and ultimate acceptance by mankind of what Israel has preached from Abraham's day—belief in the Unit-Spirit God, without partnership, division, or incarnation; to whom man is responsible, directly and not through any mediator; and who, taking note of man's work in this life, may be satisfied by duty done to the best of one's ability on earth, to be continued in the life which is beyond. This is the working creed of all Jews to-day, as of old. As regards restoration to their old home, opinions differ among modern Jews according as "reform" ideas have to a less or greater degree alienated their minds from their past. Extremists do not anticipate or desire any such restoration; these are, however, the minority. The large mass of Jews all over the world confidently expect that in due time Judea will be "for the Jews" again, not necessarily as their sole dwelling-place, but as the center of their religious organization and of such political form as the times and the powers in control may dictate. Leadership, it is believed, will be vested in the person of a lineal descendant of the house of David (Messiah), after whose appearance warfare will disappear from among nations, peace and concord reign among men. While implicitly believing in the immortality of the soul, Judaism has no specific location to assign as the scene of future life, whether above the clouds or in the internal fires of earth. It claims no knowledge of either heaven or hell, believing simply that the soul's existence after parting with the earthly body is governed by the same divine Will and Love as rule it here. This world and its duties are held to be sufficient to occupy all our thoughts and activities while here, for it is the "vestibule leading to the palace," a place of preparation and education for the longer and larger life that lies beyond this.

Bibliography.—Of modern Jewish historians covering the whole period, Jost, Graetz, and Cassel are the most important. Graetz's work is now being issued in a condensed form in five volumes by the Jewish Publication Society (Philadelphia), three volumes now ready. English readers will find much pleasure in the histories by Milman and the lectures by Dean Stanley (*History of the Jewish Church*), in the latter especially, though both are necessarily somewhat colored by the Christological teachings of their authors. Special periods have been treated by Picciotto, *Sketches of Anglo-Jewish History*; Morais, *Eminent Israelites of the Nineteenth Century*; Markens, *The Hebrews in America*; *Reformed Judaism and its Pioneers*, by Emanuel Schraber, the last tinged, however, by personalities. Readers of German will find a large number of special monographs, touching periods in the history of the Jews in Berlin, Hamburg, Posen, Vienna, and Worms, Wilna, Moravia, and many other sections, by Ludwig, Geiger, Haarbleicher, Perles, Wolf, Finn, and Friedlander. A monograph by Kayserling upon Manasseh ben Israel was translated into English by the undersigned. Among works in French are Bedarride's *Jews in France, Italy, and Spain*; Carmoly's *La France Israélite*; and Halphon's *Recueil des lois concernant les Israélites.*

F. de Sola Mendes.

Jews, Persecutions of: acts, laws, and ordinances directed against the Jews for the purpose of despoiling them, punishing them for supposed wrongdoings, or of forcing them to abjure their faith.

Causes.—The chief cause of the persecution of the Jews is the anomalous position they have always occupied politically and socially. Forming a distinct branch of the Semitic people—so distinct as to be recognizable on the oldest Egyptian, Assyrian, and Hittite monuments—when in their own home they were never strong enough to stand alone, but had to attach themselves to one of the neighboring powerful states. They vacillated in their adhesion almost from year to year. The geographical position of Palestine distinctly fostered such a course of action. With Egypt to the S., Assyria to the E., and powerful Syrian and Hittite states to the N., Palestine became the fighting-ground for the supremacy of Western Asia. Thus early in their history they became the enemy of all the nations surrounding them, the friend of none, and this fate followed them everywhere. In later times they occupied the same intermediary position between the Ptolemaic empire and Syria, between Rome and Parthia. During the Middle Ages they became the play-ball between popes and emperors, emperors and petty sovereigns, sovereigns and free cities. The fall of Jerusalem and the consequent disruption of the Jewish kingdom added to their anomalous condition. A contradiction arose between their actual condition and their hopes and aspirations which would permit of no solution. With hardly any of the elements which go to make up a nation, with no country of their own, no common language, no one

central authority, they held it their duty to preserve certain religious ideas intact, by living a life apart from their surroundings, by refusing intermarriage, and by cherishing the hope of an ultimate restoration to their former possessions.

The rise of the Christian Church placed the Jews in a still more unfortunate position. Their very existence was a standing protest against the claims of the growing power. Instead of receding before the new dispensation, the Jews were intensified in their adherence to the old by the opposition growing up around them. Though the masses of both religions lived in comparative quiet one with the other, the heads of the Church found it necessary to mark still more clearly the distance which separated the daughter from the mother-church. The Council of Nice (325) definitely fixed the time for the celebration of Easter. Silvestre, Bishop of Rome, Paul of Constantinople, and Eusebius of Cæsarea succeeded in obtaining an edict against the Jews from Constantine the Great. The following Church councils busied themselves with repressing the Jews who stubbornly refused to deny their faith: Elibaris, 303; Toledo, 682; Rome, 1078, 1215 (Lateran); Beziers, 1246; the provincial synod of Vienna, 1267; Salamanca, 1335; Palencia, 1388. The more Europe came under the power of Rome the worse did the situation of the Jews become. In its efforts the Church was largely assisted by renegades who, for pay, were willing to become informers or inventors of false accusations against their former brethren. The common people were not slow to follow the lead of their political and religious heads, especially when their envy at the real or supposed riches of the Jews was excited, and when the property of Jews was declared to be a legitimate object of plunder. Instances are too numerous to mention where the wealth of the Jews was seized by princes and nobles, or where synagogues and houses were destroyed by the populace. Time and again, by special edict, Christians were released from their lawful debts to Jews, and the obligation to pay interest agreed upon.

Historical Sketch.—The persecution of the Jews for their religion's sake began while they were still in Palestine. Upon the death of Alexander the Great his empire was split up, and Judea became the property of the Ptolemaic, then of the Seleucid princes. Ptolemy Philopator (221–204) is mentioned as having caused the death of thousands of Jews; but under Antiochus Epiphanes (176–163) a systematic attempt was made to wean them from their faith. The plan was frustrated owing to the Maccabæan uprising. The Roman procurators, such as Pontius Pilate (26), Crassus (54), and Gessius Florus (64), left bloody traces behind them in Palestine. In their wake followed the Emperors Caligula, Trajan, and Hadrian. With the destruction of the temple the scene of Jewish life was transferred to Europe. In the Middle Ages the history of the Jews is but a series of persecutions. Life was uncertain, property insecure. They had no status in the community, but were bought, sold, or loaned from one power to another. Thus Otto II. (973–993) presented the Jews of Merseberg to the bishop of that place (980). Emperor Henry IV. gave the Jews of Speier to its bishop in fee simple (1088). The laws of Edward the Confessor distinctly state that "Jews and all theirs belong to the king." (See *Jewish Quarterly Review*, iv., 638.) Louis VIII. of France ordered that no king or baron should touch the Jews not belonging to him (1223). Henry III. of England, being in need of money, loaned the Jews in his kingdom for five years to his brother Richard for 5,000 silver marks (1255), and again for £6,000 sterling (1271). In Halberstadt and Ashersleben the Jews become the property of the bishops (1261). In 1337 Ludwig the Bavarian decided against the petition of the Jews of Landau to be relieved of oppression by the bishop, on the ground the "bishop was in the right in enjoying, attacking, and annoying the Jews who were given over to him by the empire." For the same reason the Jews of Frankfort-on-the-Main were called *Hundesjuden* or *Schutzjuden*.

No wonder, then, that the crusades proved so terrible a period for the unfortunate Jews. In the wake of the advancing army there was a mixed multitude bent on nothing but plunder. The Jews, as well as the Saracens, were the enemies of the cross, and it was thought meritorious to deal two blows at the same time. The crusaders wandered through Europe, leaving a trail of Jewish blood behind them. The first crusade (1096–99) caused the loss of thousands of lives in Speier, Metz, Trier, Worms, Mayence, Cologne, Kempern, and Geldern. The second (1147–94) fell heavily upon the French Jews, especially in Carenton, Ramerü, and Sully. The third (1189–92) struck the Jews of York and Norwich in England, Reuss, Speier, and Vienna on the Continent; the fourth (1202–04) those in Veziers in France and Toledo in Spain. When the crusades were at an end, their place was taken by the Inquisition. This tribunal, established in principle by Innocent III. in 1215, but formally constituted by the Council of Toulouse in 1229, and in 1233 given into the hands of the Dominicans, paid special attention to the Jews. Spain in 1483 received its own grand inquisitor, and it was here that the Jews suffered most. Under the grand inquisitor, Torquemada (1483), the *auto-da-fé* claimed thousands of victims in Seville, Cordova, Jaen, Villarea, and Toledo. The attack was directed especially against the Marranos or forced Christians—torture being used where all other means failed.

For the Jews the end of the Middle Ages brought little relief. Persecution lasted well into the nineteenth century. They were driven out from one country after another: from England in 1290, from France in 1182, from Germany in 1388, 1420, 1499, etc. Even in Spain, where, under the dominion of the Semitic Arabs, the Jews had risen to positions of honor and trust, they were driven out in 1492 to the number of 400,000. Portugal followed in 1506. A few countries were more tolerant—Turkey, Poland, and Holland. The French Revolution in 1792 began to usher in a new era for the Jews also. Gradually the shackles fell; the Jews were given the right to live; the walls of the ghetto began to crumble. It was nearly the middle of the nineteenth century before the Jews were able to assert their natural rights as members of the communities in which they lived. Yet, in spite of the Treaty of Berlin (1878), Jewish disabilities still exist in some of the Balkan states; and Russia, since 1882, has returned to the barbarism of the Middle Ages (see below). Since 1880 other parts of Europe have also seen a revival of the old anti-Jewish feeling. An attempt has been made to dignify the movement by calling it anti-Semitism. Through the short-sightedness of certain governments, it is true, economic conditions have at times been produced which have placed the Jews in unfavorable positions. Such has been the case in certain parts of Germany, where many centuries of exclusion from all handicrafts have driven the Jews largely into businesses connected with the loaning of money—in part placing the small landed proprietors and agriculturists in their power. This, combined with the religious hatred which to a large degree still exists, was used by politicians and demagogues for party or personal motives. Starting thus as a political and anti-liberal movement, the seed grew more rapidly than its sowers ever had expected—so much so that the anti-Semitic party has in 1891–93 made itself felt not only in the Reichstag, but in the social and literary life of the people also. From Germany it has been imported into Russia, Austria, Greece, Holland, and France; but the character of the leaders of the movement and the absurdity of the charges made are likely to make its existence short.

Charges Brought against the Jews.—In order the better to kill, plunder, or repress the Jews, charges were manufactured against them of every sort and description. Whatever went wrong was attributed to them, and the very enormity and frequency of the charges—apart from the utter lack of evidence—stamp the greater part of them as false. Thus Ruprecht, Archbishop of Magdeburg, on a trumped-up charge of usury, extorted 60,000 marks from the Jews of that city and 4,000 from those of Halle. In Breslau, 1226, they were charged with arson and driven out; for the same reason in Prague, 1542. In 1010 the Jews of Orleans were tortured, they being suspected of disclosing the plans of the Christians to the sultan. An earthquake shook Rome, 1017, as the cause of which Jews were beheaded. The charge of showing disrespect to the Christian religion was easily made. They are said to have pierced the host in Bielitz, 1243, Deggendorf, 1337, Gross-Glogau, 1442; to have buried a crucifix beneath a dunghill in Naples, 1260; to have mutilated the host in Röttlingen, 1298; to have stolen three hosts in Posen, 1399; to have bought one in Berlin, 1510; to have defamed the Christian religion in Cracow, 1663.

The charges, however, became more serious. The frightful plagues which, in consequence of uncleanly living, devastated whole tracts of Europe were laid at the door of the Jews. In Guienne some plague-stricken people had poisoned the wells; the report gained that Jews had committed the act, and 150,000 francs were taken from the rich Jews of Paris, while the poor ones were driven out. The same charges were made in 1348, but with frightful results. The "black death," from which a third part of the world died,

was attributed to the Jews, who were said to have poisoned the wells. Notwithstanding a Papal bull, declaring them innocent, and a manifesto of Emperor Charles IV., thousands of Jews were hewn down and their property burned or confiscated. In Southern France, Spain, Switzerland, Piedmont, the Rhine Provinces, Swabia, Elsass, and Northern Germany, fifty-six cities are mentioned by name where these horrible scenes were enacted. More disastrous still were the results of the continued charges that the Jews murdered Christians for the sake of their blood. Though the charge had originally been brought against the Christians (see Justin's *Second Apology*, chap. xii.; Tertullian's *Apologeticus*, chap. vii. and ix.), they made it against the Jews at Bray, 1191; Fulda, 1235; Tyrnau, 1494. Wherever the body of a Christian was found the Jews were charged with the murder—at Würzburg, 1147; Boppard, 1179; Speier, 1196. In 1840 a Capucian monk disappeared in Damascus. It was said that the Jews had killed him, for which many in Turkey and Syria suffered. The combined influence of Adolphe Cremieux and Moses Montefiore induced European nations to step in and prevent a wholesale catastrophe. The apogee, however, was reached in the charge that the Jews made use of a Christian child's blood in the preparation of the Passover cakes. Originating, perhaps, in a willful misinterpretation of an old Jewish legend that Pharaoh bathed in the blood of Israelite children—a legend recited at the Passover Eve celebration—this most monstrous charge, though denied by Christian emperors, popes, prelates, and scholars, has been kept alive with the most frightful results. The first case on record is that of William of Norwich, 1144 (*Jewish Quarterly Review*, iv., 630; *Nineteenth Century*, May, 1893); then follow Blois, 1171; Vienna, 1181; Fulda, 1236; Mayence, 1283; Munich, 1285; Diessenhofen, 1401; Cracow, 1407; Austria, 1420; Salamanca, 1456; Sepulveda, 1468; Trient, 1475; Frankfort-on-the-Main, 1504; Bösing, 1529; Lüdenscheid, 1715; Smyrna, 1863; Tisza-Eszlar, 1881; Dohilew, Grodno, 1886; Constantinople, Caiffa, Budapest, Pressburg, 1887; Saloni, Samacoff, Kaschau, Pressburg, 1888; Varna, Kustendji, Aleppo, Pressburg, 1889; Damascus, Beyrout, 1890; Xanten, Philippoli, Yamboli, Smyrna, Budapest, Corfu, 1891; Malta, Posen, Kolin, 1893.

Restrictions of every conceivable description were placed upon the Jews during the Middle Ages. In order to isolate them completely, Christians were forbidden to receive them at table (Cuença, 1050); to bake for them (England, 1270; Worms, 1500); to make contracts with them (1553); to be wet-nurses for them (England, 1270); or to employ them as physicians (Pope Paul IV., 1555; Alby, 1254; Hungary, 1818). Jews were forbidden to show themselves on the street at Easter (Paris, 540); to appear at market (Regensburg, 1320); to enter Christian baths (Vienna, 1277); to bear witness against Christians (England, 1270); to live near churches (Salamanca, 1335); to own land (England, 1270; Valladolid, 1285); and to use German in their synagogues. In cases of law a peculiar kind of oath was prescribed for them, and they were gradually forced to live in ghettos, from which they have emerged only in the nineteenth century. They were to wear peculiar clothes (Lateran Synod, 1215; Vienna, 1277; Pressburg, 1520; Milan, 1521); or to carry a peculiar mark (England, 1272; Avignon, 1326; France, 1363). When disputations failed to convince them of their errors, their books were burned: the Bible at Metz (1199), Frankfort-on-Main (1614); the Talmud at Paris (1242, 1254), Avignon (1322), Medina del Campo (1451), Toulouse (1319), Italy (1553). Sometimes the restriction was a little lighter. Books were confiscated merely, as at Bourges (1320), Aragonia (1395), or were so mutilated by the censor as to be rendered harmless.

Russia.—Jews had settled at an early date in different parts of Russia, but the great influx came when in 1772, 1793, and 1795 certain portions of the old kingdom of Poland were added to the empire. The Jews had found a home in Poland when driven out of other European states, and had lived there in comparative peace; but, as part of Poland, Russia always looked upon them as aliens, and from a religious standpoint as heretics. Had they been permitted to circulate freely in the empire the few millions would soon have been lost in the larger population; but out of her Polish possessions Russia made one huge ghetto, and surrounded the settlement of Jews in other parts with so many difficulties as to make exit therefrom practically impossible. Thus it has come that—to quote figures from a report made to the Pahlen commission in 1885—"in four towns there were over 80 per cent. of Jews; in fourteen from 70 to 80 per cent.; in no less than sixty-eight from 50 to 70 per cent.; in twenty-eight there were from 20 to 40 per cent." This naturally produced an abnormal state of affairs. The so-called anti-Semitism in Germany crossed the border, and words were translated into deeds. The anti-Jewish riots of 1881 were the result. Instead of quieting the people, Gen. Ignatieff, who was at the head of the Ministry of the Interior, used these occurrences as an excuse for promulgating the May laws (May 3, 1882, old style). They created a ghetto within a ghetto—or pale, as it was now called. The Jews were forbidden to settle in any place but towns and hamlets, to acquire land, and to carry on business on Sunday and other Christian holidays. Ignatieff's persecution had a tinge of politics in it, as a number of prominent Nihilists were found to be Jews: but with the advent of M. Pobiedonostzoff as Procurator of the Holy Synod in 1880 a decided religious flavor was added.

The May laws, it is true, were merely temporary; but they might be prolonged indefinitely. Some of the laws are framed in such ambiguous language as to allow a great latitude in their interpretation, and every year this interpretation becomes more rigid and forced. Whole families have been expelled from villages, almost without a moment's notice, in the dead of winter, in the middle of the night. Towns have been called villages for the time being, so as to allow of the expulsion of the Jews. Legislation has been especially hard upon skilled artisans. They had been granted a certain measure of free transit outside the pale by Alexander II. in 1865. They were to be forced back again into the pale by every possible measure. Bakers, butchers, glaziers, and vinegar-makers were declared not to be artisans. Printing was declared to be an "art-craft," not a handicraft, and in the application of the word "skilled" the Russian officials had free scope.

The further enactments in regard to schools and universities fell heavily upon the Jews. In 1888 the percentage of Jewish children allowed in the schools was suddenly limited to 10 per cent. in the pale, 5 per cent. outside, and 3 per cent. in Moscow. This was a great loss for the Jews, especially in towns where they made up from 50 to 80 per cent. of the population. Even in schools founded by Jews the same limitations were introduced. Permission was refused them to found new ones, the splendid gift of $10,000,000 made by Baron de Hirsch for that purpose being rejected. All professions have gradually become completely closed against Jews; they can not enter the civil service or public offices. They can not become advocates, engineers, or army doctors. Until 1893 the gubernia of Poland had been largely exempt from the restrictions; but in that year persecutions broke out there too, and on Jan. 14, 1893, the Minister of the Interior sent instructions to the governors of Livonia, Courland, and Tiflis to expel all the Jews in these districts —about 60,000. Up to 1893 fully 350,000 had been forced to emigrate partly to other European countries, but in the largest numbers to the U. S. and South America, where Baron de Hirsch has endeavored to provide homes and occupations for them.

The laws which oppress the Jews in Russia were promulgated at various times; and, though often contradictory in themselves, still remain upon the statute-book to be applied when occasion demands. A few are here summarized:

(*a*) *Religion.*—If the husband or wife adopt the orthodox faith, they are prohibited from settling outside the pale. If either husband or wife is converted, he or she may have the marriage dissolved with the spouse remaining in the Jewish faith. Jews, on reaching their fourteenth year, may become converts without the permission of parents or guardians. Every convert shall receive 15 to 30 roubles; children half that sum. Synagogues must be situated at least 100 *sajen* from orthodox churches. Jews may not hold services in their houses without special permission. Synagogues can be established only where there are eighty Jewish houses; houses of prayer only where there are thirty.

(*b*) *Taxation.*—Above the ordinary assessments, Jews have to pay the special taxes: 1, The *general* "box tax" on every animal and bird slaughtered according to Jewish rite, and on every piece of such meat sold; 2, the *subsidiary* tax, a percentage on houses, shops, warehouses; on the profits of factories, breweries, and industrial establishments; on capital bequeathed, and on apparel specially worn by Jews and Jewesses; 3, the *candle* tax on Sabbath lights, amounting to 230,000 roubles a year; 4, tax on printing-offices.

(*c*) *Education.*—Jewish children are admitted to schools only in places where the parents have a right of residence.

In 1880 restrictions were put upon the number of Jews entering academies and universities. Since 1885 Jews may not hold university scholarships derived from the public treasury. All the Rabbinical schools have been closed, as also the Jewish state schools for secondary education.

(*d*) *Permanent Residence in the Pale.*—Jews are prohibited from settling anywhere (Poland excepted) outside of the gubernia: Bessarabia, Vilna, Vitebsk, Volhynia, Grodno, Ekaterinoslav, Kovno, Minsk, Mohilev, Podolia, Poltava, Taurida, Cherson, Tshernigov, Kiev. Jews of the first guild only may live in Kiev (but only in two districts); and, for the carrying on of certain trades, in Nicolaico and Sebastopol. Jews may not reside in the western gubernia next to the frontier, nor in Bessarabia within fifty versts of the frontier. Jews in the pale may not take up new residence outside the towns or hamlets, nor may they remove from one settlement to another.

(*e*) *Permanent residence outside the pale* is granted only to merchants of the first guild; those possessing a doctor's diploma; who belong to the reserve; who have passed through higher educational establishments; graduates in pharmacy, dentists, surgeons, and midwives—or those studying these professions. Jews may not enter the military territory of the Don, or enter or settle in Siberia. Jewish exiles in Siberia are prohibited from residence within 100 versts of the Chinese frontier. Jews may not dwell in the Grand Duchy of Finland.

(*f*) *Temporary Residence within the Pale.*—Only temporary residence is permitted Jews in Kiev and Sebastopol, and only in order to take possession of an inheritance, to establish legal claims to property, or for business connected with the Government. Besides, Jews may enter Kiev only for military duty, for business at fairs and markets, purchasing materials, attending educational establishments, etc.

(*g*) *Temporary residence outside the pale* is granted for six weeks solely for taking possession of an inheritance, of establishing legal claims, and for business transactions with the Government. In general, Jewish mechanics, distillers, brewers, master artisans and their journeymen, may reside outside—but only with a passport. Cutters, tailors, artisans, and carmen may reside outside—but only temporarily. Merchants of the first and second guilds may visit the Christmas and summer fairs at Kiev; those of the first the fairs of Nijni Novgorod, Irbit, Charkov, and Summi.

(*h*) *Rights of Property.*—Jews, with very few exceptions, are not permitted to purchase landed estates, nor to attend public auctions of property. Property obtained as inheritance by Jews must be sold within six months. Jews may not be managers of inhabited estates.

(*i*) *Commercial Rights.*—Jewish merchants of the first guild only may trade outside of the pale without restrictions. In Siberia only Jewish criminals and their sons may trade. Jews may not act as commission agents of foreign firms for sending goods to places where Jews may not permanently reside; nor may goods of Jews pass outside the pale. They may not use Hebrew in keeping their books, and are not to do business on Sundays and Christian holidays. Merchants of the first guild may not take with them more than one Jewish employee, and not more than four servants for every family.

(*j*) *Civil Service.*—In the civil service of the army the proportion of Jewish surgeons is limited to 5 per cent. To posts above the fifth class they can not be appointed. In a hospital there may be only one Jewish surgeon.

(*k*) *Representation.*—In the composition of official bodies not more than one-third may be Jews. They are ineligible as mayors, presidents of municipal meetings, presidents of school boards, police councilors, in many governments also as foremen of juries.

(*l*) *Military Service.*—Jews may not be employed to guard a quarantine district; or the frontier; or in the navy; or as *gendarmes* in Warsaw and the Caucasus; nor are they to be attendants upon officers. Jewish privates can not rise higher than non-commissioned officers.

(*m*) *Regulations as to Foreign Jews.*—Those who obtain landed property by inheritance must sell the same within six months. Foreign Jews, not Karaites, may not immigrate into Russia.

Authorities.—In general, besides the histories of Jost, Depping, and Graetz, see Zunz, *Die Synagogale Poesie des Mittelalters* (Berlin, 1855, pp. 9–59); B. E., *Die Leiden und Verfolgungen der Juden . . . in chronologischer Reihenfolge* (Budapest, 1882); Georgios A. Zabitrianos, *Ὁ καταδιωγμὸς τῶν Ἑβραίων ἐν τῇ Ἱστορίᾳ* (1891); *Quellen zur Geschichte der Juden in Deutschland*; ii., *Hebräische Berichte über die Judenverfolgungen während der Kreuzzüge* (Berlin, 1892); Jacobs, *Notes on the Jews of England under the Angevin Kings* in *Jewish Quarterly Review* (iv., 628, *sq.*); Jacobs, *The Jews of Angevin England* (London, 1893). On the anti-Jewish literature in the nineteenth century, see Graetz, *Geschichte* (vol. xi., p. 612). On censors of Jewish books, see A. Berliner, *Censur und Confiscation hebräischer Bücher im Kirchenstaate* (Frankfurt-on-the-Main, 1891); H. Strack, *Einleitung in den Thalmud* (Leipzig, 1887, p. 51). On the blood-accusations, see especially *Christliche Zeugnisse gegen die Blutbeschuldigung der Juden* (Berlin, 1882); *Die Blutbeschuldigung gegen die Juden von Christlicher Seite beurtheilt* (Vienna, 1883); H. Strack, *Der Blutaberglaube bei Christen und Juden* (3d ed., Munich, 1891); Reinach, *L'Accusation du meurtre rituel* (*Rev. des Études Juives*, vol. xxv., p. 161; *Die Juden und das Christenblut*, Leipzig, 1892). For the Russian persecutions, see *The Persecution of the Jews in Russia with Appendix containing a Summary of Special and Restrictive Laws*, issued by the Russo-Jewish Committee (London, 1891); Harold Frederick, *The New Exodus* (New York, 1892); *Letter from the Secretary of the Treasury, transmitting a Report of the Commissioners of Immigration upon the Causes which incite Immigration to the United States* (Washington, 1892); Errera, *Les Juifs Russes* (Brussels, 1893).

Richard Gottheil.

Jeypore: a native state and city of India. See Jaipur.

Jez'ebel [Heb. *Izebel*, liter., chaste]: daughter of Ethbaal, King of Tyre and Sidon, and wife of Ahab, King of Israel. She exercised a great influence upon her husband, leading him into idolatrous worship of Baal, a Phœnician deity, long a formidable rival, especially in the northern kingdom, to the Jehovah-worship established at Jerusalem. Many acts of persecution against the prophets and priests of Jehovah are attributed to Jezebel, and were so successful that at one time there were but 7,000 persons in Israel who had not bowed the knee to Baal. The narrative of this momentous controversy is found at length in 1 Kings. Jezebel was murdered by Jehu about 884 B.C., at the same time as her son, King Jehoram. Her daughter, Athaliah, married Jehoram, King of Judah. Revised by W. J. Beecher.

Jezi'rah [Heb. *Sepher Yetsirah*, book of creation]: one of the two chief cabbalistic works of the Jews. Its date is variously assigned to the first and the eighth or ninth century. It was printed in Hebrew, with five commentaries (Mantua, 1562); with a Latin translation and notes by Rittangelius (Amsterdam, 1642); with a German translation and notes, by J. F. v. Meyer, *Das Buch Jezira, die älteste Kabbalistische Urkunde der Hebräer* (Leipzig, 1830).

Revised by S. M. Jackson.

Jez'reel [from Heb. *Yezre'el*, liter., planted of God]: town in Northern Palestine; in the tribe of Issachar (Josh. xix. 18); the capital of the kingdom of Israel under several reigns (see map of Palestine, ref. 7–D). It comes into particular prominence in connection with Ahab (1 Kings xviii. 45, *passim*). It was on the Plain of Esdraelon (*q. v.*), often called the Plain of Jezreel. On its site is the modern village of Zer'în. S. M. J.

Jezzar: See Djezzar.

Jhansi, jaan'sĕe: a city of Central India, near the Betwa river, 68 miles S. E. of Gwalior, capital of a district of Gwalior state (see map of N. India, ref. 6–E). It is an important manufacturing and commercial city. It was the capital of a Bandela prince who took part in the insurrection against the British in 1857, and when captured it was given to the Mahratta prince of Sindia or Gwalior. It is outside of the province and district in the Northwest Provinces to which it gives its name. Pop. (1891) 52,720. M. W. H.

Jhilam, jee'lăam, or **Jhilum**: a district and town of the Rawal Pindi division of the Punjaub. The district has the Jhilam river for its eastern and southern boundary, and is traversed by the Sall range of mountains. Area, 3,910 sq. miles. Pop. about 650,000. The principal productions are salt, alum, antimony, and the cereals. The principal town is Jhilam, on the right bank of the Jhilam river, 1,608 feet elevation, 93 miles N. W. of Lahore, and on the railway between Lahore and Peshawar, 50 miles S. W. of the latter (see map of N. India, ref. 3–C). Pop. about 6,500.

M. W. H.

Jhi'lam, or **Jhelum** (Sanskr. *Vitasta*, Gr. *Hydaspes*): a large river, the westernmost of the great affluents of the Indus in the Punjaub. It rises in the Vale of Kashmir, and

flows at first N. W.: breaks through the Himalayas in the defile of Baramela, at an elevation of 4,000 or 5,000 feet, then has a generally southward course until it joins the Chinab. Length about 500 miles. M. W. H.

Jhylum: See JHILAM.

Jigger: See CHIGOE.

Jilolo: a large island of remarkable form in the East Indies. See GILOLO.

Jimenez', hĕē'mā-nĕez: a town in Chihuahua, Mexico; railway station; 271 miles S. of El Paso and 125 miles S. E. of Chihuahua city; on an affluent of the Conchos river, and on the margin of the arid region Bolson de Mapimí (see map of Mexico, ref. 3–E). It is the shipping-point for the Parral mining district, 50 miles W. Pop. 8,000. M. W. H.

Jimmu-Tenno, jim'moo-ten'nō (i. e. Jimmu the emperor): a Japanese semi-mythical personage; revered as the founder of the present dynasty. The date of his accession is placed at 660 B. C., and from this are the national records dated. He was fifth in descent from the sun, and originally bore the name of Kamu-Yamato-Ihare-Biko. He is described in the ancient annals known as the *Kojiki* (see Chamberlain's translation in the *Transactions* of the Asiatic Society of Japan, vol. x., supp.) as having moved across the sea-plain eastward in a career of conquest. His settlement in Yamato marked the original unification of the country, and this province is accordingly the center of Japanese national traditions. The national holiday on Feb. 11, selected for such occasions as the promulgation of the constitution, and known as Kigen-Setsu, is devoted to Jimmu's cult. His reign lasted twenty-two years. If he ever existed—and the Chinese annals are silent regarding him—he may have been a chief who came from Korea or the southern isles, and, uniting the various Japanese clans under his rule, drove the aboriginal inhabitants northward. J. M. DIXON.

Jingo-Kogo (i. e. Jingo the empress): a Japanese ruler, who after the death of her husband the Emperor Juai in 201 A. D. governed Japan under the title of regent, on behalf of her son. Her rule is said to have been vigorous. She pacified Southern Japan, where the barbarians (Kumaso) had risen in revolt, opened up relations with China, and exacted tribute from the Kings of Shiraki, Korai, and Kudara, the three chief divisions of ancient Korea. She is said to have personally led an expedition into that country. Deified after death, she is now adored under the name of Kashi Dai-Miōjin. The paper currency of 1884 bears a figure of the empress. She died in the year 269 A. D., and was succeeded by her son Ojin-Tenno. J. M. DIXON.

Jinn [also written djinn; from Arab. *jinn*, plur. of *jinniy*, a kind of demon. Often confused with Lat. *genius* (plur. *genii*), a tutelary spirit]: imaginary beings in whose existence Mussulmans firmly believe. In rank inferior to men, they are far superior in power. They are made of fire, and capable of assuming any form at will. Some are malevolent; others, called *peri* (fairy), benevolent. They are subject to Solomon, and sometimes to the prophet Mohammed. Anything inexplicable, as an ancient ruin, a tornado, an earthquake, is assigned to their agency. Constantly mentioned in *The Arabian Nights*, the word jinn is commonly translated into English by *genius*, to which, however, jinn has only an accidental and not etymological similarity.

EDWIN A. GROSVENOR.

Jinrik'isha [liter., man-power vehicle; a Japanese name compounded of Chinese roots; the native word, and that mostly in use, being *kuruma*]: a light carriage drawn by a human runner, who goes between the shafts. It carries one or two persons, and runs like a gig, on two wheels. Though dating only from the year 1868, or thereabouts, it is now in universal use over the empire; in the capital there is one to every thirty of the population. The rate charged is from two to five cents a mile. See CARRIAGES. J. M. D.

Jirásek, yir'aas-ek, ALOIS: novelist; b. in 1851 at Hronov, near Náchod, Bohemia; at present gymnasial professor at Litomyšl; has covered the entire range of Bohemian history, from the early heathen times (*Nevolnice*) to the present day, in his numerous historical novels. *Maryla*, an idyl, and *Vcizích službách* (In Foreign Service), a Bohemian Anabasis, portray Bohemia of the post-Hussite period; the Hussite wars form the basis of the trilogy *Mezi proudy* (Among the Currents); the sufferings of Bohemian people of the period following the Thirty Years' war are depicted in the *Psohlavci*. The story of the revival of the Bohemian nationality is graphically told in *Sousedé* (The Neighbors), *Na dvoře vévodském* (At a Duke's Court), and *F. L. Věk*, in which Mozart's sojourn at Prague and his welcome by the Bohemians form an interesting episode. Jirásek has also drawn pictures of contemporary life, and his *Povídky zhor* (Tales from the Mountains) present a series of interesting characters. His collected works, now being published by Otto, at Prague, have reached the seventeenth volume (1894). J. J. KRÁL.

Jireček, yir'etch-ek, HERMENEGILD, LL. D.: jurist; brother of Josef Jireček; b. at Vysoké Mýto, Bohemia, Apr. 13, 1827; studied philosophy and law at Prague; in 1854 obtained a position in the office of Minister of Education; became ministerial councilor in 1871, and in 1875–77 instructed the Crown Prince Rudolph in Bohemian, and in recognition of his services received from the emperor the order of the Iron Crown. His first literary efforts were in the line of fiction; in the years 1846 to 1855 the *Květy* and other magazines published a number of his novels and short stories, chiefly depicting country life. *Novely* (Novels) appeared in Vienna in 1853. The study of Slavonic laws, and notably of ancient Bohemian laws, became his life task. His most important works and essays on the history of Bohemian jurisprudence and kindred subjects are: *A Comparison of Ancient Slavonic Law with the Ancient Law of the Greeks and the Germans* (1860); *O starých soudech slovanských v zemi české* (Ancient Slavonic Courts of Justice in Bohemia, 1861); *Slovanské právo v Čechách a na Moravě* (Slavonic Law in Bohemia and Moravia, 1863–73); *Codex juris Bohemici* (A Code of Bohemian Laws, in Latin, 1867, *seq.*, contains the oldest documents); *Všehrd's "Knihy devatery"* (Nine Books of Law, a republication, 1874); *Svod zákonů slovanských* (A Collection of Slavonic Laws, 1880). J. J. KRÁL.

Jireček, JOSEF: author; brother of Hermenegild Jireček; b. at Vysoké Mýto, Hohenmauth, Bohemia, Oct. 9, 1825; studied philosophy and law at the University of Prague (1844–49); then became a journalist. In 1850 he obtained a position with the Minister of Education, at whose request he prepared for the high schools three Bohemian anthologies, *Anthologie z literatury české* (1858, for the middle period, 1859 ancient lit., 1861 modern lit.). Ancient Bohemian literature became his special study, and he wrote numerous essays on the literary history of Bohemia, besides republishing many Bohemian works of the sixteenth and seventeenth centuries. In 1862, with his brother Hermenegild, he ably defended the genuineness of the famous Queen's Court MS. in a German work entitled *Die Echtheit der Königinhofer Handschrift kritisch nachgewiesen*. In 1866–68 he published two volumes of the memoirs of Slavata, a prominent Bohemian nobleman of the seventeenth century. In 1869 Jireček became a ministerial councilor, and in Feb., 1871, was appointed Minister of Education (in the Hohenwart cabinet). In his new office he sought justice and equal rights for all the various nationalities in the Austrian empire; the Germans, however, hated him for his non-partisan zeal, and accordingly on Oct. 30, 1871, he resigned (with the entire cabinet). During all that time he had been literarily active; in 1870 he published a sketch of Old Bohemian (Old Czech) grammar, and contributed many important articles to the *Bohemian Museum Magazine*. In 1874 he removed to Prague, and in the same year was elected deputy to the Land Diet. In Prague, in 1874–75, he published his greatest work, the *Rukověť k dějinám literatury české*, a handbook of the history of Bohemian literature from the earliest times to the end of the eighteenth century. In 1875 Jireček was elected president of the Royal Bohemian Society of Sciences. Of the many old works republished by him the most important are *Koldínova "Práva městská"* (Koldín's Rights of Cities, 1876); *Dalimilova kronika* (Dalimil's Chronicle, 1878); and *Staročeské divadelní hry* (Ancient Bohemian dramas). In 1878 he published a history of ecclesiastical poetry in Bohemia, *Dějiny církevního básnictví českého*, reaching down to the end of the eighteenth century. D. Nov. 25, 1888. J. J. KRÁL.

Jireček, KONSTANTIN JOSEF, Ph. D.: historian; son of Josef Jireček; b. at Vienna, July 24, 1854; studied at Vienna and Prague; traveled in the Southern Slavonic countries, and in 1872 published his first great work, a Bulgarian bibliography, *Bibliographie de la littérature Bulgare moderne, 1806–70* (Vienna and Braila). Then followed his notable history of Bulgaria, *Dějiny národa bulharského* (Prague, 1876), since translated into German and Russian. In 1879 he was called to Bulgaria as general secretary to the Minister of Education; became minister himself in 1881, and in 1882 was ap-

pointed president of the supreme board of education, and through many reforms raised the standard of Bulgarian schools. In 1884 he was appointed Professor of History at the University of Prague in his native land. About a hundred of his essays, historical, ethnological, literary, and biographical, are scattered in Bohemian, Serbian, Bulgarian, French, and German magazines and journals. Most of these will be found in the *Bohemian Museum Magazine* (Prague).
J. J. Král.

Jiron, hē-rōn' (in full, San Juan de Jiron del Rio del Oro): a city of Colombia; in the department of Santander, on the Rio del Oro, 6 miles S. W. of Bucaramanga; 1,847 feet above the sea (see map of South America, ref. 2–C). Pop. 9,000. Founded in 1631 by miners; the gold-washings of the river are still of some importance. Besides gold it exports tobacco, Panama hats, and cattle. H. H. S.

Jitomir, zhi-to-meer': city of Western Russia; capital of the government of Volhynia; lat. 50° 15′ N., lon. 28° 40 E.; on the right bank of the Teteref, an affluence of the Dnieper (see map of Russia, ref. 9–C). It has a large commerce, especially in cereals. It is a center of Jewish influence, and about a third of the population are Jews. Many of the Hebrew books printed in Russia are manufactured here. It is situated on the boundary between extensive wooded and open areas of Southwestern Russia. This boundary is also an ethnographic one between "the people of the woods" and the "people of the steppes." The district of the same name and in the vicinity has many foundries, glass-factories, and other industrial establishments. Pop. of city 57,790.

Jizak: fortified town in Syr-Daria government, Southern Russia in Asia; 115 miles S. W. of Tashkend, on the caravan route from that place to Samarcand; lat. 40° 9′ N., lon. 67 48′ E. (see map of Asia, ref. 4–E). Pop. (1886) 21,800.

Jo'ab [from Heb. *Yōāb*, liter., Jehovah his father]: a son of Zeruiah, the sister of David. He distinguished himself as a warrior under the reign of Saul, and was made commander of the whole Hebrew army by David. He was a valiant, talented, and influential man, but violent and unscrupulous. When David tried to rid himself of him by giving the command to Amasa, Joab plunged his sword into Amasa's heart while embracing him. He took part in the unsuccessful demonstration in favor of Adonijah, and although he fled to the tabernacle for refuge, Solomon seized him and put him to death.

Jo'achim: called The Prophet; religious leader; b. at Celico, near Cosenza, in Italy, about 1154. After being employed at the court of Roger, King of Sicily, and making a pilgrimage to Jerusalem, he became a Cistercian monk, Abbot of Corace in Calabria, and in 1192 founder of the monastery of Fiore Floris near Cosenza, where he died Mar. 20, 1202. He left a reputation as a saint and miracle-worker, and his followers made an unsuccessful attempt to canonize him in 1346. He taught a peculiar mystic doctrine, of which the chief tenet was that prior to Christ was the era of the Father, then came the Christian era, the era of the Son, which would close A. D. 1260, after which the era of the Holy Spirit would begin, and in conjunction therewith a great transformation and purification of the Church. This doctrine was embodied in his treatise called the *Everlasting Gospel*, which was condemned by the Council of the Lateran in 1215, and by that of Arles in 1260. He left many writings, chiefly commentaries, and prophesied the downfall of the papacy. His followers, called Joachimites, were numerous in the thirteenth century, among them was Dante. See Döllinger, *Fables and Prophecies of the Middle Ages* (Eng. trans., New York, pp. 365–392); T. N. Schneider, *Joachim von Floris und die Apokalyptiker der Mittelalters* (Dillingen, 1873). Revised by S. M. Jackson.

Joachim, Joseph: violinist; b. at Kittsee, Hungary, June 28, 1831. He began playing the violin at five years of age, and his childhood and youth were spent in studying under the best masters and playing in concerts. When thirteen years old he played with the London Philharmonic Society. In 1868 he became head of the Berlin Academy of Music, where he has since remained. He has made many concert tours and has composed much for the violin. The University of Cambridge conferred the degree of Mus. Doc. on him in 1877, and he afterward received the honorary degree of D. C. L. from Oxford University. D. E. Hervey.

Joachim de Flore (in Italian *Gioachino da Flora*): mystic; b. at Celico, near Cosenza, Calabria, Italy, about 1132; d. at the convent of San Martino, in the desert of Pietralata, Calabria, Mar. 30, 1202. As his family belonged to the bourgeois nobility, he was destined to an official career, and at the age of fifteen he was given a place in the royal curia of Calabria; but he desired to see the Holy Land, and his father finally permitted him to depart, accompanied by a train of friends and servants. They reached Constantinople in the midst of the plague, and the sight of the awful misery showed him his true vocation. He dismissed his suite and set forward for Jerusalem on foot and without money. After many hardships he reached his destination; and there, after forty days of fasting in a cavern on Mt. Tabor, he had a vision of his prophetic work. Returning to Calabria, he remained some time in concealment; but, at last compelled to reveal himself, he was permitted by his father, who had given him up for dead, to become a lay brother in the Cistercian monastery of Sambucina. Here, after a year of service as mere doorkeeper, he was incited by another vision to begin to preach. His success was amazing, and he seemed destined to be a precursor of St. Francis. The Church, however, compelled him to take orders (1168); and he settled in the abbey of Corazo to study and meditate. In 1178 he was compelled by the prayers of his brethren to become their abbot; but this position was distasteful to him, and he obtained from Pope Lucius III. release from it. He withdrew into the wilderness of Pietralata, where he meditated and labored on his three great works—his *Concordia novi et veteris Testamenti* (printed at Venice in 1519), his *Expositio in Apocalypsin* (*ibid.*, 1527), and his *Psalterium decem chordarum* (*ibid.*, 1527). Successive popes blessed his task; and when from time to time he journeyed through Italy, pointing out the corruptions of the monasteries, he moved men deeply and strangely. About 1196, finding his solitude more and more invaded, he withdrew into the heart of the Calabrian Alps, where on a cold plateau of Mt. Sila (mod. Aspromonte), behind Reggio, he founded the church and monastery of Flora. Here he remained until he perceived the approach of death, when he had himself carried down to San Martino in Pietralata. The Benedictines of all Southern Italy flocked to his bedside to hear his last prophetic words, which were that the old order was coming to an end, and the new order of perfect love and perfect knowledge was fast approaching.

Few men have stirred their contemporaries more deeply than Joachim de Flore. He early acquired the fame of prophetic gifts, and for centuries was invariably known as *Vates*, the prophet. Dante (*Paradiso*, xii., 140) calls him

> Il calavrese abate Gioacchino,
> Di spirito profetico dotato;

and in the churches of Calabria, on his festal day (May 7), the words are still chanted: *Beatus Joachim, spiritu dotatus prophetico, decoratus intelligentia, errore procul hæretico, dixit futura ut præsentia.* Yet few men have introduced the seeds of more profound trouble into the Church. Again and again during the thirteenth and fourteenth centuries her peace was disturbed by unrest and heresy, which were the natural consequences of his teachings. These were, in brief, that the religious life of the world is, according to a right exposition of the Bible, divided into three ages: (1) The age of the flesh, of the literal law, of the patriarchs and kings, extending from Adam to Christ, forty-two generations of thirty years each, or 1260 years all told. (2) The age of human wisdom, of faith, of the priesthood, begun by Hosea and the tribe of Judah, having Jesus Christ as its supreme figure, and extending a similar period of 1260 years after him. (3) The age of complete knowledge, of vision face to face, of contemplation, of freedom from the flesh, of the monks, of the "eternal Gospel," which shall endure forever. These ages somewhat overlap; and, as the second age had begun with the prophet Hosea, so the third really began with St. Benedict; but the complete triumph of the Word and the sole and supreme sway of the eternal Gospel were to come in the fateful year of our Lord 1260. The years preceding this, however, would be years of trouble and preparation; and in the disasters of his time Joachim thought he saw the sure premonitions of the approaching end. In these teachings the revolutionary thing was the rejection in the third period of the Church as an intermediary between man and God. When the Word had triumphed, man should know all truth by contemplation alone. The Church was unnecessary. In the succeeding centuries this was the line followed by all the mystics, all the ardent and revolutionary spirits in the Church. See E. Renan, in *Revue des Deux Mondes* (1866), p. 94, *seq.*; P. Denifle, in *Archiv*

für Litteratur- und Kirchengeschichte des Mittelalters, Bd. i.; Reuter, *Geschichte der religiös. Aufklärung im Mittelalter*, Bd. ii., p. 191, *seq.*; É. Gebhart, *L'Italie mystique* (1890); J. N. Schneider, *Joachim von Floris und die Apokalyptiker des Mittelalters* (1873); H. Haupt, *Zur Geschichte des Joachimismus* (Gotha, 1885). A. R. Marsh.

Joan, Pope: a fabulous personage who was long believed to have occupied the papal chair (853–856) as John VIII., succeeding Leo IV. and preceding Benedict III. The report was that Joan was born in Germany, the daughter of an English priest; falling in love with a monk, she assumed male attire and entered a convent at Fulda, and then went with her paramour to Athens and Rome, where she acquired a high reputation for piety and learning, and was unanimously chosen pope when a vacancy occurred. One day in the street, at the head of a procession, so states the romance, the pope was unexpectedly delivered of a child, soon after which she died. There has been much speculation as to the origin of this fiction, which acquired universal credence in the Middle Ages, owing chiefly to the uncritical compilation of the Dominican Martin Polonus, and in the cathedral of Siena a supposed portrait of Pope Joan was long seen. The fable still occasionally finds a literary defender, but is utterly without historical foundation, the odd myth being no doubt only the shroud of a certain phase of popular resentment against the conduct of some mediæval popes. See Döllinger, *Papstfabeln des Mittelalters* (2d ed. 1890), pp. 1–53. Revised by J. J. Keane.

Joanes, chō-aa'nās, Vicente: called also Juan de Juanes and Vicente Juan Macip; painter; b. in Spain in 1523. He studied in Rome, imitated Raphael, and became the founder of a Spanish-Italian school of painters, whose seat was Valencia. He was deeply religious, and prepared himself, before he began a new picture, by taking the sacrament, and treated exclusively religious subjects. D. at Bocairente in 1579. His most celebrated pictures are in Valencia, as the *Madonna of the Immaculate Conception* in the Jesuits' church, the *Last Supper*, the *Taking down from the Cross*, and four others in the cathedral. The Madrid gallery has a celebrated *Last Supper*.

Revised by Russell Sturgis.

Joan'na I.: Queen of Naples from 1343 to 1382; b. in 1326; a daughter of Charles, Duke of Calabria, and granddaughter of Robert of Anjou. She was married when seven years old to Andrew of Hungary, her second cousin. This marriage was to ally the two branches of the family of Anjou, but the contest between the two branches of the royal family only became fiercer. In 1345 Joanna had her husband strangled, and married Louis of Taranto, but when Louis the Great of Hungary invaded Naples to avenge his murdered brother she fled to Avignon. The pope summoned her to answer to the charge of murder, but she procured her acquittal and the recognition of her second marriage after selling Avignon to the pope for only 80,000 golden florins. She was afterward reinstated in Naples through papal mediation. Louis of Taranto having died in 1362, she married James of Aragon, and on his death Otho of Brunswick, but she remained childless. In the papal schism between Clement VII. and Urban VI. Joanna sided with Clement, and at the instigation of Urban VI. a rebellion took place in Naples. Joanna was seized, imprisoned in Muro, and delivered to the King of Hungary, who immediately had her put to death, 1382.—Her grand-niece, Joanna II., Queen of Naples from 1414 to 1435, b. in 1371, was married first to William of Austria, and after his death to Jacques de Bourbon. She was notorious for her dissolute life, and her government was distracted by the feuds and intrigues between her different favorites. D. 1435.

F. M. Colby.

Joannes: See Marajó.

Joan of Arc [trans. of Fr. *Jeanne d'Arc*, the Eng. Joan being a doublet of Jane; Fr. Jeanne]: the Maid of Orleans; b. at Domrémy, a village in the department of Vosges, France, in 1412, of parents who, though sprung of wealthy and ancient stock, were reduced to the state of serfdom. The youthful Jeanne was distinguished for her simplicity, piety, and industry. Her patriotism was early inflamed by the fact that Domrémy was allied with the Armagnac or French faction, rather than with the Burgundian party of those times. When she was thirteen years old France was overrun by the Anglo-Picard troops of the Duke of Bedford, regent of Henry VI., and by the forces of Burgundy. Jeanne, moved by the distressed state of France, believed that she heard voices from heaven and saw visions of St. Michael, St. Margaret, and St. Catharine, who called her to deliver the country. Three years later (1428) she announced her vision to Baudricourt, Governor of Vaucouleurs, and in 1429 gained an audience with the dauphin, who in April gave her command of the French troops, the army being now fully inspired with belief in her heavenly mission. She assumed male attire, a sword, and a white banner, threw herself boldly into Orleans, of which she quickly raised the siege; defeated the English at Meun, Jargeau, Beaugency, and Patay; caused the dauphin to be crowned at Reims in less than three months after she took the field. She now demanded to be released from further service, the heavenly voices having ceased to be heard, and a dread foreboding taking their place, but the king would not consent. In the subsequent attack on Paris she was badly wounded, and soon after she and her family were ennobled. On May 23, 1430, after having taken part in many successful combats, she was captured by the Burgundians while heading a sortie from Compiègne, and was sold to the English (who feared her as a witch) for 16,000 francs. After a year's imprisonment she was brought for trial as a sorceress and heretic before the tribunal of the Bishop of Beauvais. The University of Paris having pronounced against her, she was found guilty and was condemned to be burned at the stake. She consented to a formal abjuration of heresy and for a time her life was spared, but, falling soon afterward under suspicion of renewing her errors, she was burned in the market-place of Rouen with every circumstance of indignity and cruelty, May 30, 1431. In 1894 she was beatified by Leo XIII. The question of the authenticity of various points in this account, especially the story of her death, has been the subject of numerous works. Some of the most noteworthy authorities are the *Procès de condamnation et de réhabilitation de Jeanne d'Arc* (5 vols., 1841–49), edited by J. Quicherat; *Doute Historique* (1855); Wallon's *Jeanne d'Arc* (1867); Marin's *Jeanne d'Arc Stratégiste* (1889).

Revised by C. K. Adams.

Jo'ash, or **Jeho'ash** [Heb. *Yoash*, or *Yeho'ash*, liter., given by Jehovah]: the name of two kings. I. A King of Judah, son of Ahaziah by Libnah, of Beersheba; b. about B. C. 884. His father having died in his infancy, all his brothers were massacred by his grandmother Athaliah, who usurped the throne, but Joash was secretly saved by his aunt, the wife of the high priest Jehoiada. She brought him up within the temple until his eighth year, when a successful revolution was made, Athaliah was killed, and the young prince, the last scion of the house of David, was placed on the throne. During the minority of Joash, and for many years thereafter, his government is approved by the biblical writer, but at length he fell into idolatry, when his kingdom was ravaged by Hazael of Damascus, and he was besieged in Jerusalem, giving up the treasures of the temple to the enemy. He was murdered in his bed by his servants about B. C. 837, after a reign of forty years.—II. A King of Israel, son and successor of Jehoahaz, and grandson of Jehu; became king about B. C. 838, successfully resisted the Syrians, and defeated Amaziah, King of Judah. Joash is esteemed one of the best of the kings of Israel. D. about B. C. 823.

Job [from Heb. *'Iyob* = Arab.; liter., persecuted], **The Book of**: one of the books of the Old Testament, narrating the story of Job, a wealthy Arabian sheik or patriarch who dwelt in the land of Uz, and was a man of benevolent, devout, and blameless life. At an advanced age he is visited with loss of estate, of family, and of health; his wife breaks down under the load of trials, but he remains true to God, and endures all without a sinful word of complaint, to the discomfiture of Satan, his tempter and accuser. At last his faithfulness receives an ample reward. The doctrine of retribution held a prominent place in the Jewish theology. As a popular dogma it amounted to this—that God balances men's sins by adversity in this life with a perfect and inexorable justice. Thus affliction and adversity came to be regarded as the indices of sin. Nothing less than this dogma is at stake in the poem—or drama, as we may well call it, from the intensity of the interests and feelings involved. Job's wife represents the evil spirit of rebellion against God. His friends represent the various shades of the popular dogma. They insist that his adversity is proof of sin, either specifically or in general, and blandly exhort him to humility and submission. Against them he defends his integrity, and it seems to be rather vexation at their

platitudes than the actual effect of Satan's machinations which drives Job from his patience and leads him to fail, so far as he does fail, under the test. Finally, this vexation passes away. He turns to God in unaffected humility, which he is able to reach without doing violence to his consciousness of his own integrity, but out of his spontaneous and loving trust in God. Then he wins a new revelation of God, such as he had never had before. He sees that man can not pretend to fathom or compass or follow the plan and purpose of God. Man's mind would fail if God should make known to him even a part of the many things which must be taken into account in the divine plan. He can not know God's purpose in sending adversity on this man or on that; and, in short, nothing can be more absurd or impious than for man to frame little dogmas by which to pretend to interpret the dispensations of Providence.

This poem is a wonderful specimen of literary art. The characters sustain the parts allotted to them perfectly. The time assigned to the incident is that of Moses and Joshua, and the "historic sense" is admirably displayed. Probably an historical fact lay at the basis, but the writer has used it so independently that it has disappeared. The language is peculiar, and presents numerous difficulties, and the thought is so subtle as to tax the utmost skill of the interpreter. It was assigned to a very early date, but most critics now bring it down as far as Solomon's time.

The translation in the Authorized Version is confessedly obscure in many places; that in the Revised Version is much better. There are numerous commentaries on the book; the latest in English are by Samuel Cox (London and New York, 1880; 2d ed. 1885); G. H. B. Wright (London, 1883; 2d ed. 1885); A. B. Davidson (Cambridge, 1884); G. G. Bradley (London, 1887; 2d ed. 1888); Joseph Parker (1890); G. H. Gilbert (Chicago, Ill., 1890); J. F. Genung (Boston, 1891); A. Walls (New York, 1891); R. A. Watson (London and New York, 1892); Rawlinson, Johnson and Adeney (in *Pulpit Commentary*, 1892). Of these, Cox, Davidson, Genung, and Watson are specially recommended.

Revised by S. M. Jackson.

Job's Tears: popular name of *Coix lacryma*, a grass, a native of India, where it often grows to the height of 8 feet. It resembles maize. Its name is derived from its seeds, or rather indurated husks, which are bony, shining, bluish-white globules. In India the seeds are used as an article of food, but outside of India they are used only as ornaments, made into bracelets and necklaces, or as beads for rosaries. It is occasionally cultivated in the U. S. as an ornamental grass. Revised by L. H. Bailey.

Jochmus, Jacob August, Baron de Catignola: general; b. at Hamburg, Germany, in 1808; was led to enter the Greek army, took part in the capture of Missolonghi, and was made a captain in 1828. Afterward he fought in Spain against the Carlists, and was made a brigadier-general by Espartero in 1837. In 1839–40 he led the British divisions in the Syrian campaign, and from May to Dec., 1849, he acted as Minister of Foreign Affairs in the administration of Archduke John. In 1859 he was made lieutenant field-marshal, and in 1866 field-marshal, in the Austrian army. D. at Hamburg, Sept. 14, 1887.

Jodelle, Étienne, Seigneur de Lymodin: dramatic poet; b. in Paris in 1532. A man of brilliant parts and many accomplishments, painter, sculptor, engraver, and architect as well as writer, he was one of the enthusiastic group of devotees of classical literature called the *Pléiade* that followed the leadership of Ronsard. It was his distinction to be the first to answer the demands of his party that the Latin dramas produced by the schools and the translations of classical works that had begun to appear should be followed up by the composition of original French plays after the classical model. *Cléopâtre captive*, with which he won in 1552 the admiration of the public of letters and the favor of the king, was hailed as the inaugurator of a new era for the drama, and is regarded as the first French tragedy. It abandoned completely the native tradition of the mediæval theater, and drew its rules from the drama of antiquity, particularly the tragedies of Seneca. At the same time he produced a comedy, *Eugène*, in which, in spite of his classical principles, the tradition of the native farce is not wholly lost. A second tragedy, *Didon se sacrifiant*, was produced in 1558. The same year he lost the royal favor, and led thereafter a dissolute life, wrecking his talents and soon his life in excesses. D. in Paris in July, 1573. We have from him, besides the three dramas, some poems both in French and Latin. The best edition of his works is that of Marty-Laveaux (2 vols., Paris, 1868–70). A. G. Canfield.

Jodhpur: capital of the native state of Marwar, Rajputana, India; 110 miles W. S. W. of Ajmir; on an affluent of the Loni, a tributary of the Rann of Katch; beautifully situated at the base of a high rock and on the edge of a wooded plain, sloping toward the Loni (see map of N. India, ref. 6–C). The palace of the Maharajah is very fine, and is dominated by the citadel on the rock above. The town is surrounded by walls, and numerous lakes and ponds are interspersed with flourishing gardens and fields. The sacred city of Mahamandil is properly a suburb of Jodhpur, though it has a distinct government. It contains a superb Brahmanic temple, and is governed by the pontiff of the state. At 5 miles N. are found the interesting ruins of Mandor, an ancient capital, abandoned in 1459 for the present site. Jodhpur is an important commercial center, and its banks are well known over Western India. Pop. (1891) 61,849.

Mark W. Harrington.

Jodhpur: a later name of the Rajputana state of Marwar (*q. v.*).

Jodl, Friedrich, Ph. D.: Professor of Philosophy in the German University of Prague, Austria; b. in Munich, Bavaria, Aug. 23, 1849; was lecturer on Universal History in the Kriegs-Akademie in Munich 1873–80; privat docent in Munich 1880–85, when he became professor in the university at Prague. His principal works are *Leben und Philosophie David Humes* (1873); *Die Culturgeschichtschreibung ihre Entwicklung u. ihr Problem* (1878); *Volkswirtschaftslehre und Ethik* (1885); *Geschichte der Ethik in der neueren Philosophie* (I. Bd., 1882; II. Bd., 1889); *Religion, Moral und Schule* (1892); *Lehrbuch der Psychologie* (1893).

J. Mark Baldwin.

Jo'el [= Heb. *Yoēl*, liter., Jehovah his God]: one of the Hebrew minor prophets, of whom nothing is known, except from the book that bears his name. The book is a single prophecy. The situation it contemplates is marked by a threefold calamity: an invasion of locusts, a drouth, and an invasion of enemies. In view of this, the prophet discourses concerning "the day of Jehovah," calls the people to fasting and repentance, and promises deliverance and the outpouring of Jehovah's Spirit. A majority of scholars regard this as the earliest of the books of the major and minor prophets, while some regard it as one of the latest. Its contents fit the situation when Hazael invaded Judah, just before the death of King Jehoash (about 840 B.C., Ussher). Willis J. Beecher.

Jogues, *zhōg*, Isaac: missionary; b. at Orleans, France, Jan. 10, 1607; became a Jesuit at Rouen in 1624, and went to Canada as a missionary in 1636. After preaching to the Hurons, he founded in 1642 a mission among the Chippewas in Michigan. On a journey to Quebec he was captured by the Mohawks and made a slave, but escaped to the Dutch at Albany, and went to France, whence he soon returned to Canada. In May, 1646, he concluded a treaty between the French and the Mohawks, remained among them as a missionary, and was put to death by them as a sorcerer at Caughnawaga Oct. 18 of the same year. His *Letters* were published in the New York Historical Society's Collection, and his description of the New Netherlands was reprinted in New York in 1862, with a memoir by John G. Shea. See his *Life*, by Rev. Felix Martin, S. J. (Paris, 1873).

Johann: See John (Johann Nepomuk Maria Joseph).

Johanna: See Comoro Isles.

Johan'nesburg: the largest town in the Transvaal, and the mining center of the Witwatersrand (*q. v.*) gold-fields; 35 miles S. of Pretoria, and nearly 1,000 miles by rail from Cape Town. It is also connected by rail with Natal, Pretoria, and Delagoa Bay (see map of Africa, ref. 9–F). The city contains many fine buildings, including a stock exchange, churches, banks, theaters, clubs, etc. Pop. (1896) 103,074 (one-half whites).

Joannes Scotus: See Erigena.

Johannot, *zhō'ăă-nō'*, Charles Henri Alfred: engraver; b. at Offenbach, Hesse-Darmstadt, Germany, Mar. 21, 1800; removed in 1806 to Paris, where he received his education. He attracted great attention in 1824 by his engravings after Scheffer and Gerard; in 1827 by his illustrations of Walter Scott, Cooper, and Byron; and later by his pictures, of which the two most celebrated, *Mademoiselle de Montpensier* (1833) and *The Battle of Brattelen* (1837), are at Versailles. D. at Paris, Dec. 7, 1837.

Johannot, Tony: painter and book-illustrator; b. at Offenbach, in Hesse-Darmstadt, Nov. 9, 1803. When about thirty years old his remarkable designs in illustration of Molière's works, the *Diable Boiteux* of Le Sage, and *Don Quixote*, called attention to his powers. Following, in 1838, were many designs for a splendid edition of Bernardin de Saint-Pierre's stories, *Paul et Virginie* and *La Chaumière Indienne*; in 1846 came the illustrations to the *Confessions* of J. J. Rousseau and the *Contes* (short stories) of Charles Nodier. In 1843 had appeared a number of the most extraordinary designs of monsters and wild visions, all of truly imaginative character, in the *Voyage où il vous plaira* of Alfred de Musset and P. J. Stahl. Indeed the first illustrated edition of this book has Johannot's name first on the title-page, as in assertion of his claim to have remade the book. Most of the illustrations are in wood-engraving; perhaps his most important series of etched designs is that of Goethe's novel *Werther*. He appears, therefore, as one of the originators of modern book-illustration, but his paintings are of less value. Two or three battle-pieces are in the Museum of Versailles. D. in Paris, 1852.

Russell Sturgis.

Johansson, yō'hăăn-sŭn, Karl Ferdinand, Ph. D.: philologist; b. at Misterhutt, Småland, Sweden, Sept. 9, 1860; was educated at the University of Upsala; became docent in Sanskrit and Comparative Philology at the same university; is author of *De derivatis verbis contractis linguæ græcæ quæstiones* (1886); *Några ord om dialekter, speciellt de grekiska* (1888); *Beiträge zur griechischen Sprachkunde* (1890); of various articles in *Bezzenbergers Beiträge*, vols. xiii.–xvi. and xviii., in *Kuhns Zeitschrift*, vols. xxx. and xxxii., in the *Indogerm. Forschungen*, vol. ii., in the *Nordisk Tidskrift for Filologi*, vol. viii.; also of an article, *Några ord om de latinska verbalbildningarne med n i preseus stammen* in the *Akademiske Afhandlinger til Professor Dr. Sophus Bugge*; a review of Schmidt's *Pluralbildungen* in the *Göttingische gelehrte Anzeigen* (1890); an article, *Der Dialekt der sogenannten Shâhbâzgarhi* in the *Actes du huitième congrès international des orientalistes en 1889 à Stockholm et à Christiania*, and various other papers. His writings show a wide acquaintance with grammatical phenomena, and a marvelous readiness of combination, but have thus far proved richer in suggestion than in clearly established results. Benj. Ide Wheeler.

John: the name of twenty-three popes. John I., a Tuscan, chosen pope Aug. 13, 523, and in 525 compelled by Theodoric the Ostrogoth to visit Constantinople and intercede for the Arians. On his return he was imprisoned, and died at Ravenna May 18, 526. He was afterward canonized. —John II., a Roman, was chosen pope by simoniacal means Dec. 31, 532, and was acknowledged by Justinian as the head of the Church. D. in Rome, May 27, 535.—John III., a Roman, pope from July 14, 560, till his death in Rome, July 12, 573.—John IV., a Dalmatian, became pope Dec. 25, 640, was distinguished for zeal and doctrinal strictness, and died in Rome, Oct. 11, 642.—John V., a Syrian, became pope July 24, 685. D. in Rome, Aug. 2, 686.—John VI., a Greek, became pope Oct. 20, 701, and died in Rome Jan. 9, 705.—John VII., a Greek, became pope Mar. 1, 705, died in Rome Oct. 17, 707. —John VIII., a Roman, became pope Dec. 14, 872, was zealous for the papal primacy and the extension of the temporal authority of the holy see. His reign was vexed by the incursions of the Saracens into Italy. He was murdered in Rome Dec. 15, 882.—John IX., b. at Tibur, became a Benedictine, was chosen pope June, 898, and strove for the reform of many abuses. D. May, 900.—John X., Bishop of Bologna and Archbishop of Ravenna, became pope Mar., 914, and was an able prelate, though reputed a man of impure life. He led in person the armies which routed the Saracens and expelled them from Italy, but was imprisoned by the infamous Marosia, and died July, 929.—John XI., natural son of Marosia, probably by Pope Sergius III., was made pope Mar., 931, by his mother, and is supposed to have died by poison in Jan., 936.—John XII., son of Alberic and grandson of Marosia, became pope Dec. 16, 955, when sixteen years old. His name was Octavian, and he is regarded as the first pope to assume a new name on consecration. He was a man of extreme licentiousness, and was condemned by a council called by Otho I. at Rome for murder, incest, sacrilege, idolatry, and witchcraft. D. in Rome, May 14, 964. The most important event of his reign was his coronation of Otho I., regarded as the first German emperor.—John XIII., a Roman Bishop of Narni, became pope Oct. 1, 965, and after a disturbed pontificate died in Rome Sept. 6, 972.—John XIV. (*Peter*, Bishop of Pavia), a native of Pavia, was arch-chancellor to Otho II., who made him pope in Nov., 983, in place of Boniface VII., who returned soon after, and John died in prison, probably of starvation, Aug. 20, 984.—John XV. became pope in Aug., 985, and was chiefly remarkable for avarice and nepotism. D. in Rome, Apr., 996.—John XVI. (*Philagathus*), a Greek, and Bishop of Piacenza, became pope in 997 in opposition to Gregory V., by whom he is thought to have been put to death.—John XVII. (*Sicco*), b. at *Ripa Jani*, in the March of Ancona, of noble family; became pope June 13, 1003, died in Rome Dec. 7, 1003.—John XVIII. (*Phasianus*), became pope Dec. 25, 1003, and abandoned the papal chair for a monk's cell in May, 1009.—John XIX., a son of the Count of Tuscany, succeeded his brother, Benedict VIII., having obtained the election by force and bribes, in June, 1024; was chiefly remarkable for avarice. D. Jan., 1033. —John XX., usually omitted from the list of popes, was a rival of Gregory VI., Benedict IX., and Sylvester III. There were at one time (1045) three reigning popes at Rome, who divided the revenues and expended them in excesses.—John XXI. (*Pedro*), b. at Lisbon, studied at Paris, and won great respect by his learning. He became cardinal-priest, Archbishop of Braga, and first physician to Gregory X.; became pope Sept. 8, 1276. D. at Viterbo, May 20, 1277.—John XXII. (*Jacques d'Euse*), b. at Cahors about 1244, became in 1300 Bishop of Fréjus, Archbishop of Avignon 1310, in 1312 cardinal-bishop, and Aug. 7, 1316, pope at Avignon, and there died Dec. 4, 1334. He was learned in the canon law, and was remarkable for avarice.—John XXIII. (*Balthazar Cossa*), b. at Naples, became cardinal in 1402, and succeeded Alexander V. May 17, 1410; convoked the Council of Constance 1413; was deposed in 1415, and died in Florence Dec. 22, 1419. Revised by S. M. Jackson.

John: King of England; surnamed Lackland (*Sans Terre*), either as a younger and portionless son, or on account of his loss of a large part of his French possessions in 1203; b. at Oxford, Dec. 24, 1166, the son of Henry II. During the reign of his brother, Richard Lionheart, who made him feudal lord of almost one-third of England, he was guilty of ingratitude, if not of treason. Nevertheless, Richard appointed him his successor, ignoring the claims of his nephew Arthur. John became king in 1199, and an expensive war with Arthur and Philip Augustus of France ensued, in which John lost a large part of his French territories. The tale of the king's cruelties to Arthur has been called in question. Soon after followed the controversy with Innocent III. concerning the appointment to the vacant see of Canterbury. The pope excommunicated and deposed John, laid an interdict on England, and let loose the armies of France upon the king. John, not sustained by his own people, was compelled to yield and become the vassal of the pope, greatly to the indignation of the English. In consequence of this ill-feeling, a rising of his barons compelled him (1215) to sign Magna Charta (*q. v.*); but he repudiated that charter and made head against the barons. During the war he died at Newark Oct. 19, 1216. Revised by C. K. Adams.

John II.: King of France; surnamed The Good; b. about 1319; was son of Philip VI., the founder of the Valois line; and was crowned at Reims in 1350. The chief event of his reign was the war with England, in which he was defeated and taken prisoner by the Black Prince at Poitiers, Sept. 19, 1356. His captivity in Bordeaux and London (1356–60) was brought to an end by the humiliating peace of Brétigny (May, 1360), which surrendered several provinces to the English, in addition to a ransom of 3,000,000 crowns. His son, the Duke of Anjou, was left in London as a hostage for the fulfillment of the treaty, but it was rejected by the States General. The prince having escaped in violation of his parole, John returned to London as a prisoner early in 1364, and died there Apr. 8 of the same year.

John (Joao or Joam): the name of six Kings of Portugal, of whom the following are the most noted: John I. The Great, b. at Lisbon, Apr., 1357; was a natural son of Peter I., and brother of Ferdinand, at whose death, in 1383, he became regent and seized upon the throne, in violation of the rights of the infanta Beatrice, married to John I. of Castile. The war which ensued was decided by the victory of Aljubarotta (Aug. 14, 1385), in favor of the former. He made an expedition into Africa, and took Ceuta (1415) from the Moors. Through his efforts and those of his son, Prince Henry, the islands of Madeira, Cape Verde, the Canaries, and Azores were discovered, and the coasts of Africa ex-

plored as far as the Gulf of Guinea. D. in 1433.—John II., The Perfect, b. at Lisbon in 1455; married Leonora of Lancaster in 1471; took part in an African campaign the same year; was conspicuous for bravery at the battle of Toro (1476); succeeded his father, Alfonso V., in 1481; put to death the Duke of Braganza and his own brother-in-law, the Duke of Viseo, for conspiracy (1483–84). Under his auspices a series of great navigators explored the coasts of Africa, and Bartolomeu Diaz discovered the Cape of Good Hope. He was unwise enough to refuse the services of Columbus, but after the discovery of America he sent a fleet thither (1493). The conflicting claims of the crowns of Portugal and Castile were decided by Pope Alexander VI. (1493) by establishing the famous meridian line. D. 1495.—John IV., b. at Villaviciosa in 1604; was Duke of Braganza, and by a successful revolution overthrew the Spanish usurpation in Portugal (1640), which had lasted sixty years, placing himself on the throne. His entire reign was passed in hostilities with Spain. D. in Lisbon in 1656.—John VI., b. at Lisbon, May 13, 1767; married Charlotte (Carlota), Infanta of Spain, 1785; was named Prince of Brazil 1788; governed the kingdom in consequence of his mother's illness 1792; assumed the title of regent 1799, and, after a series of wars with Spain and France, removed with his court to Brazil in Nov., 1807, on the approach of the French army of occupation; protested against the acts of the French; formed an alliance with England, and was a party to the treaty of Paris 1814. He became king at his mother's death, Mar. 16, 1816; returned to Portugal 1821; modified the constitution 1823, but his son, Don Miguel, supported by the Absolutists, revolted against the Government. The Liberals prevailed, and Don Miguel was banished. John recognized the independence of Brazil 1825, and died at Lisbon, Mar. 10, 1826.

John (Johann Baptist Joseph Fabian Sebastian): Archduke of Austria; b. at Florence, Italy, Jan. 20, 1782; son of Leopold II. and Maria Louisa of Spain. When he was very young he was generally believed by his family to be possessed of great military talents, and he consequently commanded the Austrian armies in 1800, 1803, 1805, and 1809; but he was generally unsuccessful, and when at the battle of Wagram he failed, for reasons not well understood, to bring his brother, the commander-in-chief, the proper support, he was severely blamed. In 1848 he was generally believed by the people to be possessed of great political virtues. He was chosen *Reichsverweser* by the Parliament of Frankfort. He was a most obstinate defender of the interests of the house of Austria, and, as these did not always coincide with the interests of the German people, he resigned Dec. 20, 1849. D. in Gratz, May 11, 1859.

John (Johann Nepomuk Maria Joseph): King of Saxony; b. at Dresden, Dec. 12, 1801. He was a highly educated man, whose inclinations turned toward literary and scientific occupations, but who, nevertheless, devoted himself with conscientiousness to his royal duties. He lacked, however, the graver qualities of a ruler, and never became very popular. His youth was wholly devoted to art and science, especially to the study of Italian language and literature; from 1839–49 he published at Leipzig, under the pseudonym of *Philalethes*, a translation of Dante, with critical and historical notes. His elder brother having become co-regent in 1830, Prince Johann took part very actively in public life as a member of the privy council, as president of the council of finances in the diet, in military matters, and acquired thorough knowledge of all branches of the administration. At the death of his brother he became King of Saxony, Aug. 11, 1854. He was active and successful in measures referring to the internal development of his country, especially in the introduction of trade freedom, in the extension of railway lines, and in the conclusion of commercial treaties between Germany and other countries; but in the great political questions he was unfortunate. Probably ruled by ecclesiastical and Roman Catholic influences, he showed himself an unconditional adherent of Austria, and an adversary of the Protestant and progressive Prussia. This tendency had already become apparent during the complications with Denmark concerning Schleswig-Holstein, and at a later period his stubbornness all but cost him his throne. The war of 1866 between Austria and Prussia was brought about, at least to some extent, by King Johann and his minister, Beust. The idea was that by a decisive participation in the humiliation of Prussia, Saxony should further the Roman Catholic Church and extend its own circumscribed sphere of power; but after the defeat of the Austrian-Saxon army the sovereignty of King Johann was saved only by the intervention of Napoleon III. Nevertheless, having concluded peace with Prussia and returned to his country, he was perfectly loyal, and showed himself capable of sacrificing his personal feelings to his political insight. In the difficult time of the war with France, Saxony acted as a true and reliable member of the North German Confederation. King Johann in 1822 married Amalia, a daughter of King Maximilian of Bavaria, who bore him three children. D. at Pillnitz, Oct. 29, 1873. Revised by C. K. Adams.

John I. (in Span. Juan): King of Aragon; b. Dec. 27, 1350; married in 1384 Yolande, daughter of the Duke of Bar, granddaughter of John II. the Good of France; succeeded to the throne on the death of his father, Peter IV., in 1387; imprisoned Sibylle, his wife's mother, on the charge of having poisoned the late king, and confiscated her property; recognized Clement VII. as pope at Avignon, and devoted himself to literature and pleasure, leaving the cares of state to his queen. He sent a formal deputation to France to enlist the most famous troubadours, with whose aid he founded at Barcelona an academy of poetry on the model of the Floral Games of Toulouse, much to the disgust of the rude Aragonese. He repelled the invasion of the Count of Armagnac, a pretender to the throne in 1390, and reconquered the island of Sardinia in 1392. D. May 19, 1395.

John II.: King of Aragon and Navarre; b. June 29, 1397; was son of Ferdinand the Just; married in 1419 Blanche, daughter of Charles III. of Navarre, and succeeded to the throne of that kingdom in right of his queen, Sept., 1425; took an active part in intrigues at the court of Castile against Alvaro de Luna; in 1428 aided his brother, Alfonso V. of Aragon, in a war against Castile, and accompanied him in an expedition against Naples, in which both kings were taken prisoners by the Milanese in the celebrated naval battle of Ponza, near Gaeta, Aug. 5, 1434. Released shortly after, he administered the government of Aragon for many years in his brother's absence, and renewed his attempts to obtain supreme influence in Castile. The death of Queen Blanche in 1441 was followed by a period of internal war, in consequence of the rebellion of Prince Carlos, who claimed the throne of Navarre. John succeeded to the throne of Aragon in 1458; declared Sicily and Sardinia annexed to Aragon, and soon had new troubles with his son, whom he unwillingly recognized as heir, but afterward threw into prison (1460), and whose sudden death (1461), attributed to poison, was the pretext for a formidable revolt in Catalonia, lasting eleven years. He made war in Roussillon against Louis XI. of France in 1473, and died at Barcelona, Jan. 19, 1479. He was succeeded by his son Ferdinand, known as *The Catholic*. See Prescott's *Ferdinand and Isabella*.
Revised by C. K. Adams.

John II. (Casimir): King of Poland from 1648–68; b. Mar. 21, 1609; was the second son of Sigismund III. After a somewhat adventurous life he entered, in 1640, the order of the Jesuits, and was made a cardinal soon after. Nevertheless, he succeeded to the throne on the death of his stepbrother, Ladislas (Nov. 20, 1648), and married the latter's widow, Maria Gonzaga. His reign was unfortunate. To the Elector of Brandenburg he abandoned all seignorial rights in East Prussia, to Sweden he lost Esthonia and Livonia, and to Russia, by the Peace of Andrussov (Jan. 14, 1667), White and Red Russia. His government was distracted by the feuds and intrigues of the nobles; and, unable to master the situation, he abdicated in Sept., 1668, went to France, and lived in retirement. D. at Nevers, Dec. 16, 1672.
Revised by C. K. Adams.

John Frederick, The Magnanimous: Elector of Saxony; b. at Torgau, June 30, 1503. He was son of John the Constant, on whose death, in 1532, he became administrator in the joint name of himself and his younger brother, John Ernest; gave official sanction to the Reformation throughout his states 1533; was recognized as elector by the emperor at Vienna in 1535, and in 1546 headed the armies of the Schmalkaldic League in the contest with Charles V., by whom he was put under the ban of the empire in 1547, and defeated at Mühlberg, Apr. 24 of the same year, being taken prisoner and condemned to death, but was spared on condition of renouncing his claims to the electorate. He was liberated in 1552 upon the renewal of the war under the leadership of his cousin, Maurice of Saxony, who had formerly been his rival for the electoral domains. John Frederick succeeded to the full title by the death of his brother, John Ernest, in 1553, and died at Weimar, Mar. 3, 1554.

John George I.: Elector of Saxony; b. Mar. 5, 1585; succeeded his brother, Christian II., in 1611; supported the Emperor Ferdinand against the Bohemians in 1620, at the outset of the Thirty Years' war; formed an alliance with Gustavus Adolphus, King of Sweden, 1631; contributed to the victory of Leipzig, and took Prague (Nov. 11), but lost it, with all Bohemia, to Wallenstein in 1632; made peace with the emperor at Prague, May 30, 1635, and declared war against Sweden; was defeated by the Swedes at Domnitz and at Witstock 1636; aided the imperialists against France in the battle of Dutlingen 1643. D. Oct. 8, 1656.

John of Austria: generally known under the name of Don Juan de Austria; was a son of Charles V. and the beautiful Barbara Blomberg, a daughter of a wealthy citizen of Ratisbon, where he was born, Feb. 24, 1545 (according to some accounts, two years later). He was taken to Spain soon after his birth, and his parentage was kept a secret for many years. He received an excellent education, however, in the house of the imperial steward, Don Luis Mendez Quixada, and after the death of Charles V., in 1559, Philip II. publicly acknowledged him as his brother, and established a princely household for him, first in Valladolid and then in Madrid. He was gifted with great talents, both as a general and as a statesman. In 1568 he led with great success an expedition against the African pirates. In 1569 and 1570 he subdued the Moorish rebellion in Granada, and gave striking proofs not only of personal valor, but also of tactical skill. In 1571 he commanded the magnificent Spanish-Italian armament against the Turks, and routed their fleet completely in the battle of Lepanto, Oct. 7, 1571, the greatest naval battle of the century. In 1573 he conquered Tunis, and in 1576 he was made vice-regent in the Netherlands. Here he did not succeed in managing the Prince of Orange, William the Silent. He was foiled by him in his political measures, but in an open rupture the forces of Don John triumphed at Gembloux, Jan. 31, 1578. His half-brother, Philip II., loved him, but was too despotic and too suspicious to allow him an independent career. His earlier plans of founding a kingdom in Greece or in Tunis were sensible, but were opposed by Philip. His later plans of rescuing Mary Stuart and becoming King of Scotland were fantastical, and his policy in the Netherlands was so many-sided that his sudden death in camp at Namur, Oct. 1, 1578, gave rise to a suspicion of his having been poisoned by the Spaniards. See Ranke's *Fürsten und Völker von Sud-Europas in XVI. und XVII. Jahrhundert*; Prescott's *Philip II.*; Stirling-Maxwell's *Don John of Austria* (London, 1883). Revised by F. M. Colby.

John of Gaunt, gaant (*Ghent*): Duke of Lancaster and Aquitaine, and titular King of Castile; the fourth son of Edward III.; b. at Ghent in 1340. He married Blanche, daughter of the Duke of Lancaster, 1359; became Duke of Lancaster 1362; served with honor under the Black Prince, and after the latter's death became the strongest subject in England. His first wife having died, he married the daughter of Peter the Cruel of Castile. He afterward headed an unsuccessful expedition into France and became very unpopular in England, where he was held responsible by the Commons for the mismanagement of the war. At the time of the Peasant Revolt he was forced to take refuge in Scotland. He invaded Castile in 1386, in pursuance of his claim to that kingdom, and formed a treaty by which his daughter Catherine afterward became Queen of Castile. He was the friend and defender of Wycliffe, and the ancestor of the Lancastrian and Tudor families of English kings. His mistress and third wife, Catharine Swynford, was the ancestress of the Beauforts and Tudors. D. Feb. 3, 1399.

John of Leyden: whose true name was Johann Bockhold or Bockelson; a tailor by trade, but a poet and actor by talent and business; b. at Leyden, Holland, in 1509. Having come in contact with the Anabaptists, he became a religious fanatic and strolling preacher. In 1533 he went to Münster, and so great was his power over the minds of the people that in 1534 he succeeded in overthrowing the constitution of the city and establishing a new one of his own make. He was crowned as King of Zion, appointed ministers, coined money, introduced polygamy, married several wives, lived in royal splendor and luxury, and for more than a year the city was the stage for the most frightful scenes of fanatical cruelty and sensual dissipation. In 1535 it was conquered by the neighboring princes, and order restored. John was tortured to death by hot pincers Jan. 26, 1536, and his body was hung in a cage on the tower of St. Lambert's church; many of his followers were also severely punished. John of Leyden furnishes the historical subject of Meyerbeer's well-known opera *Le Prophète*.

John of Salisbury: b. at Salisbury, England, about 1115; went to France in 1136; studied under Abelard and other masters at Paris and Chartres; returned in 1151; became secretary to Archbishop Theobald and after his death to Thomas à Becket, and was appointed in 1176 Bishop of Chartres, where he died, Oct. 24, 1182. His theological system he developed in *Policraticus* and *Metalogicus*, but the most interesting of his writings are *Vita ac Passio S. Thomæ*, and letters, 302, edited by Mason (Paris, 1811). He was one of the few scholars of the Middle Ages who possessed a knowledge of Greek. A collected edition of his works was published at London (1848, 2 vols).

Revised by A. Guldman.

John III., Sobieski: King of Poland from 1674 to 1696; b. at Olesko in Galicia, June 2, 1624; received an excellent education at home and in foreign countries, and distinguished himself so much in the wars against the Swedes, Russians, and Transylvanians that in 1667 he was made commander-in-chief of the whole Polish army. The successor of John II., Michael Korybut, having made a humiliating treaty with the Turks, Sobieski had it rejected by the Polish diet, hastened at the head of his army to meet the Turks, and routed them completely at Khotin (Nov. 11, 1673). Soon afterward Michael Korybut died, and Sobieski was unanimously elected King of Poland (May, 1674). His greatest achievement was his victory (Sept. 12, 1683) over a vastly superior force of Turks who were besieging Vienna. As a ruler, however, John III. was much less fortunate than as a general, and the latter part of his life was much disturbed by civil and domestic troubles. D. at Warsaw, June 17, 1696. See Salvandy, *Histoire du roi Jean Sobieski et du royaume de Pologne* (Paris, 1876); and Rieder, *Johann III., König von Polen, Sobieski in Wien* (Vienna, 1881).

Johns Hopkins University: an institution in Baltimore, Md.; endowed by the Baltimore merchant whose name it bears (see Hopkins, Johns), with a bequest of more than $3,000,000, including his estate known as Clifton, in Baltimore County. It was chartered by the State of Maryland, with power to confer degrees, and opened for instruction Oct., 1876. Suitable buildings have been provided in the heart of Baltimore. They include an administration building, with recitation-rooms, a public hall, a library, a gymnasium, a chemical laboratory, a biological laboratory, a physical laboratory, a hall for the Young Men's Christian Association, accessory rooms for university and collegiate purposes, and a new academic hall of large dimensions. The staff of instructors for the year 1891–92 numbered 65 teachers, including a president and 15 professors, 15 associate professors, 10 lecturers, and a large number of associates and assistants. The number of students in 1891–92 was 544, of whom 334 were graduates of other institutions, pursuing advanced studies. The library includes over 55,000 bound volumes, and more than 1,000 serial publications are regularly received. The university possesses a large and valuable collection of apparatus selected with especial reference to investigation as well as to instruction. The following serials are regularly issued under the auspices of the university: *American Journal of Mathematics*, quarterly; *American Chemical Journal*, eight times yearly; *American Journal of Philology*, quarterly; *Studies from the Biological Laboratory*; *Studies in Historical and Political Science*, monthly; *Contributions to Assyriology*; *Modern Language Notes*; *Johns Hopkins University Circulars*. There are twenty fellowships, each yielding $500 annually, and there are sixty-seven scholarships. Thus far the philosophical or arts department is the only one which has been organized. It provides instruction in Greek, Latin, Sanskrit, Semitic, Teutonic, and Romance languages; in history, political science, philosophy, and pedagogics; in mathematics, astronomy, physics, electrical engineering, physiology, chemistry, mineralogy, geology, pathology, zoölogy, and morphology. The instruction is for two grades of students—first, for those who are undergraduates and candidates for the degree of bachelor of arts; second, for those who have already taken their first degree and are pursuing advanced courses which, if carried far enough, may bring them to the degree of doctor of philosophy. In the first fifteen years of instruction 300 persons were admitted to the degree of B. A., and 212 to the degree of Ph. D. Steps have been taken for the organization of a department of medicine. Post-graduate courses

are given by the medical staff of the hospital for which the trustees of the university also gave an endowment. The hospital was opened in May, 1889. The authorities issue at regular intervals hospital reports and hospital bulletins. Daniel C. Gilman, A. M., LL. D., the first president of the university, entered upon his office in 1875.

Johnson, Andrew, LL. D.: the seventeenth President of the U. S.; b. at Raleigh, N. C., Dec. 29, 1808. His father died when Andrew was four years old. He became a tailor's apprentice, and being unable to attend school did not learn to read until late in his apprenticeship, when he suddenly acquired a passion for obtaining knowledge, and devoted all his spare time to reading. After working two years as a journeyman tailor at Laurens Court-house, S. C., he removed in 1826 to Greeneville, Tenn., where he worked at his trade and married. Under his wife's instruction he made rapid progress in his education, passing from writing and arithmetic to the higher branches, and manifested such an intelligent interest in local politics as to be elected as "workingmen's candidate" alderman (1828–30) and mayor (1830–32), being twice re-elected to each office. During this period he cultivated his talents as a public speaker by taking part in a debating society consisting largely of students of Greeneville College. In 1835, and again in 1839, he was chosen to the lower house of the Legislature as a Democrat; was a candidate for elector at large in 1840, when he canvassed the State for Van Buren; was elected State Senator in 1841, and representative in Congress in 1843, being re-elected for four successive periods until 1853, when he was chosen Governor of Tennessee. In Congress he supported the administrations of Tyler and Polk in their chief measures, especially the annexation of Texas, the adjustment of the Oregon boundary, the Mexican war, and the tariff of 1846. He was re-elected Governor in 1855 after an exciting contest with the combined Whigs and Knownothings, and in 1857 entered the U. S. Senate, where he was conspicuous as an advocate of retrenchment and of the Homestead Bill, and as an opponent of the Pacific Railway. When the secession movement began, Johnson did everything in his power to keep Tennessee in the Union, and throughout the war he was conspicuous for active and fearless loyalty. The popularity which this gave him in the North resulted in his election as Vice-President on the ticket with Lincoln, and on the latter's assassination Johnson succeeded to the presidency Apr. 15, 1865. He was very soon involved in a bitter feud with the Republican majority in Congress. His policy of reconstruction brought the two highest branches of the Government into open antagonism. The action of Congress in opposing his policy was characterized by the President in a public speech (Feb. 22, 1866) as a "new rebellion"; the cabinet was reconstructed, and an unsuccessful attempt was made to form a new party on the basis of the administration policy. In the winter session (1866–67) Congress enacted over the President's veto a series of measures for extending the right of suffrage to the freedmen, dividing the Southern States into military districts, and excluding them from self-government until they should have ratified the late amendments to the Federal Constitution and until they should have adopted State constitutions in accordance therewith. An opinion of the Attorney-General against the validity of this legislation led to conflicts between the military commanders and the new State governments, and to new acts of Congress defining the powers of the former, making them independent of the President's authority. On Aug. 12, 1867, President Johnson removed the Secretary of War, replacing him by Gen. Grant. Secretary Stanton retired under protest, based upon the Tenure-of-office Act, which had been passed in the preceding March. On Sept. 7 an amnesty was published, relieving nearly all the participants in the rebellion from the disabilities thereby incurred, on condition of taking an oath to support the Constitution and laws. In December Congress refused to confirm the removal of Secretary Stanton, who thereupon resumed the exercise of his office, but on Feb. 21, 1868, President Johnson again attempted to remove him, appointing Gen. Lorenzo Thomas in his place. Stanton refused to vacate his post, and was sustained by the Senate. On Feb. 24 the House of Representatives voted to impeach the President for "high crimes and misdemeanors" (yeas 136, nays 47, not voting 17), and presented (Mar. 5) eleven articles of impeachment on the ground of his resistance to the execution of the acts of Congress, alleging, in addition to the offense lately committed, his public expressions of contempt for Congress in "certain intemperate, inflammatory, and scandalous harangues" pronounced in Aug. and Sept., 1866, and thereafter, declaring that the Thirty-ninth Congress of the U. S. was not a competent legislative body, and denying its power to propose constitutional amendments. The impeachment trial began Mar. 23, the President appearing by counsel, and resulted in acquittal May 16 and 26, the votes on the two leading articles standing 35 guilty to 19 not guilty, thus lacking one vote of the two-thirds required for conviction. The remainder of Johnson's term of office was passed without any such conflicts as might have been anticipated. He failed to obtain a nomination for re-election by the Democratic party, though he received 65 votes on the first ballot. New proclamations of pardon to the participants in the rebellion were issued July 4 and Dec. 25, but were of little effect. On the accession of President Grant, Mar. 4, 1869, Johnson returned to Greeneville, Tenn. Unsuccessful in 1870 and 1872 as a candidate respectively for U. S. Senator and representative, he was finally elected to the Senate in 1875, and took his seat in the extra session of March, in which his speeches were comparatively temperate. He died July 31, 1875, and was buried at Greeneville. Several biographies of President Johnson have been published, generally with a selection of his speeches, among which may be mentioned those of Savage (1865), Frank Moore (1865), and Foster (1866). See also the official record of *Proceedings in the Trial of Andrew Johnson* (Washington, 1868).

Revised by C. K. Adams.

Johnson, Barton W.: minister and author; b. in Tazewell co., Ill., in 1833. He was educated in Bethany College, West Virginia, where he taught for a time under the presidency of Alexander Campbell. He became president of Eureka College (Illinois) and of Oskaloosa College (Iowa), served as corresponding secretary of the General Christian Missionary Convention of the Disciples of Christ, and later was one of the editors of *The Christian Evangelist*, St. Louis, Mo., and of the *New Christian Quarterly*, in the same city. Author of *The Vision of the Ages*; *Commentary on John*; *The People's New Testament* (2 vols.); several volumes of *The Christian Lesson Commentary*, and *Young Folks in Bible Lands*, the last being the result of travels in the East. D. at De Leon, Tex., May 24, 1894. J. H. Garrison.

Johnson, Bushrod Rust: general; b. in Belmont co., O., Oct. 7, 1817; graduated at West Point in 1840; served in the Florida and Mexican wars; resigned in 1847, and at the outbreak of the civil war was professor in the Western Military Institute of Kentucky at Georgetown. He became a Confederate brigadier-general; was captured at Fort Donelson, but soon escaped; was severely wounded at Shiloh; became major-general in 1864, and commanded a division under Lee at the surrender of Appomattox Courthouse. After the war he became superintendent of the military college in the University of Nashville and chancellor of that institution. D. at Brighton, Ill., Sept. 11, 1880.

Johnson, Eastman: genre and portrait painter; b. at Lovell, Me., July 29, 1824. He studied in Düsseldorf 1849–51, and later in Paris, Italy, and Holland; spent four years at The Hague; became a National Academician in 1860; member Society of American Artists in 1881; received third-class medal at Paris Exposition 1887. *Old Kentucky Home* (1867) and *Husking Bee* (1876) are two of his best-known works. Studio in New York. W. A. C.

Johnson, George: Canadian statistician; b. in Annapolis Royal, Nova Scotia, Oct. 29, 1837, and educated at Sackville, New Brunswick, Academy. He was editor of *The Halifax Reporter* for many years; special correspondent of *The Toronto Mail*; chief census officer for Nova Scotia in 1881; accompanied Sir John A. Macdonald to British Columbia in 1886, Sir Charles Tupper to Washington in 1887 and in 1891; was appointed statistician to the Department of Agriculture in 1889. He wrote *Handbook of Canada* (1885); *Graphic Statistics of Canada* (1886); and *Alphabet of First Things in Canada* (1889). Neil Macdonald.

Johnson, Herman Merrills, D. D., LL. D.: educator; b. at Butternuts, Otsego co., N. Y., Nov. 25, 1815; graduated at the Wesleyan University in 1839; was 1839–42 Professor of Ancient Languages in St. Charles College, Missouri; in 1842 was called to the same chair in Augusta College, Kentucky; held the Professorship of Ancient Languages and Literature in the Ohio Wesleyan University, Delaware, O., 1844–50, and was for a part of the time its acting president; in 1850 became Professor of English Literature in Dickinson College, and

was its president 1860–68. D. at Carlisle, Apr. 5, 1868. He edited *Orientalia Antiquaria Herodoti*; also an edition of the *Clio* of Herodotus, with notes (1850).

Johnson, Herrick, D. D., LL. D.: Presbyterian minister; b. near Fonda, N. Y., Sept. 21, 1832; graduated from Hamilton College (1857), and from Auburn Theological Seminary (1860). He was pastor in Troy, N. Y., 1860–62; in Pittsburgh, Pa., 1862–68; in Philadelphia, 1868–74; Professor of Sacred Rhetoric and Pastoral Theology in Auburn Theological Seminary 1874–80; pastor in Chicago 1880–84; Professor of Homiletics in McCormick Theological Seminary from 1880. He was moderator of the General Assembly in 1881, and is a member of an unusually large number of the boards that have charge of the interests of his Church, or its institutions, or interdenominational causes. For some years he published Sunday-school lessons in the *Presbyterian at Work*. He has published *Christianity's Challenge* (Chicago, 1881); *Plain Talks about Theaters* (1883); *Revivals* (1883); *Forms for Special Occasions* (Chicago, 1889).

Willis J. Beecher.

Johnson, Herschel Vespasian: jurist; b. in Burke co., Ga., Sept. 18, 1812; graduated at the State University 1834; studied law, and in 1840 entered politics as a Democrat; was appointed in 1848 to fill a vacancy in the U. S. Senate; was elected to the bench in his judicial circuit in 1849; in 1853 was elected Governor of the State, and re-elected to the same office in 1855. In 1860 he was candidate for Vice-President of the U. S. on the ticket which was headed by Stephen A. Douglas for the Presidency. Though he opposed secession, he went with his State, and became a member of the Confederate Senate. After the war he was elected U. S. Senator from Georgia, but his seat was denied him by the reconstruction acts of Congress. He resumed the practice of law with great success, and in 1873 was appointed to the circuit bench. D. in Jefferson co., Ga., Aug. 16, 1880.

Revised by C. K. Adams.

Johnson, Sir John: b. near Johnstown, N. Y., Nov. 5, 1742; a son of Sir William Johnson; was knighted in 1765, and succeeded in 1774 to his father's great estates and influence in the Mohawk Valley. In 1776 he fled to Canada with 700 followers; raised two battalions called the Royal Greens; was commissioned a colonel; invested Fort Stanwix in Aug., 1777; defeated Gen. Herkimer, and was himself defeated in Oct., 1780. His property was confiscated by the U. S., but the British Government made him several grants of lands in Canada, where he became a member of the colonial council, and was superintendent of Indian affairs until his death at Montreal, Jan. 4, 1830.

Johnson, John B.: civil engineer; b. at Marlboro, O., June 11, 1850. He graduated at the University of Michigan 1878, and served as a civil engineer on the U. S. Lake Survey and Mississippi River Survey till 1883, when he became Professor of Civil Engineering in Washington University, St. Louis, Mo. He directs the work of testing the strength of American timbers, begun by the U. S. Forestry Bureau in 1891, this part of the work being done in Prof. Johnson's laboratory at Washington University. He is a member of the Institution of Civil Engineers (London), and of various American scientific and engineering societies. He has published *Theory and Practice of Surveying* (1886) and (as joint author) *Modern Framed Structures* (1892). He has conducted the index department of *The Journal of the Association of Engineering Societies* since its organization in 1884, in which all current engineering literature of value is listed with descriptive notes. A seven-year summary of these notes was published in book form in 1892.

Johnson, Manuel John, F. R. S.: astronomer; b. in England in May, 1805; studied at Addiscombe Military School; joined the East India Company's artillery at St. Helena in 1821, and remained there eleven years. During his residence at St. Helena he studied astronomy, and prepared a catalogue of 606 stars of the southern hemisphere; returning to England, he entered Magdalen College, Oxford, at the mature age of twenty-eight, and graduated in 1839, when he was immediately appointed Radcliffe astronomer. In that capacity he greatly extended the lists of stars by his annual catalogues, and introduced improved astronomical instruments. His observations of double stars with the great heliometer, and his photographic registration of stars, were especially important. Prof. Johnson was president of the Royal Astronomical Society in 1857 and 1858. D. at Oxford, Feb. 28, 1859.

Johnson, Oliver: reformer and editor; b. at Peacham, Vt., Dec. 27, 1809; became the editor of a new paper, *The Christian Soldier*, Jan. 1, 1831, and from this time up to 1865 engaged in the anti-slavery cause as a lecturer and editor. He was managing editor of *The Independent* (1865–70); editor of *The Weekly Tribune* (1870–72); managing editor *The Christian Union* (1872). He published *William Lloyd Garrison and his Times* (1880). D. in Brooklyn, N. Y., Dec. 10, 1889.

Johnson, Percival Norton, F. R. S.: metallurgist; b. in England about 1793; was the son of a London assayer, and early acquired great skill in the same profession. He was the first to determine with accuracy the exact proportions of gold and silver in bullion. He introduced into England from Germany the alloy known as German silver, extracted palladium and platinum from gold bullion, and manufactured them for commercial purposes. He invented several pottery colors, especially the much-admired rose-pink. He was in great request as a consulting metallurgist at the great English mines, and he introduced numerous improvements into the machinery of the Cornish mines. He was elected a fellow of the Royal Society in 1846. D. in London, June 1, 1866.

Johnson, Reverdy: jurist; b. at Annapolis, Md., May 21, 1796; son of Chancellor John Johnson of that State; was educated at St. John's College; studied law in his father's office; was admitted to the bar in 1815; removed to Baltimore in 1817, and was shortly after appointed Deputy Attorney-General of Maryland; was a State Senator 1821–25, and was re-elected, but resigned to attend to the increasing duties of his profession, in which he gained a leading position in his State, as well as at the bar of the Supreme Court of the U. S. In 1845 he was elected to the U. S. Senate from Maryland, and in 1849 President Taylor appointed him Attorney-General of the U. S., which office he held until the death of President Taylor, when he retired and resumed the practice of his profession; was member of the peace commission in 1861; U. S. Senator 1863–68; succeeded Charles Francis Adams as U. S. minister to England in 1868, and negotiated a treaty for the settlement of the Alabama claims, which was rejected, however, by the U. S. Senate. He was recalled in 1869. D. at Annapolis, Feb. 10, 1876.

Johnson, Richard Mentor: Vice-President of the U. S.; b. in Kentucky, Oct. 17, 1780; was educated at Transylvania University; studied law, and was admitted to the bar; was a member of Congress 1807–19, and fought with distinction in the war of 1812. In 1819 he was elected to the U. S. Senate, and remained a member of that body until 1829; he was again a member of the House 1829–37. In 1837 he was elected Vice-President of the U. S., the choice having devolved upon the Senate. In Mar., 1841, he returned to his home in Kentucky. Undisturbed retirement, however, was not allowed him. He was again returned a member of the State Legislature, and while holding this position died at Frankfort, Ky., Nov. 19, 1850. He was the author of the law abolishing imprisonment for debt in Kentucky.

Johnson, Richard W., A. B., A. M.: general; b. in Livingston co., Ky., Feb. 7, 1827; graduated from the U. S. Military Academy in 1849, and entered the army as brevet second lieutenant of infantry; was transferred to the cavalry 1855 as first lieutenant; promoted captain 1856, major 1862; engaged in campaigns against Indians in Texas 1851–61; appointed brigadier-general of volunteers in the Union army Oct., 1861, and commanded a division of infantry at Stone River, Liberty Gap, Chickamauga, Missionary Ridge, and all the battles on the line of march from Nashville to New Hope church, near Atlanta, Ga., where he was severely wounded; subsequently commanded a division of cavalry at the battle of Nashville and the pursuit of the enemy through Tennessee. He received successive brevets from lieutenant-colonel to major-general U. S. army; retired on the full rank of major-general Oct., 1867, on account of wounds received at New Hope church; was reduced to the rank of brigadier-general under a subsequent law of Congress retiring officers on rank actually held at the time when disabled. He was military professor in the University of Missouri 1868–69; at the University of Minnesota 1869–70. He published *A Soldier's Reminiscences in Peace and War* (1866) and *Life of Gen. George H. Thomas* (1881).

Revised by James Mercur.

Johnson, ROSSITER, Ph. D., LL. D.: author and editor; b. at Rochester, N. Y., Jan. 27, 1840; graduated at the University of Rochester 1863; was associate editor Rochester *Democrat* 1864–68; editor Concord (N. H.) *Statesman* 1869–72; associate editor *American Cyclopædia* 1873–77; managing editor of the *Cyclopædia of American Biography* 1886–88; editor *Annual Cyclopædia* since 1883; was secretary of the Authors' Club 1890–92. He has published *Phaeton Rogers*, a novel of boy life (1881); *A History of the French War, ending in the Conquest of Canada* (1882); *A History of the War of 1812–15 between the United States and Great Britain* (1882); *Idler and Poet* (1883); *A Short History of the War of Secession* (1888); *The End of a Rainbow*, an American story (1892); and has edited *Little Classics* (1874–80); *Famous Single and Fugitive Poems* (1877); *Fifty Perfect Poems*, with Charles A. Dana (1882).

Johnson, SAMUEL, D. D.: educator; b. in Guilford, Conn., Oct. 14, 1696. He graduated at Yale College in 1714, and subsequently became a tutor in the institution. In 1720 he was ordained as pastor of the Congregational church at West Haven, but in 1722 he, together with Rector Cutler, of Yale, and Tutor Brown, declared for episcopacy, and, relinquishing their positions, sailed from Boston Nov. 5, 1722, to obtain holy orders in the Church of England. He returned to Connecticut after a year's absence, having been ordained both deacon and priest, and was settled at Stratford as a missionary of the Society for the Propagation of the Gospel in Foreign Parts. For a long time he was the only Episcopal clergyman in the colony. He secured from Dean Berkeley for Yale College the donation of many valuable books, and a deed of his farm at Newport for the founding of scholarships. He was a profound philosopher for his day, comprehending Berkeley, and going deeply into Hutchinsonianism. The University of Oxford conferred upon him in 1743 the degree of D. D. Three years later he published a *System of Morality*; a new edition, under the title of *Elementa Philosophica*, which was dedicated to Berkeley, was printed by Benjamin Franklin in 1752. In 1753 he accepted the oversight of King's (now Columbia) College, New York. He guided this institution through its early troubles, and gave shape to its policy and course of study. Dr. Johnson resigned the presidency of the college Feb., 1763, and retired to Stratford, resuming the charge of his old parish. His published works include *An English and Hebrew Grammar* (London, 1767; 2d. ed., 1771). D. at Stratford, Jan. 6, 1772. See Beardsley, *The Life of Samuel Johnson, D. D.* (Boston, 1876).

Revised by W. S. PERRY.

Johnson, SAMUEL: author; b. at Lichfield, Staffordshire, England, Sept. 18, 1709; the son of a bookseller of limited means. He attended the Lichfield grammar school, and read a great deal at home. In 1728 he entered Pembroke College, Oxford, which he abandoned in 1731, without taking a degree, his father's death having left him without means to continue his studies at the university; was employed for some time as usher in a school at Market Bosworth, Leicestershire, and afterward lived at Birmingham, writing for a newspaper and publishing for a local bookseller *A Voyage to Abyssinia*, translated from the French (1735). In 1736 he improved his circumstances by marrying a widow nearly double his age, who had £800 in the funds, and opened a private academy near Lichfield. After a brief and unsatisfactory experience in teaching, Johnson went to London in 1737, accompanied by his pupil Garrick, and thenceforward devoted himself to literature as a profession. His first serious employment was on Cave's *Gentleman's Magazine*, for which he continued to write until 1754. The publication of *London*, a satire imitated from Juvenal (1738), and of two or three political pamphlets, brought him into public notice, and procured him the friendship of Pope, Richardson, and other leading authors. In 1740 Johnson undertook to report the debates in Parliament for the *Gentleman's Magazine*, and acquired considerable celebrity by his practice of improving upon the real utterances of the speakers; in 1744 appeared his *Life of Savage*; in 1749, his best poem, *The Vanity of Human Wishes*, and a heavy drama, *Irene*, which was acted at Drury Lane theater on Feb. 6, ran for nine nights, and brought the author £300. In 1750–52 he wrote the *Rambler*, a semi-weekly series of literary essays which extended to 208 numbers, and had great success. From 1747 to 1755 he was chiefly occupied upon his great work, the *Dictionary of the English Language*. His wife had died in 1752, his mother in 1759, and it was to pay the expenses of the latter's funeral that Johnson wrote *Rasselas* (originally entitled *The Prince of Abyssinia*, a moral apologue which gained immediate popularity, and went through eight editions in the author's lifetime) within a single week. The *Idler*, an imitation of the *Rambler*, appeared in 1758–60. It was not until about 1762 that Johnson acquired that settled position in the republic of letters which is so familiar to the world in the pages of Boswell—a position apparently dating from the publication of his *Dictionary of the English Language*, in two folio volumes in 1755, and his acceptance, a few years later, of a pension of £300. He now became an authority on all points of erudition, and his wonderful conversational powers began to attract the attention of an admiring circle, which in 1764 formed the nucleus of the famous Literary Club, including among its members Burke, Goldsmith, Reynolds, and other men of distinction. It was in 1763 that he first met his future biographer, James Boswell, and in 1765 that he made the acquaintance of the Thrale family. In 1773 he visited Scotland and the Hebrides, accompanied by Boswell, publishing in 1775 the *Journey to the Western Islands*, and a pamphlet against the American rebellion, entitled *Taxation no Tyranny*. His last literary work of any importance was the *Lives of the Poets* (1779–81). He died in London Dec. 13, 1784, and was buried in Westminster Abbey. The character and career of Dr. Johnson are, or may be, better known than those of any other author that ever lived, through the incomparable biography in which Boswell has edited his conversations for a series of years. The only complete edition of his works is that in eleven volumes (Oxford, 1825). Johnson's character was pure and devout, but his mind was not free from a morbid gloom bred of poverty and inherited scrofula. He had strange superstitions, inherited from infancy, which colored his life. He was a man of vast learning and of masculine grasp of thought, but his judgment was warped by prejudices. In some respects his taste was singularly unrefined. Johnson's oddities, virtues, and prejudices were characteristically English. He hated Frenchmen, Scotchmen, and Americans, and had a cockneyish fondness for London. He was a tory and a Churchman, deeply religious, but with a horror of death. He was burly in person, slovenly in dress, a great diner-out, an inordinate tea-drinker, a voracious and untidy eater. His reading was wide and his memory retentive, and his *English Dictionary* is still a work of great value. The criticisms in his *Lives of the Poets* are commonly sound, but sometimes marred by prejudice and by a lack of sympathy. His written style is often ponderous, but he talked with wit and vivacity. A pleasing trait in his character was kindness toward the poor and suffering.

Revised by H. A. BEERS.

Johnson, SAMUEL: clergyman; b. at Salem, Mass., Oct. 10, 1822; graduated at Harvard in 1842, and at the Divinity School in 1843; became in 1853 pastor of a free church at Lynn—free from any sectarian control or doctrinal test of fellowship.. A deep thinker, brilliant writer, and eloquent speaker, Mr. Johnson wrote much on subjects of philosophy, religion, and reform. He was prominent in the anti-slavery movement. In 1846 he compiled, in connection with the Rev. Samuel Longfellow, *A Book of Hymns*, some of the finest of which were his own. In 1868 he published *The Worship of Jesus*. Of his great work, *Oriental Religions*, the first volume, *India*, appeared in 1872; the second, *China*, in 1877; and the third, *Persia*, was posthumous, 1885. D. at North Andover, Mass., Feb. 19, 1882. His biography was written by the Rev. Samuel Longfellow, and published, with a select number of his sermons and addresses, in 1883.

Revised by J. W. CHADWICK.

Johnson, SAMUEL WILLIAM, A. M.: chemist; b. at Kingsboro, Fulton co., N. Y., July 3, 1830: studied in the Yale Scientific School, and at the Universities of Leipzig and Munich. In 1856 he became Professor of Analytical and Agricultural Chemistry in the Sheffield Scientific School at Yale College. He is a member of the National Academy of Sciences, and of the American Academy of Arts and Sciences, and has published *Essays on Manures* (1859), *Peat and its Uses* (1866), *How Crops Grow* (1868; republished in England in 1869), etc., besides translating Fresenius's *Qualitative Chemical Analysis*, and the same author's *Quantitative Chemical Analysis*.

Johnson, THOMAS CARY, D. D.: a minister in the Presbyterian Church (South); b. in Fishbank Hill, Monroe co., Va. (now West Virginia), July 19, 1859; was educated at Hampden Sidney College, the University of Virginia, Union

Theological Seminary in Virginia, and Yale College. He was Professor of Old and New Testament Exegesis in the Austin School of Theology, Texas, 1888–90; pastor of the Third Presbyterian church, Louisville, Ky., 1890–91; Professor of English Bible and Pastoral Theology, Union Seminary, Virginia, 1891–92; Professor of Ecclesiastical History and Polity, same seminary, from 1892. He is the author of *The History of the Southern Presbyterian Church* in vol. xi. (1894) of the series of American Church History.

WILLIS J. BEECHER.

Johnson, WALTER ROGERS: chemist; b. at Leominster, Mass., June 21, 1794; graduated at Harvard in 1819; was for many years a teacher in Framingham and Salem, Mass., and in Germantown, Pa., and the Philadelphia High School; was 1839–43 Professor of Physics and Chemistry in the University of Pennsylvania. He made important researches in physics; made an official report (1844) to Congress on the character of the varieties of coal; was engaged (1845) in examining the proposed sources of water-supply for Boston, Mass.; was the first secretary of the Association for the Advancement of Science; became in 1848 connected with the Smithsonian Institution, and in 1851 with the World's Fair, London. D. at Washington, D. C., Apr. 26, 1852. His principal works are *Use of Anthracite* (1841); *Report on Coals* (1844); *Memoir of L. D. von Schweinitz* (1835); *Coal Trade of British America* (1850).

Johnson, Sir WILLIAM: general and statesman; b. at Warrentown, County Down, Ireland, in 1715; went in 1738 to North America to manage some landed estates belonging to his uncle, Admiral Sir Peter Warren, and settled among the Mohawk Indians, being the earliest white resident of that immense and fertile region, and by his prudence in dealing with the Indians won their confidence and esteem. He learned the Mohawk language, and was made an honorary chieftain of that tribe. In 1743 he was appointed superintendent of Indian affairs for the province, and held this post under different titles for the remainder of his life. In the French war of 1755 Johnson was commissioned a major-general and commander-in-chief of the provincial forces in the expedition against Crown Point, in which he defeated Baron Dieskau at Lake George (so named by him), and destroyed his army in Sept., 1755. Johnson was severely wounded in this engagement, which was considered so important that it procured him the thanks of Parliament, a grant of £5,000, and a baronetcy. In 1756–57 Sir William was engaged in the expeditions for the relief of Oswego and Fort William Henry, was with Abercrombie at Ticonderoga in 1758, and was second in command under Gen. Prideaux in the expedition against Fort Niagara in 1759. On the death of Prideaux, who was killed before that fort, Sir William prosecuted the siege, aided by 1,000 Indian allies, defeated a French force sent to relieve the fort, and received its unconditional surrender. In 1760 he participated in Amherst's expedition to Montreal. For these services Sir William received from the king a grant of 100,000 acres of land N. of the Mohawk, long known as Kingsland or the Royal Grant, and in 1764 he built Johnson Hall, around which soon sprang up the village of Johnstown, the capital of Tryon County, which then embraced all Central and Western New York. He made the Indian treaty of Fort Stanwix in 1768. D. at Johnstown, July 11, 1774. See his *Life*, by W. L. Stone (2 vols., Albany, 1865).

Johnson, WILLIAM, LL. D.: jurist; b. at Charleston, S. C., Dec 27, 1771; graduated at Princeton in 1790; studied law at Charleston under C. C. Pinckney; was a member of the Legislature for three terms, being Speaker the last term; was elected judge of the new court of common pleas, and appointed by Jefferson a justice of the Supreme Court for South Carolina and Georgia. He edited for the family of that officer the *Life and Correspondence of Maj.-Gen. Nathanael Greene* (1822), with copious and learned annotations. He inclined to support the Federal Government in the nullification question (1832). D. in New York, Aug., 1834.

Johnson, WILLIAM SAMUEL, LL. D.: statesman and president of Columbia College; the eldest son of the Rev. Dr. Samuel Johnson; b. in Stratford, Conn., Oct. 7, 1727; graduated at Yale College with great distinction in 1740; studied law, and rose at once, when admitted to the bar, to the highest rank in his profession. He was selected to attend the first Colonial Congress that met at New York in 1765 to consider the Stamp Act, and drew up the petitions and remonstrances which were sent to the king and two houses of Parliament. At the October session of the General Assembly of Connecticut in 1766 Dr. Johnson—for by this time the University of Oxford had honored him with the degree of doctor of laws—was appointed to proceed to England and defend the colony in a cause pending before the king and lords in council concerning the title to a large tract of land obtained from the Mohegan Indians. After the battle of Lexington he and another gentleman were deputed to wait on Gen. Gage, then in command of the British forces at Boston, with a letter from the Governor of Connecticut, the object of which was to stay hostile proceedings, and inquire if means could not be adopted to secure peace. The embassy was unsuccessful, the progress of events hurrying on the war. He was a delegate from Connecticut to the convention which framed the Federal Constitution, and president of the committee of five appointed to revise the style of the instrument and arrange its articles. He proposed the organization of the Senate as a separate body, and was elected the first Senator from Connecticut, and in concert with his colleague, Oliver Ellsworth, drew up the bill to organize the judiciary. After King's College, New York, became Columbia under the new organization of trustees established in 1787, he was chosen to the presidency—an office which his father had filled under the royal charter. After 1800 he lived in retirement at Stratford, and died there Nov. 14, 1819.

Revised by C. K. ADAMS.

Johnson City: city; Washington co., Tenn. (for location of county, see map of Tennessee, ref. 5–K); on the Charl., Cin. and Chi., the E. Tenn. and W. N. C., and the E. Tenn., Va. and Ga. railways; 25 miles S. S. W. of Bristol. It has machine-shops, blast furnace, and foundry, tannery, and sash, blind, and furniture factories, and a daily and three weekly newspapers. Pop. (1880) 685; (1890) 4,161.

Johnson-grass: popular name of *Sorghum halapense*, a coarse grass which has been recommended for cultivation as a forage plant. It possesses less nutritive value than maize and the better grasses, and in the southern parts of the U. S. it becomes a serious weed. It yields a large amount of herbage, but is scarcely worth cultivation.

L. H. B.

Johnston, ALBERT SIDNEY: general; b. in Kentucky, Feb. 3, 1803; graduated at the U. S. Military Academy July 1, 1826, and entered the army as second lieutenant Sixth Infantry; after serving in the Black Hawk war, he resigned from the army, and, in 1836, emigrated to Texas, arriving shortly after the battle of San Jacinto. Entering the Texan army as a private, he was soon promoted to succeed Gen. Felix Huston in chief command, in consequence of which a duel occurred in which Johnston was wounded. He held the office of senior brigadier-general till 1838, when he was appointed Secretary of War of Texas, and in 1839 organized an expedition against the Cherokees, who were totally routed in an engagement on the Neches. In 1840 he retired from public life. He was an ardent advocate of the annexation of Texas to the U. S., and in 1846, at the request of Gen. Taylor, took the field against Mexico as commander of the Texan volunteer rifle regiment. Subsequently he served as inspector-general on the staff of Gen. W. O. Butler, and distinguished himself at the battle of Monterey. In 1849 President Taylor reappointed him in the army as paymaster, with the rank of major, in which capacity he served until 1855, when he was appointed colonel Second U. S. Cavalry. In 1857 he commanded the U. S. forces sent to coerce the Mormons into obedience to Federal authority, conducting the expedition in safety to Salt Lake City, and commanded the Department of Utah. For ability displayed in this expedition he was breveted brigadier-general. In 1860 he was removed to the command of the Department of the Pacific. In May, 1861, he resigned from the service and joined the Confederacy. He was at once appointed a general in the Confederate army, and assigned to an important command in the West. At the battle of Shiloh he was commander-in-chief, and on the first day of that battle was killed, Apr. 6, 1862. A bronze equestrian statue of him was unveiled in Metarie Cemetery, New Orleans, Apr. 6, 1887.

Revised by C. K. ADAMS.

Johnston, ALEXANDER: historian and educator; b. in Brooklyn, N. Y., Apr. 29, 1849; graduated at Rutgers College in 1870, taught for three years in the Rutgers College Grammar School, New Brunswick, N. J., and became principal of the Latin School in Norwalk, Conn. In 1883 he was appointed to the chair of Jurisprudence and Political Economy in Princeton College. He has written a number of brief but valuable works on U. S. history, some of which have been employed as text-books. Among his publications

ard *History of American Politics* (1879); *The Genesis of a New England State*, in the Johns Hopkins University Series (1884); *Representative American Orations, with an Outline of American Political History* (1885); *History of the United States, for Schools* (1886); *History of Connecticut* for the American Commonwealth Series (1887); and *The United States: its History and Constitution* (1889). D. at Princeton, N. J., July 21, 1889. F. M. COLBY.

Johnston, ALEXANDER KEITH: b. at Kirkhill, Scotland, Dec. 28, 1804; traveled extensively, and studied the principal modern languages the better to further his research for geographical data, and published in 1843 a *National Atlas*. His *Physical Atlas of Natural Phenomena* (1847–49; 2d ed. 1854–56) contained important contributions from Sir R. Murchison, Sir David Brewster, Prof. Rogers, of Boston, and other eminent scientists. Mr. Johnston was chosen a member of the geographical societies of Paris and Berlin, received the appointment of geographer to the Queen for Scotland, and issued many educational, manual, and special atlases. D. July 10, 1871. His son, bearing the same name, succeeded him in his geographical enterprises.

Johnston, GEORGE: naturalist; b. at Simprin, Scotland, in 1798; graduated at the University of Edinburgh in 1819, after serving a medical apprenticeship with Dr. Abercrombie, and became a physician at Berwick-on-Tweed. He studied natural history with success, and was one of the founders of the Ray Society. He published important works on the *History of British Zoöphytes* (1838); *History of British Sponges and Lithophytes* (1842); *Introduction to Conchology* (1850); and *Natural History of the Eastern Borders* (1854). D. July 3, 1855.

Johnston, JAMES F. W.: chemist; b. at Paisley, Scotland, about 1796; was for many years a classical and scientific teacher at Glasgow and Durham; went to Sweden in 1830; studied chemistry under Berzelius; became reader in chemistry and mineralogy at the University of Durham, and prepared numerous treatises on agricultural chemistry, most of which have enjoyed a wide circulation in America. Prof. Johnston visited the U. S. in 1849–50. Among his works are *Elements of Agricultural Chemistry and Geology* (1842); *Catechism and Lectures* (1844) on the same sciences; *Notes on North America* (1851); and *Chemistry of Common Life* (1853–55). D. at Durham, Sept. 18, 1855.

Johnston, JOHN, LL. D.: educator; b. Aug. 22, 1806, in Bristol, Me.; graduated at Bowdoin College in 1832; after being principal of a seminary at Cazenovia, N. Y., he became in 1835 Assistant Professor of Mathematics and in 1839 Professor of Natural Science in the Wesleyan University at Middletown, Conn., where he remained for many years. He published several text-books on chemistry and natural philosophy, and a history of Bristol and the adjoining town of Bremen (1873). He was a frequent contributor to various periodicals, and was a member of the historical societies of several of the States and of various scientific associations. D. at Clifton, Staten Island, N. Y., Dec. 1, 1879.

Johnston, JOSEPH EGGLESTON: general; b. in Prince Edward co., Va., Feb. 3, 1807; graduated at West Point, and entered the army as second lieutenant of artillery July, 1829. From the date of graduation until 1837 he served mainly on garrison duty, being, however, actively engaged for some two years in Florida against Seminole Indians, a portion of the time on the staff of Gen. Winfield Scott. In 1837 he resigned his commission to follow the profession of civil engineer, but re-entered the service on July 7, 1838, as first lieutenant of topographical engineers, and for former gallantry in Florida was now breveted captain. From this time until the outbreak of the war with Mexico he was engaged upon river and harbor improvements, surveys of Texas boundary-line and that between the U. S. and the British provinces, etc. At the siege of Vera Cruz (Mar., 1847) he served on engineer duty; was appointed Apr. 9 lieutenant-colonel of voltigeurs, and at Cerro Gordo on the 12th received severe wounds while engaged in reconnoitering the enemy's position, and was breveted major and colonel. In the subsequent battles of Contreras, Churubusco, Molino del Rey, Chapultepec, and final assault on the city of Mexico he participated, and was wounded at the latter engagement. Upon the disbandment of the voltigeurs in 1848, Johnston, by act of Congress restoring officers of the old army to their former positions, returned to duty as captain of topographical engineers, serving as such until 1855, when he was appointed lieutenant-colonel of cavalry, and was engaged in frontier duty and on the Utah expedition as inspector-general. On June 28, 1860, he was appointed quartermaster-general with the rank of brigadier-general, but resigned Apr. 22, 1861, to follow the fortunes of his native State. At once appointed major-general in the Confederate army, he commanded the force which occupied Harper's Ferry, May, 1861, and which subsequently, in the vicinity of Winchester, held in check the Union force under Gen. Robert Patterson, and still later re-enforced Gen. Beauregard in his position about Manassas. At the battle of Bull Run, Gen. Johnston waived his right to command in favor of Beauregard, the latter being familiar with the ground and troops, while the former was not. In the Peninsular campaign he was in command, and at the close of the first day's fighting at Fair Oaks (May 31, 1862) was severely wounded and disabled for several months, being succeeded by Gen. R. E. Lee. Upon his recovery he was assigned to command the Southwest department, with the rank of lieutenant-general, and during the siege of Vicksburg made several ineffectual attempts to relieve that place, being finally defeated at and driven beyond Jackson, Miss. In Dec., 1863, Johnston, now a general, succeeded Gen. Bragg in command of the Tennessee Department, but, failing to prevent the invasion of Georgia the following spring by the Union forces of Gen. Sherman, he was superseded (July 17, 1864) by Gen. J. B. Hood, after having been forced to retire from the strong positions at Dalton, Resaca, Kenesaw, etc., and beyond the Chattahoochee. In 1865 Johnston was restored to command in the Carolinas to collect and command an army to oppose the advance of Gen. Sherman, but was defeated at Fayetteville, Bentonville, etc., and upon receiving intelligence of the surrender of Lee entered into correspondence with Gen. Sherman which led to the surrender of his army at Durham Station, N. C., Apr. 26, 1865. In 1874 he published a *Narrative of Military Operations*. He was a member of the Forty-sixth Congress, and became U. S. commissioner of railways Apr. 2, 1885. D. Mar. 21, 1891.

Johnston, RICHARD MALCOLM: novelist; b. in Hancock co., Ga., Mar. 8, 1822; graduated at Mercer University in 1841; studied law and was admitted to the bar, and began practice at Sparta in 1843. In 1857 he was chosen Professor of *Belles-Lettres* in the State University of Georgia, a post he held until 1861: he then established a select classical school at Rockby in his native county, which became famous in the Southern States; in 1867 he moved his school to Chestnut Hill, 2 miles N. of Baltimore, Md., where it is now known as Pen-Lucy Institute. Among his publications are the *Dukesborough Tales* (1883); a *Biography of Alexander H. Stephens* (1883); *Old Mark Langston* (1884); *Ogeechee Cross-firings* (1889), etc. Revised by H. A. BEERS.

Johnston, SAMUEL, LL. D.: legislator; b. at Dundee, Scotland, Dec. 15, 1733; nephew of Gov. Gabriel Johnston; was taken in infancy to North Carolina. He was admitted to the bar, was chosen to the Assembly in 1769, and espoused the cause of resistance to the British cabinet; was an active member of the first two provincial Congresses, and presided over the third and fourth. In 1775 he was chairman of the provincial council, was a member of the Continental Congress in 1781–82, Governor of North Carolina 1788–89, presiding over the State convention which adopted the Federal Constitution; was U. S. Senator 1789–93, and judge of the superior court 1800–03. D. near Edenton, N. C., Aug. 18, 1816.

Johnston, WILLIAM PRESTON, LL. D.: educator; b. in Louisville, Ky., Jan. 5, 1831; graduated at Yale College 1852, and at Louisville Law School 1853; served in the Confederate army as colonel and aide-de-camp to President Davis; was Professor of History and Literature in Washington and Lee University 1867–77; president Louisiana State University 1880–83; became president of Tulane University 1884; was elected regent of the Smithsonian Institution 1891. *The Life of General Albert Sidney Johnston* (1878), his father, is his most important book. He has written in addition *The Prototype of Hamlet* (1890), and numerous addresses on educational and social subjects.
C. H. THURBER.

Johnstone: town; in the county of Renfrew, Scotland; on the Black Cart river; about 10 miles W. of Glasgow, with which it is connected by rail (see map of Scotland, ref. 12–G). It has large manufactures of cotton fabrics, paper, and articles of iron and brass. The vicinity contains rich coal-mines. About a mile to the E. is Elderslie, the traditional birthplace of Wallace. Pop. (1891) 9,668.

Johnstown: city (1895); capital of Fulton co., N. Y.; on Cayadutta creek, and the Fonda, Johnstown and Gloversville Railroad; 3 miles S. of Gloversville, 42 miles N. W. of Albany (for location, see map of New York, ref. 4–I). It is connected with Fonda and Gloversville by steam and electric railways; has gas, electric-light, water, and sewerage plants, 2 national banks with combined capital of $225,000, a savings-bank, and 2 daily and 3 weekly newspapers, and is principally engaged in the manufacture of gloves and knit goods. The town of Johnstown was founded by Sir William Johnson, who in 1764 built a baronial home there, which stands nearly as he left it. He also built the courthouse, jail, and Episcopal church. Pop. (1880) 5,013; (1890) 7,768; (1892) 8,977. D. C. Durfee.

Johnstown: city; Cambria co., Pa. (for location of county, see map of Pennsylvania, ref. 5–D); on the Conemaugh river, and the Penn. and the Balt. and Ohio railways; 79 miles E. of Pittsburg. It is on a T-shaped plain, at the junction of Stony creek and the Little Conemaugh river, forming the Conemaugh river. These streams are liable to sudden freshets, and, owing to the contraction of the waterway in the lower part of the city by the dumping of cinders and slag on the banks of the stream, and also encroachments by riparian owners, the upper portion of the city is liable to inundations. On May 31, 1889, a dam on the Little Conemaugh river, 9 miles above Johnstown, broke away during an extraordinarily heavy rainfall. The impounded water added to the already overflowing streams swept down over the city in a great wave, destroying a very large portion of the town and causing great loss of life. This calamity created great sympathy throughout the whole country, and a large fund was contributed for the relief of the sufferers. The city has been rebuilt and restored to its former prosperity. It is engaged in the manufacture of iron, steel, wire, cement, fire-brick, and leather and woolen goods, and has 2 national banks with combined capital of $200,000, a savings-bank, and a monthly, 3 daily, and 7 weekly periodicals. Pop. (1880) 8,380; (1890) 21,805. J. James R. Croes.

John the Baptist [trans. of Gr. Ἰωάννης ὁ Βαπτιστής]: a son of the priest Zacharias and Elizabeth, a cousin of the mother of Jesus. John was born six months before Jesus. In the fifteenth year of the reign of Tiberius (26 A. D.) he began to preach in the deserts of Judea, announcing the coming of the Messiah, admonishing to repentance, and baptizing as a symbol of purification from sin. The wonderful circumstances accompanying his birth and his baptism of Jesus, as well as his relations to Christ and his death, are recorded in the Gospels, and very little is known of him from other sources. He was imprisoned and beheaded by order of Herod Antipas in the Castle of Machærus, E. of the Dead Sea, perhaps early in 29 A. D. In the Christian Church June 24 is commemorative of his birth. There are many representations of him by Christian art.

John the Constant: Elector of Saxony; b. June 30, 1468; was brought up at the imperial court and distinguished himself in the war against the Hungarians. He succeeded his brother, Frederick the Wise, in 1525, and put an end to the Peasants' war in his own dominions. He formed an alliance with the landgrave, Philip of Hesse, and other princes, in support of the principles of the Reformation, lately inaugurated by Luther. He protested in 1529 against the decision of the Diet of Spires adverse to the Reformation, and was influential in causing the proclamation of the Augsburg Confession. Still later he helped to form the League of Schmalkald, and died Aug. 16, 1532.

John the Evangelist: one of the twelve disciples and the author of several books of the New Testament.

1. *Life.*—John was born on the shores of the Lake of Gennesaret, in Galilee, and probably at Bethsaida (compare Mark i. 16, 19 and John i. 45). According to the first text, he followed the occupation of a fisher, together with his father Zebedee, his brother James, and his two friends and associates Simon (Peter) and Andrew. His mother, whose name was Salome (according to Matt. xxvii. 56, which compare with Mark xv. 40), must have been a pious woman, ardent and filled with the Messianic expectations, though under their most earthly form (Matt. xx. 20, *seq.*). She no doubt poured her own faith, including this alloy, into the hearts of her sons. As soon as John the Baptist, the new prophet who announced the approach of the kingdom of God, called people to prepare themselves by repentance and baptism, John and James hastened to him and remained with him as his disciples; and it was here that Jesus first met with them on his return from the temptation in the desert. The admirable picture drawn in the first chapter of the Gospel by John embodies in traits full of freshness the remembrance of this meeting, which became decisive for the life of John. Having found his first disciples among the followers of his precursor, Jesus took them back with him to Galilee; and as he himself had not yet separated from his family (John ii. 1–12), he sent them also back to theirs; but on the approach of the next Passover feast he called them definitively to follow him permanently as his disciples, and repaired with them to Jerusalem, where he inaugurated his public ministration by expelling the venders from the temple (Matt. iv. 18, *seq.*; John ii. 14, *seq.*). From this moment John accompanied him through all the incidents of his earthly life, which he has described so dramatically in his Gospel. Together with Peter and James he formed a closer circle around Jesus, and he was present at the most secluded scenes of his life (the resurrection of the daughter of Jairus, the transfiguration, Gethsemane); but of the three he was the friend of the heart of the Lord. It is, indeed, impossible to doubt that the "disciple whom Jesus loved," which is the expression used in the fourth Gospel, means John himself. It is the phrase which he substitutes for his own name, embracing the gentlest remembrances which ever thrilled through the heart of man. Modern criticism has raised the supposition that either Nathanael or Andrew could have been meant, or even a purely ideal being which never existed in reality. But those two disciples are designated by name in several passages of the Gospel (i. 41; vi. 8; xii. 22; i. 46, *seq.*; xxi. 2), and how could the disciple whom Jesus loved be any other than one of the three intimates with whom he liked best to associate? As for an ideal being, how could the evangelist place him among the twelve, and ascribe to him a decisive part in the scene which brought about the departure of Judas from the Last Supper (John xiii.)? How could an ideal being be the friend to whom Jesus from the cross bequeathed his mother, and who took her into his home from that moment (John xix. 27)? Such traits can be applied only to a being of flesh and bones. Up to the time of the death of Jesus, John lulled himself in the most glorious earthly expectations (Mark x. 35, *seq.*), but the resurrection of Christ then opened his eyes, and at the same time he understood the whole Scripture, and he "believed" (John xx. 8). The New Testament does not mention that there was granted to John, like Peter and James (Luke xxiv. 34; 1 Cor. xv. 5, 7), any appearance of the Lord after his resurrection. If those appearances of Jesus which are recorded were fictitious, the very first would certainly have been attributed to John. Pentecost accomplished the work commenced by the resurrection. John makes us understand what took place within him on that day, recalling with predilection in his Gospel those promises of Jesus, "When the Spirit of truth is come, he shall glorify me"; "At that day ye shall know that I am in my Father, and ye in me, and I in you" (John xvi. 13 and xiv. 20). In spite of the very particular privilege with which he had been honored, John performed only a secondary part in the foundation of the Church, compared with his associates, Peter and James. Peter was the great instrument for the establishment of the Church in Israel (Acts i.–v.). James died in 44 as the first martyr, a fact which by itself proves the power of his influence on the Jewish people (Acts. xii. 2). Of the activity of John we know nothing except the two traits of little importance recorded in Acts iii. 1, *seq.*, and viii. 14; and we should have considered his influence on the apostolic Church as very small but for the words of St. Paul (Gal. ii. 9), who ranks him among the three "pillars" of the Church. A modern school has attempted to establish, by the aid of this and some other texts, that John and the other apostles belonged, even after Pentecost, to that narrow Jewish-Christian party which would impose the circumcision and the Mosaic law on the Gentiles as a condition of their entering the Church. But the above text proves exactly the opposite, since Paul here expressly distinguishes between the representatives of the apostolate, James ("the brother of the Lord"), Peter and John, who would not impose the law on the Gentiles (verse 9), and the "false brethren" who had stolen themselves into the Church in order to maintain the rule of the law (verse 4). Compare the: "because of the false brethren" (Gal. ii. 4), which indicates the opposition between the apostles (verse 2) and them, and the: "But of those" (verse 6), which indicates again the opposition between the false brethren and the apos-

less. John himself, no doubt, observed the law, as did his associates, but only from a feeling of national piety and Israelitish fellowship; he would not impose it on the Gentiles who believed, for if so he could not have given "the right hands of fellowship" to St. Paul (verse 9). It was not until after the death of Peter (about 64) and Paul (about 66), and after the destruction of Jerusalem, that the activity of John assumed its grand proportions. According to a unanimous tradition in the churches of the second century, he went to Asia Minor, where Paul had founded a magnificent circle of churches. The truth of this tradition has been disputed, however, quite recently. It has been said that the Church fell into this error by attributing falsely the Revelation to John the apostle, and then inferring that he lived in the center of the Asiatic churches (Rev. i.–iii.). But the historical testimonies are with respect to this fact so old and so authoritative that to deny it would be to overthrow all history. In his great work *Against the Heresies* (about 185), Irenæus, who in his youth had been a disciple of Polycarp, speaks frequently of the relations of Polycarp to the apostle during the sojourn of the latter in Asia. He refers to what the presbyters of Ephesus and Polycarp have heard John record of the Lord; and he adds, "there are people who have heard from the mouth of Polycarp how John, the disciple of the Lord, once went to take a bath in Ephesus, but suddenly, on seeing Cerinthus, left the house without taking any bath, exclaiming, 'Let us flee before the house falls down on us, for Cerinthus, the enemy of truth, is here.'" In a celebrated letter he refers to his old friend Florinus, and the time which they, while young people, spent together in the presence of Polycarp, recalling how this bishop taught people and told them of his "connection with John and others who had seen the Lord." In another letter, addressed to Victor, Bishop of Rome, he reminds him of his predecessor, Anicetus—how, in spite of certain ritualistic differences, he had celebrated Easter together with Polycarp, and how this latter had defended his form of the celebration by the fact that in this manner he had always commemorated the event with "John, the disciple of our Lord, as well as with the other apostles with whom he had been together." Besides this decisive testimony by Irenæus we have another by Apollonius, a writer from Asia Minor, living about 175, who attributes to John the resurrection of one dead at Ephesus: and a third by Clement of Alexandria, who in his essay, *Who is the Rich that shall be Saved?* (par. 195), records an interesting story of a young Christian from Asia who had become the chief of a band of robbers, but was reclaimed by John, who at that time was visiting the churches of Asia Minor for the purpose of appointing bishops and regulating their affairs; and last we have the testimony of Polycratus, seventh Bishop of Ephesus, in whose family this office has been, so to speak, hereditary since the time of the apostles, and who in the name of the bishops of Asia reminds Victor of the incontestable fact that among the founders of the Church of Ephesus was John, the disciple "who had leaned on the bosom of the Lord, and that he was buried at Ephesus." Before such testimonies the criticism which denies accuses itself of partiality. Jerome represents how the old apostle, in the last days of his life, was carried into the assemblies of the Church, but confined himself to the repetition of the command, "Little children, love one another"; and how, when asked "Why do you never say anything more?" he answered, "Because when this is done enough is done." Irenæus states that John lived in Asia till the time of Trajan (97–117) and Jerome adds that he died in extreme old age "in the sixty-eighth year after the death of the Lord" (which, if Jesus died in 30, brings us down to 98), and that he was "buried in Ephesus." These authors ignore entirely a strange story contained in a newly discovered fragment of a chronicle written in the ninth century by a certain Georgius Haumartolos, who says that he has read in a work of Papias, written in the second century, but now lost, that John was "put to death by the Jews." This legend has been used as an argument against the residence of John in Asia, as if there had been no Jews in Ephesus. Even this very day those who visit the tomb of Polycarp at Smyrna, and pass through the Jewish quarter, know what such a boldness may cost. At all events, no importance need be attached to this story, since it has never been mentioned by Irenæus, Eusebius, and the many others who were possessed of the work of Papias.

2. *Writings.*—Of the twenty-seven writings of the New Testament, five are attributed to the apostle John by the more or less unanimous tradition of the primitive Church—the fourth Gospel, one large and two smaller epistles, and the Revelation. In the evangelical collection the fourth Gospel shows a character of its own. It is a work composed in one train of inspiration, and not a redaction of a tradition already circulating in the Church, such as are the three others, at least to some extent. It opens with an introduction in which is given the essence of the history that follows: (1) The glory of the creative Word; (2) the crime and misery of the Jews who have rejected it in its humiliation; and (3) the fortune of the Church which has received in faith the incarnate Son of God. These three ideas of the introduction are also the fundamental ideas of the whole Gospel: Jesus begins making his glory manifest by his words and acts; soon the world divides itself, the ones taking part against him, others for him. Thus the *glory of Jesus*, the *unbelief*, and the *faith* are the three facts on which the whole narrative rests. (1) Chs. i.–iv., first revelations of Jesus, and first impressions of unbelief and faith, as yet intermingled; (2) chs. v.–xii., special development and constant progress of unbelief, both with the chiefs and the mass of the people, as each appearance of Jesus at Jerusalem on the festivals is the signal to a new outburst of hatred; (3) chs. xiii.–xvii., special development of the faith with the disciples during the last times preceding the death of Jesus; (4) chs. xviii. and xix., the external victory of the Jewish incredulity and defeat of Christ (his judgment and punishment); (5) chs. xx. and xxi., the consummation of faith with his disciples through the victory of Jesus over death by the resurrection. No other name than that of John has ever been inscribed in the title of this work. It bears a formal testimony of itself in the last words of chapter xxi., affixed by the editors of the book, according to which the author was the disciple whom Jesus loved, and who was still living at the time when the publication took place: "This is the disciple which testifieth of these things and wrote these things" (xxi. 24). The author himself declares that he has been an eyewitness of the events he records (i. 14; xix. 35). Moreover, the whole narrative has an autobiographical character. It does not begin with the history of the ministration of Jesus, but with the first meeting between Jesus and the author—for the second disciple (i. 35, *seq.*) must be the author himself; the anonymity guarded with respect to this disciple, and the picturesqueness of the narrative, prove it sufficiently; and it does not extend to the ascension, but ends at the moment when the author's faith becomes full, when he can exclaim from the depth of his heart, with Thomas after his conviction, "My Lord and my God!" The last word of the Gospel corresponds with its first, "The Word was God!"

In our days the authenticity of this book is attacked with particular eagerness; and this is quite natural. If the divinity of the Lord is the palladium of the Church, the Gospel of John is the palladium of this truth. Matthew has demonstrated the Messianic *office* of Jesus; Mark has described his powerful daily *activity*; Luke has traced the progress of his *work of salvation* from Bethlehem to Jerusalem, and from Jerusalem to Rome; but it is John who has unveiled the eternal divinity of his person, thus offering to the Church its most perfect food and to unbelief the heaviest stone of offense. To whom could such a work be attributed if it were not written by St. John? A great unknown, it is answered, composed it in the first half or in the middle of the second century. But the great authors of the second century, Ignatius, Papias, Polycarp, were men of deep piety certainly, but of mediocre talent, and that this superior genius who composed the fourth Gospel, and who surpasses all the known authors, should have remained completely unknown himself, and passed through the Church of the second century without leaving the smallest vestige of his personal existence is incredible. Renan himself acknowledges that it is not possible to trace a probable place in the ministration of Jesus without the dates of the fourth Gospel. He points out in this book a multitude of "precise traits" which necessarily indicate an eyewitness. Credner, a critic who by no means belongs to the orthodox school, ends his essay on the fourth Gospel by saying, "If we had no historical dates at all referring to the author of the fourth Gospel, . . . the nature of the language, the freshness and vividness of the narrative, the precision of the dates, . . . the author's love and tenderness toward the person of Jesus, the irresistible charm diffused throughout the whole narrative, . . . would lead us to infer that the author could be no other person than a *native of Palestine*,

an *eyewitness*, an *apostle*, one *beloved by Jesus*—*John*, indeed, whom the Lord had personally captivated by the celestial charm of his teaching, . . . and who, during his residence in a city like that of Ephesus, had become able to vindicate his place among the Greeks, so distinguished for their literary culture." (*Introduction to the New Testament*, § 93.) It seems, indeed, that John wrote the Gospel in Ephesus, and between 80 and 90. This is sufficiently proved by the only contradictions worth mentioning. The Alogians, a small Phrygian sect formed toward the end of the second century, attributed this Gospel to Cerinthus, the adversary of John in Ephesus, thus testifying to the great antiquity and to the birthplace of the book.

The larger Epistle bearing the name of John is evidently by the same author as the Gospel. Here too he represents himself as an eyewitness to the life of Jesus (i. 1, *seq.*). From the beginning of the second century it has been used by Ignatius, Papias, and Polycarp. It contains the celestial philosophy which the author has drawn from the teaching, the labor, and the person of Jesus. This he opposes to the heresy already breaking in, and he offers it to the Church as the ideal of Christian life; not that he considers this ideal of perfection as something inaccessible; on the contrary, it is a holiness which the presence of Jesus in the believing soul realizes every moment. The two small Epistles seem to have spread very slowly in the Church, on account of their smaller importance. This explains also why they have not as many testimonies in their favor as the two preceding writings. There is between them a beautiful contrast. In the first, John praises the firmness of a Christian lady called *Kyria* in breaking with the preachers of heresy; in the second he praises the charity of his beloved Gaius, whose house is always open to the preachers of the Gospel. It is on the one side the holy exclusiveness, on the other the generous broadness, of the Christian faith. The book of Revelation is discussed elsewhere. See REVELATION, BOOK OF.

3. *Character and Influence.*—John seems not to have possessed either the bold initiative of Peter or the penetrating dialectical power of Paul. The part, little conspicuous, which he plays before and after Pentecost, and up to his residence in Asia Minor, indicates a character discreet, reserved, even timid, which must arrive at a sure feeling of its own maturity before it dares act in the external world; but this trait reveals a profound nature, meditative, gifted with a deep receptivity. By giving to John and James the surname of "Boanerges" (that is, "the sons of thunder") Jesus has unveiled the mystery of their characters. We understand at once those rare and passionate characters. It is they who will command fire to come down from heaven on the Samaritan village which did not receive Jesus (Luke ix. 52, *seq.*). It is also John who silences the disciple who, without following with him, casts out devils in the name of Jesus (Luke ix. 49). We also understand how the John of the Gospel can be the John of the Revelation. Nothing is falser, indeed, than the idea which is generally entertained of the sweet tenderness and feminine softness of John. Such natures as his generally attach themselves passionately to the object of their love: there is absolutism in their feeling. While the other apostles admired the miracles of Jesus, and more especially retained his moral precepts, John contemplated his person, and pondered in his heart over those mysterious testimonies emanating from the consciousness of Jesus concerning his relation to the Father —testimonies which escaped all the others. Renan has said that the Semite proceeds by intuition, not by deduction. This remark is in the highest degree applicable to the intellectual tendency of John. He does not dissect the argument of his adversary, as does St. Paul, dissolving it with his irresistible dialectical power; he crushes it with one blow. He sees the light on the one side, and on the other the darkness, and when he has given each of them its true name, he has said his all. The upright soul can not hesitate, according to him. Having seen this vision, he who still searches after the way is lost. Being thus constituted, St. John was not intrusted with the foundation of the Church among the Jews or the Gentiles, as were the missionary apostles, or as Paul, with the emancipation of the New Testament from the Old through a profound and penetrating study. His mission was to place the crown on the work of his two colleagues. He gave to the Church of Asia Minor that powerful organization which enabled it to stand against the floods of heresy in the beginning of the second century, and made this Church the center of the whole Church during this epoch, on account of the power of its spiritual life. By his writings, more especially, he led the Church to a perfect understanding of the salvation which is in Christ, developing in his Gospel the idea of the *Redeemer*; in his Epistle, that of the *Christian*; and in the Revelation, that of the *Church*. In him the Church of the first century finished its cycle, which is the type of the history of the whole Church.

The literature upon the Gospel of John, and especially upon the problem of its authorship, is very large. The reader is referred to the volume in such general commentaries as Lange's, the *Speaker's*, the *Popular*; to the *Exposition Bible*, the *Pulpit Commentary*; Sadler's; to the independent works on the Gospel by Luthardt (2 vols., Edinburg, 1878–79), Godet (1881–85, 3 vols.); on the Epistles by W. Alexander (London, 1881; 3d ed. 1890); B. F. Westcott (1883; 3d ed. 1892). FRÉDÉRIC GODET.

Johor, jō-hōr': a native state occupying the southern end of the peninsula of Malacca, bounded by the Moar on the N. W. and the Indu on the N. E., excepting Singapore and vicinity. It comprises an area of 9,000 sq. miles, with a population—exclusive of the tribes of the interior—estimated at 100,000, mostly Malays and Chinese. The country is very little known, and seems for the larger part to be covered with primitive forests. Gambier and catechu, black pepper, timber, rattans, and dammar are exported. But the soil is extremely fertile and well suited to the cultivation of the sugar-cane, the coffee-tree, the tobacco-plant, rice, etc. The town of Johor, situated in lat. 1° N., 15 miles N. E. of Singapore, is a flourishing settlement. The state is under British protection.

Joigneaux, zhwäñ'yō', PIERRE: journalist and agronomist; b. at Varennes, department of Côte-d'Or, France, Dec. 23, 1815. He passed through the Paris École Centrale des Arts et Manufactures, and launched himself in politics, writing for the opposition papers. He was sentenced to prison under the Louis Philippe Government, but elected in 1848 representative to the National Assembly, where he took his seat on the extreme Left. After the *coup d'état* of Dec., 1851, Joigneaux was exiled to Belgium, from whence he returned after the proclamation of amnesty to devote himself exclusively to agricultural writings. He published many articles, founded agricultural journals, and wrote *The Peasants under Royalty* (2 vols., 1850–51); *Dictionary of Practical Agriculture* (2 vols., 1855); *Counsels to the Young Farming-woman* (1861); *Vine Culture and Manufacture of Wine in Belgium* (1862); *New Letters to Farmers* (1871); and many other works. He was elected a member of the National Assembly in 1871 and of the Chamber of Deputies in 1876. He took his seat among the extreme Left and voted against the preliminaries of peace, but chiefly devoted his attention to economical and agricultural questions. He was returned in 1881 and 1885. In 1889 he was elected senator. D. at Bois-Colombes (Seine), Jan. 25, 1892.

Joinder: a term used (1) in the law of contracts for the uniting of two or more persons or parties as obligors or obligees; and (2) in the law of pleading for the joining or coupling together of two or more parties in an action at law or other legal proceeding, and of the joining together of two or more causes of action in the same declaration or complaint.

In the *law of contracts* express words of joinder are not necessary to create a joint obligation or right, but when an obligation is undertaken by two or more or a right given to two or more, it is the general presumption of law that it is a joint obligation or right, and in order to produce a several responsibility or several right there should be words of severance. Where the obligation is joint the obligee can enforce it only against the obligor, where the obligation is joint and several the obligee may proceed against each severally, or jointly against all; but he can not treat it as several with relation to some of the obligors and joint as to the rest. A right can be either *joint* or *several*, but a covenant or right which is single in its nature can never be *joint and several* with respect to the covenantees or obligees. A fuller treatment of this subject will be found under the article JOINT AND SEVERAL.

The rules governing the *joinder of parties* in actions are much more liberal in courts of equity than in common-law courts. The latter are frequently extremely technical, while the former permit the bringing in of all persons whose presence is necessary to complete the determination of the matter in controversy, those who properly should be plaintiffs being made defendants in case of their refusal to

join as plaintiffs. In certain cases also when the parties are numerous, one or more may sue for the benefit of all, as where one creditor brings suit by a creditor's bill.

The general rule governing this subject at common law is that when the interest in a contract is joint, the cause of action is of the same nature and all the parties must be united; and the rule is the same in the case of a joint liability. When the liability is joint and several suit may be brought against all or severally against each. In the case of husband and wife, special rules exist requiring them to be united as parties to an action, these rules growing out of the technical common-law fiction that the legal existence of the wife is merged in that of the husband. These rules have been largely done away with by statutory laws modifying the common law.

The penalty at common-law procedure for failure to make the proper persons parties is very severe, and in some instances fatal at any stage of the cause, but by modern legislation errors of this kind are in many cases amendable before or at the trial.

The rule as to *joinder of causes* of action in the same declaration or complaint at common law was, in civil cases, that when the same plea might be pleaded and the same judgment given on all the counts of the declaration, or when the counts were of the same nature and judgment was to be given on them, all the several causes of action might be joined. Thus in an action on contract, a count for debt upon a bond might be united with a count for debt upon a simple contract, and in an action of tort several claims for trespasses might be joined. A demand upon contract, however, could not be united with a claim grounded in tort. The subject of joinder of actions, particularly in civil cases, is now generally regulated by statute.

Most of the rules of law governing the subject of joinder are of so technical a character that there has here been given only the most general statement of them, reference being made for a fuller exposition to the books on pleading referred to under the article PLEADING, and to the works of Dicey, Barbour, Hawes, and Calvert *On Parties to Actions*.

F. STURGES ALLEN.

Joint [from O. Fr. *joint*: Ital. *giunta* < Lat. *junc'ta*, joining, joint, deriv. of *jun'gere*, join, whence Eng. *join*]: in anatomy, an articulation, or the connection existing between the several bones of the skeleton. The tissues entering into its formation are bones, the ends of which are covered by cartilage, and bound together by ligaments; in the more movable a membranous sac is interposed, which secretes a lubricating fluid called synovia. The construction of joints differs in various parts of the body, according to the function which they have to perform; and in consequence of this they have been divided into three classes, viz., the immovable, those permitting limited motion, and the movable. The latter, which are the most important, are of several types, as the ball-and-socket, the hinge-like, etc. Joints are liable to a number of diseases of an inflammatory type, which, like rheumatism and gout, result from some general bodily condition, or, like ordinary synovitis, from injury to the joint. If the inflammation is serious the underlying bones may be involved, and finally the joint may be destroyed, the bones becoming united by firm adhesions.

1. *Synarthrosis*, an immovable articulation: (*a*) *Sutura*, in which the bones are dovetailed into each other, as in the skull. (*b*) *Harmonia*, in which the joints are but slightly marked, as union of superior maxillæ. (*c*) *Gomphosis*, in which a conical point fits into a socket, as the teeth into the alveoli. (*d*) *Schindylesis*, an articulation by furrowing, as the rostrum of the sphenoid with the vomer.

2. *Amphiarthrosis*, an articulation permitting limited motion: (*a*) *Syndesmosis*, the articulation of two or more bones by means of ligaments, as radius and ulna. (*b*) *Synchondrosis*, the articulation of bones by means of cartilage, as that of the ribs with the sternum. (*c*) *Symphysis*, the union of bones by fibro-cartilage, as the pubes.

3. *Diarthrosis*, a movable articulation: (*a*) *Arthrodia*, a gliding joint, as sterno-clavicular. (*b*) *Enarthrosis*, a ball-and-socket joint, as the shoulder and hip joints. (*c*) *Ginglymus*, a hinge-like articulation, as at the elbow and knee. (*d*) *Diarthrosis rotatorius*, as the atlo-axoid joint.

The diseases to which the joints are most liable are synovitis, chondritis, and osteitis.

Revised by WILLIAM PEPPER.

JOINTS: in geology, cracks of a peculiar kind dividing rock masses. They usually occur in systems, the members of each system being approximately parallel and plane. They are distinguished from the dividing surfaces of strata in that they do not coincide with changes in texture, and they usually intersect strata at a high angle. They are distinguished from cleavage by the greater thickness of the blocks between parallel planes, and by the fact that the blocks have little or no tendency to split in the same direction. In level stratified rocks joints frequently exhibit two vertical systems intersecting one another approximately at right angles. One theory explains joints as a result of the passage of earthquake waves; another as minute faults resulting from strains engendered by the forces that elevate mountains. See A. Daubrée, *Études synthétiques de géologie expérimentale* (1879); W. O. Crosby, *Proc. Boston Society of Natural History* (Oct., 1882); G. F. Becker, *Bull. Geol. Soc. Am.* (vol. iv., pp. 13–90, Rochester, 1892).

G. K. GILBERT.

Joint and Several: a legal phrase denoting the liability of two or more persons to be held either collectively or as individuals. Such liability may arise from a contract or may be imposed by the law. If the contract declares that the obligors bind themselves jointly and severally, there can be no doubt as to the nature of their liability. When it contains no express statement on this point, it will generally be held a joint agreement if the interests of the obligors are joint, while if their interests are several, it will be deemed the several contract of each. The tendency of the common-law courts was to hold a contract to be joint rather than joint and several. On the other hand, a court of equity often declared a contract joint and several although its language imputed a joint promise. (Story's *Equity Jurisprudence*, § 162.) It was formerly understood that the liability of partners in England was joint and several in equity, but the House of Lords decided in *Kendall* vs. *Hamilton*, 4 Appeals Cases 504, that such had never been the rule. This decision is in accordance with the doctrine prevailing in the U. S. in the absence of a statute. (See PARTNERSHIP.) In Scotland the liability of partners upon firm contracts is joint and several. (English Partnership Act of 1890, § 9.) In case a promise is written in the singular number, but the instrument is executed by more than one, it is treated as the joint and several agreement of all. If a firm and others sign such a contract, the partners are jointly bound as between themselves, but the firm and the other signers are jointly and severally liable.

At common law the death of a joint debtor discharged his estate from liability and threw the entire burden of the obligation on the survivor. This has been changed by statute in many of the U. S. Some of the States have even declared that all contracts, which are joint in form or by legal implication, shall be deemed joint and several. Upon the death of one bound by a joint and several contract the obligee can sue the survivors and also the representative of the deceased. If the obligee releases under seal a joint, or a joint and several obligor, he thereby releases all, unless he expressly reserves his rights against the others. A release of one of such obligors by operation of law, as by a bankruptcy discharge, does not affect the liability of his copromisors. Suit may be brought on a joint and several contract against any one promisor, or against all, but not against more than one and less than all. A judgment against one without satisfaction will not bar a suit against any other, but it will bar a joint action; and so a joint judgment even without satisfaction will bar a separate suit. This has been changed by statute to some extent.

Persons who unite in committing a tort are jointly and severally liable. It is not necessary that they act in concert. If their acts or their omissions to act contribute to produce the injury, both are responsible therefor; as where an individual places a dangerous article in the highway and the city authorities negligently allow it to remain, both or either may be sued for damages thus occasioned. (*Osage City* vs. *Larkin*, 40 Kansas 206.) In the case of a joint tort, the party wronged may join all or any number of the wrongdoers. In the U. S. a judgment against one or more without satisfaction does not bar a suit against the others. It does in England.

The phrase "joint and several" is not applied to the obligees in a contract. At common law they were either joint or several, but never joint and several, and the same rule applied to those having causes of action in tort. In equity, however, persons having distinct claims which are not antagonistic are frequently allowed to join in a suit

against common opponents. An example is a creditor's suit to set aside a fraudulent conveyance of his property by a debtor. This may be brought by a single creditor, or any number of the defrauded creditors may unite in the suit. It is the tendency of modern legislation to conform common-law procedure to that of equity in this respect. The liability of "joint and several" parties to CONTRIBUTION is discussed under that heading. FRANCIS M. BURDICK.

Joint Firs: popular name of gymnospermous plants belonging to the order *Gnetaceæ*, which is closely related to the *Coniferæ*. The species are thirty-six in number. They are small trees and shrubs, mostly belonging to the genera *Gnetum* and *Ephedra*, and natives of tropical and warm countries. Their stems are jointed, their juices not resinous, but watery, or sometimes gummy. Several species grow in the southwestern part of the U. S. The curious Welwitschia (*Tumboa bainesii*), a native of Southwestern Africa, has a stump-like stem bearing two long strap-shaped leaves, and clusters of scarlet cones. CHARLES E. BESSEY.

Joint Ownership: a general descriptive term including all forms of ownership whereby the title to property, real or personal, is held by more than one person at one and the same time. Opposed to the notion of joint ownership is that of individual ownership, or ownership in severalty, which, as Blackstone says, is "the more common and usual way of holding an estate." The foregoing definition makes it clear that if lands are granted to A and his heirs, or to A for life with remainder to B, or to a corporation, its successors and assigns, or to one person in trust for several others, the property is, nevertheless, held in several and not in joint ownership, the title to the same being in each case vested in only one person at one and the same time; the corporation being regarded as one person, and the words of inheritance, or succession, or of trust vesting in no one a present legal interest. It is the individual and exclusive nature of the ownership that distinguishes an estate in severalty. In the various forms of joint estate, on the other hand, there is no exclusive ownership of the whole estate or of any particular part of it. Whether the subject-matter be a horse, a sum of money, or a tract of land, each joint owner owns the whole or an undivided interest in the whole property concurrently with the others. No one person has an individual and exclusive right to a separate and particular portion of the horse, or land, or money.

This conception of a joint or common ownership of property, shared by several or by many persons, no one of whom can claim any particular portion or share of the property as his own, is for most of us a somewhat difficult one to entertain, accustomed as we are to separate, individual ownership; but it can not be doubted that the notion of a common ownership of property has been far more familiar to the race as a whole than that of ownership in severalty; that ownership in common, by the family, or clan, or tribe, at one time prevailed very extensively among the races from which our modern social order and law are derived; and that ownership in severalty, under the description of private ownership, is a comparatively modern development out of those primitive conditions. From this point of view the various forms of joint ownership which are herein described may be regarded as a survival from a state of society and law which was once very widely extended if not universal, and not as an anomalous development out of the more usual forms of tenure now prevailing.

As was to be expected from what has been above said, joint or common ownership has prevailed under every system of law of which we have any knowledge. The rules defining and regulating such ownership formed an important part of the Roman law of *Dominium*, or ownership. In what follows, however, we shall confine ourselves to a brief consideration of the subject as understood and developed in the common law of England and the U. S. By that law five different forms of common ownership are recognized, viz.: joint tenancy, tenancy in common, coparcenary, tenancy of the entirety, and partnership.

I. *Joint Tenancy.*—This is the oldest and was formerly the most widely extended and the most important form of common ownership, though it has now, in the two latter particulars, yielded precedence to tenancy in common. It arose whenever an estate was acquired by two or more persons in the same property by the same title, at the same time, and without any limitation by words importing that they were to take in distinct shares. A joint tenancy can be created in no other way than by "purchase." This is a technical term, comprehending every mode of acquiring property excepting inheritance. In addition to this the following four conditions are essential to constitute such an estate: (1) It must be created by one and the same instrument, or originate in one and the same act. Thus one party can not acquire his title by deed and another his interest by will or by a disseisin. In other words, there must be "unity of title." (2) The estate must vest in each and every one of the tenants at the same moment of time. A conveyance from A to X and Y, the estate of X to vest immediately, that of Y to take effect on the death of A, would not create a joint estate. There must be "unity of time." (3) The quantity or duration of the estate of each owner must be the same. One can not have a life estate while another has a leasehold or a fee simple, but all must have life estates or leasehold estates, or fees simple, as the case may be. This is called "unity of interest." (4) The whole estate must be vested in each and every tenant. There can be no shares, nor any greater interest in one than in another. The estates of all are identical, for each one owns all there is. This is "unity of possession," and the several parties are said to be seised *per my et per tout*, which is interpreted to mean "of every part as well as of the whole."

These four unities, as they are termed, are the ear-marks of a valid joint tenancy; but the most important characteristic of the estate is the *jus accrescendi*, or right of survivorship. This means that however many joint tenants there may be, whether of a jewel, a flock of sheep, or a tract of land, each tenant, as he dies, leaves his estate to the whole body of survivors, and the survivor of them all gets the entire property free from any claims or interests of his late associates. And there is no way by which this right of survivorship can, so long as the joint tenancy continues, be defeated. The estate of each tenant is free from rights of dower and curtesy, and can not be alienated by will. Neither, as is obvious, can the estate of any tenant be alienated during his life; but a conveyance, purporting to convey the separate interest of a tenant has the curious effect of dissolving the tenancy, so far as he and his interest are concerned, and of creating a tenancy in common, with the purchaser as one of the parties and the survivor or survivors of the joint tenancy as the other party. If there are only two joint tenants originally, this of course has the effect of converting the joint tenancy into a tenancy in common. But if there are three or more joint tenants, as A, B, and C, and C sells out to X, X will enter the group as a tenant in common, having a one-third interest with A and B, who will together hold an undivided two-thirds of the property in common with X; but, as between themselves, A and B will continue to be joint tenants with the right of survivorship. Accordingly, if B should die, A would immediately become seised of his interest, and there would remain only a tenancy in common, with A holding an undivided two-thirds and X an undivided third of the estate.

It was a presumption of the common law, upon a conveyance to two or more persons, that they would take as joint tenants and not as tenants in common. This was due to the fact that the common law, under the influence of the feudal system, strongly favored joint tenancies, as being more in accord with the feudal organization of society. Although the reasons for entertaining this presumption have long since passed away, the presumption itself, through the inertia of the common law, still survives in England and in such of the U. S. as have not abrogated the common-law rule by statute. In most of the U. S. statutes have been enacted reversing this common-law presumption and practically abolishing joint tenancies except in the cases of executors, trustees, and in cases where the conveyance expressly provides that the property shall be held in joint tenancy, and not in common. In all other cases the estate is deemed to be a tenancy in common. See *Tenancy of the Entirety*, below.

II. *Tenancy in Common.*—This estate resembles joint tenancy in the particular that at common law it could be created only by "purchase"; but of the four "unities" which must characterize the latter, only one, unity of possession, is requisite to a tenancy in common. That is to say, although the interests of tenants in common may arise at different times and be the result of different instruments, and although one tenant may hold only a life estate or a leasehold while another has a fee simple, nevertheless, their interests being undivided, each one is deemed to be seised of the whole. But this seisin is not of such a nature that the several tenants must have equal shares, and of course there

is no right of survivorship. Upon the death of a tenant in common, his share, whether greater or less than that of his co-tenants, descends to his heir, who thereupon becomes a member of the tenancy, in common with the survivors. So, too, one of several tenants in common may alienate the whole or a part of his share by conveyance during his life, or by will, to one of his co-tenants or to a stranger. In any case the tenancy goes on just as before, only with a change of parties. The common-law rule confining tenancies in common to cases where the estate was created by "purchase" has been altered in many of the U. S. by statutes providing that two or more heirs taking lands by descent, shall hold them as tenants in common.

III. *Coparcenary.*—This estate was the substitute at common law for joint tenancy and tenancy in common in a class of cases where the two latter could not take effect, by reason of the fact that the estate was not created by "purchase" but by descent. Where lands descended on "two or more females" (among whom, there being no male heir, the rule of primogeniture did not prevail) they would inherit, not as joint tenants or tenants in common, but as parceners, or coparceners. Although the estate resembled joint tenancy in some respects, it was in all essential particulars more nearly akin to tenancy in common. There was no right of survivorship, and any parcener might freely alienate her share by deed or will. This estate still exists substantially as at common law in England and a few of the U. S. But in most of the U. S., as has been above said, heirs now inherit lands as tenants in common and not as coparceners.

IV. *Tenancy of the Entirety.*—This is a variety of joint estate which obtains where the tenants are husband and wife. It arises upon a conveyance of land by deed or will directly to husband and wife, and vests in them a joint tenure with right of survivorship and all of the other beneficial incidents of joint tenancy. But the unity of possession is even closer than in joint tenancy pure and simple. Husband and wife, being but one person in law, can not take the estate by moieties (*per my*), but both are seised of the *entirety* (*per tout*). It follows from this that neither party can alienate his share, or do any act that will dissolve or impair the estate. Tenancy of the entirety, or "by entireties," as it is sometimes termed, still prevails in England, and in many of the U. S. It has been preserved even in some of the States which, like New York, have most effectually destroyed the legal identity of husband and wife by recent legislation. See *Bertles* vs. *Nunan*, 92 N. Y. Reports 152.

V. *Partnership.*—The interest of copartners in the partnership property, though it has many analogies to tenancy in common, and is usually treated as a form of that tenure, nevertheless differs from it in many important respects. As these differences can not be understood without an understanding of the nature of the partnership relation, the subject of the property rights of partners will be considered as a part of that general subject. The same may be said of the nature of the interests which ship-owners have in ships and other maritime property jointly owned by two or more of them. These have some peculiar features which will be referred to under the head of PART-OWNERSHIP.

A few general characteristics, common to all or most of the above-described forms of joint ownership, remain to be mentioned. In all of them, whether the subject-matter be real or personal property, any one of the owners may represent the others and, if in possession, is entitled to the custody and enjoyment of the property. Usually he can not, in the absence of such abuse as amounts to a destruction of the property, be called to account for the way in which he may deal with it, nor can he be compelled to share the enjoyment thereof with his co-owners. However, if one receive the rents and profits of the estate, he may be compelled to account to the others, and pay to them their proportionate shares. One tenant is responsible to the others for the commission of waste upon the estate. If he will not join with them in making necessary repairs to the premises, after having been duly requested to contribute, an action may be maintained against him. Furthermore, if one tenant buys in an outstanding adverse claim to the property, it enures to the benefit of his co-tenants if they will contribute toward discharging the expense incurred. For this and other purposes each is deemed to be a trustee for the others. In all cases, however, excepting in tenancy of the entirety, the law recognizes a voluntary partition, or will compel the parties, on the request of any one of them, to make partition of the estate. Upon a partition the property is divided up among the parties, and each takes his own parcel or portion as tenant in severalty. At common law there could be no partition of personal property, but in many of the U. S. this is now permitted. For a fuller discussion of the subject, consult Washburne, *Real Property*; Stephens's *Commentaries*, and Freeman's *Co-tenancy and Partition*.

GEORGE W. KIRCHWEY.

Joint-stock Company: an association of individuals formed for the purpose of carrying on some mercantile, industrial, or other lawful undertaking, and having a capital divided into shares which are transferable by the respective shareholders at their own option, and the ownership of which is a condition of membership. As formed in accordance with common-law rules governing their organization and defining their powers, such associations are unincorporated and constitute a species of partnership. These associations are generally entered into under articles of association (commonly known in England as a deed of settlement) prescribing the general nature of the association and the object of its formation, together with provisions regulating its management, such as the amount of the capital stock, the number of shares, and the manner of their assignment, the number of directors, etc. They are usually, though not necessarily, composed of a much larger number of persons than an ordinary partnership, and, as a general rule, are designated by some specific name and not by the names of the members. The legal rights and liabilities of the members differ in many respects from those of common partners, and these differences will be here treated of, first, with regard to the rights and liabilities of the members between themselves; and second, with regard to their rights and liabilities toward third parties. For the rules by which they are governed, in common with PARTNERSHIPS, reference is made to that article.

Rights and Liabilities of the Members toward One Another.—The rights and liabilities of the members of an unincorporated joint-stock company, as between themselves, are in most respects the same or similar to those of a shareholder of a corporation, depending in any case, of course, upon the terms of the agreement under which the association is formed. Under the ordinary terms of association the management and direction of the company's business is committed to a board of directors or agents chosen by the votes of the shareholders, who have the same rights as shareholders of a corporation, namely, to take part in public meetings of the company, to elect or remove directors, to vote for or against proposed resolutions for the regulation of the affairs of the company, to receive dividends, to dispose of their shares as separate pieces of property, and upon the dissolution of the company to receive their proportionate share of its assets, and who have no other rights in or over the association, its assets, or its transactions. The doctrine of *delectus personarum* (Lat. choice of persons), therefore, which applies to all proper partnerships, has no application to a joint-stock company, membership therein being created and destroyed only by the transfer of the shares; nor is a dissolution effected, as in the case of a partnership, by the death, lunacy, or bankruptcy of one of the members, or by his assignment or transfer of his interest to another.

Rights and Liabilities of the Members toward Third Parties.—Each member of a joint-stock company, however great may be the number of its members, is liable, in the absence of any agreement by the creditors to the contrary, for the full amount of indebtedness incurred by the company in the course of its legitimate business, as in the case of a partnership; but, unlike the case of a partnership, only those members or agents can bind the company who are regularly authorized so to do, and a claim against the company based upon dealings with an unauthorized member will not be enforceable, the rule being the same as that which applies in the case of a partnership in which a stipulation between the partners limiting each one's capacity to bind the firm has been made known to a person who transacts business with any one of them upon that understanding. But an unincorporated joint-stock company, like a partnership, is not, like a corporation, a fictitious person capable of suing and being sued, and of acting generally in legal transactions like a natural person; nor is it regarded as having any distinct legal existence independently of the members who compose it. The members, like partners, must sue and be sued in the same way as all individuals who have engaged in a joint enterprise and have acquired joint rights and incurred joint liabilities. All must regularly be joined as plaintiffs or as defendants, and suit can not be brought in

the name of the company, but this has been generally changed by statute, as noted below.

Statutory Modifications of the Laws governing Joint-stock Companies. The rules governing joint-stock companies at common law gave rise to many inconveniences and hardships, especially those requiring (1) that all members of a joint-stock company must be joined as plaintiffs or defendants; (2) that no action could be brought by one member against another for money due in respect of any transaction of the company; and (3) that each member shall be responsible for the entire indebtedness of the company. In consequence of the first two of these rules it was, in many cases, practically impossible to enforce calls upon the stock, to adjust the rights of the shareholders among themselves, or for third parties to obtain justice in demanding settlement of claims against the company. In consequence of the third of these rules members were liable to have their entire property taken for claims or debts arising from the dishonesty or mismanagement of those to whom the management of the business of the company had been intrusted. To remove these disadvantages statutes have been passed both in Great Britain and generally in the U. S., modifying the rules and providing for the assumption by the company of certain characteristics of incorporations, and enabling the company to sue or be sued in its corporate name (service being made upon either of certain designated officers), and enabling the members to limit their liability.

The statute by which the formation of these companies is now regulated in England is the Companies Act of 1862 (25 and 26 Vict., c. 89; repealing all previous acts), as amended by subsequent acts 30 and 31 Vict., c. 131, and other acts). The provisions of these acts are applicable to the formation and incorporation of all joint-stock companies, require their registration in proper offices, and permit the shareholders to agree that their liability shall be limited either to the amount unpaid on their shares or to such amount as they may respectively undertake to contribute to the assets of the company in the event of its being wound up. Any seven or more persons associated for any lawful purpose may form such a company, and are required to subscribe a memorandum of association stating the name of the company, the amount of capital, the object of the association, the place of business, and the limit of liability, if any is agreed upon. If there is no declaration that the liability shall be limited, the company is called an unlimited one, and each shareholder is responsible for the entire debt of the company, as at common law. There are also provisions relating to the management and administration of companies, their inspection by boards of examiners, and the method of winding them up. The effect of this legislation has not been, however, to confer upon companies the entire powers which corporations regularly possess, since there is still retained the principle of the individual liability of the members, even though this may be limited in extent. In a true corporation legal responsibility does not attach to the individual corporators as separate persons, but only appertains to the fictitious person or body corporate which they have united to form.

In some of the U. S. provisions have been made for the formation of joint-stock companies by statutes which in their general effect are similar to the statutes enacted in England. In a number of the States there are no such associations as joint-stock companies distinct from corporations, but provisions have been made by statute for the formation of associations of a similar character by modifying the general principles relating to corporations in regard to the personal liability of the members. The practice has been not, as in England, to assimilate partnerships to corporations, and to designate the new form of association as a joint-stock company, but to assimilate corporations to partnerships by making the associates personally responsible to a greater or less degree for the common indebtedness, while the associations formed in accordance with such statutory regulations have been still designated as corporations. It is evident, however, that they are in important respects distinguishable from regular and true corporations, and bear a close resemblance to joint-stock companies.

History.—Before the year 1700 the formation of joint-stock companies was hardly known in England. But within a few years subsequent to 1711, when the South Sea Company was formed, and largely as a result of its speculative enterprises, a feverish spirit of speculation and adventure was widely prevalent throughout the kingdom, and gave rise to large numbers of private commercial companies for the prosecution of various visionary undertakings. Some of these companies were founded upon obsolete charters, while the larger number were organized without any pretensions of such a nature. These were commonly denominated "bubbles," and were deemed so detrimental to the public welfare that in 1720 an act of Parliament (known as the Bubble Act) was passed for their repression. This declared such companies illegal and void, and to be public nuisances. This act was not repealed until 1826, so that for more than a hundred years such companies were illegal in England. Since the time of this repeal the tendency of English legislation has been to favor such associations, and to render them more efficient and beneficial by remedying the defects in their organization at common law. In the U. S. joint-stock companies may be formed under common-law rules, except as otherwise provided by the statutes.

For details as to the laws regulating joint-stock companies at common law and under statutes, see the works of Thring and Wordsworth *On Joint-stock Companies* (both London), and the works of Lindley, Collyer, Parsons, and Story, *On Partnerships.* F. STURGES ALLEN.

Joint Tenancy: See JOINT OWNERSHIP.

Jointure: an interest or estate in real or personal property settled upon a wife at her marriage, to be enjoyed after her husband's death, in lieu of DOWER (*q. v.*). The common law has always provided for the substitution of a certain and definite provision for the widow in place of the general and indefinite provision secured by dower. Thus Littleton speaks (secs. 39 and 40) of "dowment at the church door," where the husband, as a part of the marriage ceremony, endowed the wife of a certain portion of his lands, at the same time declaring the quantity and the certainty of the land which she shall have for her dower. After the husband's death the widow might elect whether to enter upon the lands thus secured to her or to refuse them and take her dower after the course of the common law. Later, and for upward of two centuries, the common-law estate of dower was practically in abeyance, owing to the prevalence of the practice of conveying lands "to uses," the naked legal title to the land being vested in one man, and the use or beneficial enjoyment thereof in another. In the early part of the sixteenth century the greater part of the land of England was held in this way. This arrangement shut out the wives of both men from acquiring dower in the lands, the one having only a barren title, without any rights of use or enjoyment in the property, the other having all of those rights but not being seised of the legal estate. Accordingly, it became customary on the marriage of the parties, in order to provide a substitute for this lost dower, to settle by express deed some special estate in lands to the use of the husband and his wife for their lives in joint tenancy or jointure, which settlement would, by the operation of the principle of survivorship (see JOINT OWNERSHIP), be a provision for the wife in case she survived her husband. But when the Statute of Uses (27 Hen. VIII., c. 10, A. D. 1536) transferred the legal seisin of all lands to those who had the use thereof, it practically, at a single stroke, revived dower all over England. The effect of this would have been to give many wives both dower and the jointure which had been settled on them as a compensation for the loss of dower. Wherefore the same statute recognized the existence of jointure as a provision in lieu of dower, and declared that where such an estate had been or should thereafter be settled upon the wife before marriage she should be forever barred of her dower. In order to constitute it a good jointure, however, it was necessary (1) that the provision be an estate or interest in lands; (2) that it be limited to take effect immediately on the death of the husband; (3) that it be an estate for the wife's own life at least, and not for the life of another or any smaller estate; (4) that it be secured to the wife herself and to no one else in trust for her; and (5) that the provision be made in satisfaction of her whole dower and not of a part of it only, and this intention must be plainly expressed in the deed creating the jointure. On the other hand, if the jointure was made to the wife after marriage, she had her election after her husband's death, as in the case of endowments at the church door, either to accept it, or to refuse it and betake herself to her dower at common law.

At the present time the institution of jointure, as "a competent livelihood of freehold for the wife" (Lord Coke, in *Vernon's Case*, 4 Coke Rep. 1) as a substitute for dower, exists in England and most of the U. S. substantially as at

common law. The equity tribunals have modified it by allowing to a pecuniary provision, if accepted by the wife, the same effect as a provision of lands at common law. So, also, an estate less than a freehold, an interest in personal property, or even an executory agreement to make a settlement in lieu of dower, will satisfy the requirements of equitable jointure; but no settlement or provision which falls short of the rigid requirements of the common law as to jointure will be obligatory on the wife unless the same be accepted by her either before marriage or after the death of her husband. In the U. S. the law in relation to jointures has, to a considerable extent, been further modified by statute. The tendency of legislation has been to assimilate the rules in relation to legal jointure to those prevailing in equity. In some of the States the distinction between legal and equitable jointure has been entirely abolished, and the entire subject is regulated by express statutory provisions. Thus in New York it is provided that either an estate in lands or a pecuniary provision may be given in lieu of dower, and that if the jointure be created before marriage it must be consented to by the intended wife in order to be a bar of dower. Her consent may be evidenced, if she be of full age, by her becoming a party to the conveyance by which the jointure shall be settled; if she is a minor, by her joining with her father or guardian in such conveyance. If the settlement be made after marriage, she will have her choice between jointure and dower. The election is to be made within one year after the husband's death, or she will be deemed to have accepted the jointure. Jointure may also usually be barred in the same manner and forfeited for the same causes as dower. It is also true that, both in law and equity, if the provision made by way of jointure should wholly or partially fail, or the jointress be disseised of her estate, the right of dower will revive so far as is necessary to afford compensation for the loss sustained. See Scribner on *Dower*, Roper on *Husband and Wife*, and Stimson's *American Statute Law*. GEORGE W. KIRCHWEY.

Joinville, zhwaṅn'veel, François Ferdinand Philippe Louis Marie d'Orléans, Prince de: the third son of Louis Philippe; b. at Neuilly, Aug. 14, 1818. At the age of thirteen he began his naval career as pupil on board the frigate Artémise. In the attack upon Fort San Juan de Ulua and the city of Vera Cruz he distinguished himself in a shore expedition against the city, in which in a hand-to-hand combat he captured the Mexican general Arista, for which he was made chevalier of the Legion of Honor and *capitaine de vaisseau*. In 1840 he, in command of the frigate La Belle Poule, was charged with conveying the remains of Napoleon from St. Helena to France. In the same frigate he visited the U. S., and was warmly received in Philadelphia and Boston. In 1843 he married the Princess Francesca di Braganza, daughter of Pedro I. and sister of the Emperor of Brazil. Made at the same epoch (1843) *contre-amiral* (rear-admiral), he in 1844 commanded the fleet which bombarded Tangiers and seized Mogador, displaying on the latter occasion conspicuous personal gallantry. On the breaking out of the civil war in the U. S. in 1861 he embarked for New York, taking with him his son, the Duc de Penthièvre (who entered as a cadet the U. S. Naval School, then at Newport), and accompanied by his nephews, the Comte de Paris and the Duc de Chartres. The latter received military commissions from the Government, and were members of the personal staff of Gen. McClellan during the latter part of the year, and during what is known as the Virginia Peninsular campaign against Richmond (Apr., May, June, 1862), showing on various occasions, and especially at the battle of Gaines's Mill, great efficiency and personal gallantry. The prince accompanied Gen. McClellan, who appreciated and gladly availed himself of his military experience, sound judgment, and statesmanlike qualities. Immediately on his return to France he communicated to the *Revue des Deux Mondes*, under the *nom de plume* of A. *Trognon*, an able sketch of the events of the campaign under the title of *L'Armée du Potomac*, etc. Subsequently he collected and published in two volumes, entitled *Études sur la marine et récits de guerre*, his various contributions to that periodical. When the French armies had been almost annihilated by the Germans in 1870 and disaster overwhelmed their native land, the prince and his nephew, the Duc de Chartres, disappeared from the family reunion at Claremont to find their way to serve their country. Repelled by the Government, which regarded his presence as dangerous, and denied permission to serve even under a borrowed name, he was compelled to return to England, where he remained until the edict of banishment resting upon his family was abrogated by the French assembly (1871). By his marriage with the Princess of Brazil the Prince de Joinville has two children—Pierre Philippe Jean Marie d'Orléans, Duc de Penthièvre (b. Nov. 4, 1845), and a daughter, Françoise Marie Amélie (b. Aug. 14, 1844), who married (June 11, 1863) her cousin, the Duc de Chartres.

Revised by C. K. Adams.

Joinville, Jean, Sire de: seneschal of Champagne; b. 1224; by birth he was vassal of Count Thibaut of Champagne. He took part in the seventh crusade (1248–54) under St. Louis (Louis IX.), whose vassal he became in 1253. After his return he lived much at the king's court. He advised against the second crusade of St. Louis, and refused to take part in it. D. July 11, 1317. His fame he holds as a writer. He was in the habit of writing down his observations on men and events about him, and from his notes and his memory, borrowing also somewhat from the *Chroniques de Saint-Denis*, he composed, at the age of about eighty, an *Histoire de Saint-Louis*. This work has no unity and does not rise to comprehensive or general views, but for its details, for its direct reflection of men and events, for its affectionate but sincere evocation of the person of St. Louis, for the ease, familiarity, and good humor of its style, and for the simple genuineness of its reflection of the writer, a typical feudal lord, wholly of his time, scrupulously careful of his duties and his rights, it is one of the most important works of early French prose. Joinville wrote also a *Credo* and a letter to Louis X. The best edition of Joinville is that of N. de Wailly (Paris, 1874). An *édition classique* by the same appeared in 1890. A. G. Canfield.

Joist: See Floor.

Jokai, jō'kī, Mor: novelist; b. at Komorn, Hungary, Feb. 19, 1825; studied law in Pest, but never practiced. In 1842, when only seventeen years old, he published his first drama, *The Jew Boy*, and in 1845 his first novel, *Working Days*, which were well received. In 1847 he became editor of a weekly paper, half political and half literary, and in 1848 he espoused the cause of the revolution. After the restoration of Austrian rule political authorship was out of the question, and he devoted himself exclusively to fiction, publishing about 200 volumes of romances and novels, besides some dramas. Among his most celebrated novels are *A Hungarian Nabob*, *Sad Times*, *The Accursed Family*, *The Last Days of the Janissaries*, *The Romance of the Next Century*, *Black Diamonds*, etc. Most of his novels have been translated into German. *The New Landlord* was translated into English by A. Patterson (London, 1865). In 1863 Jokai founded the *Hon* (Fatherland), a daily political paper, and the most widely circulated Hungarian journal, and is to-day (Mar., 1894) the editor of *The Comet*, the leading weekly humorous paper of Budapest. In Jan., 1894, all Hungary united in celebrating the fiftieth anniversary of his first book. The most enthusiastic expressions of love were showered on him by the whole population from king to peasant, and an *édition de luxe* of his complete works was published at $100 a copy, groups of poor people, or, in some cases, villages combining to buy copies. He was recognized as Hungary's most beloved living son; it is he who, in his books, has given best utterance to Magyar sorrow and aspiration.—His wife, the famous actress Rosa Laborfalvi, was scarcely less esteemed than he; her memory is embalmed in one of his novels.

Revised by C. H. Toy.

Jokjokar'ta: the name of a former kingdom of Java, now a Dutch presidency. Its capital, Jokjokarta or Mataram, situated in lat. 7° 47′ S., lon. 10° 21′ E., has 45,000 inhabitants, many European settlers, and European institutions, and a most curious palace of the sultan.

Joliba: See Niger.

Joliet: city; capital of Will co., Ill. (for location of county, see map of Illinois, ref. 3–G); on the Des Plaines river, the Ill. and Mich. Canal, and the At., T. and S. Fé, the Chi. and Alton, the Chi., R. Is. and Pac., the Elg., Jol. and East., and the Mich. Cent. railways; 36 miles S. W. of Chicago. The city is built mainly in the river-valley, but partly on bluffs on either side. Very fine calcareous building-stone underlies the whole city and vicinity, and is extensively quarried. Cement, gravel, and fire-clay are largely obtained, the latter being utilized in the manufacture of fire-brick and drain-tile. The census returns of 1890 show that 231 manufacturing establishments (representing 43 in-

dustries) reported. These had $9,078,727 capital; employed 3,037 persons; paid $1,844,138 for wages and $8,624,285 for materials; and had products valued at $12,180,367. The principal industries are the manufacture of foundry and machine-shop products, steel rails, wire, Corliss engines, agricultural implements, clocks, stoves, and bicycles, and marble and stone quarrying and working. There are 26 quarries, 28 churches, 19 public-school houses that cost $350,000, county building that cost over $200,000, Masonic temple, cost over $60,000, a workingmen's club-house, built by the Illinois Steel Company at a cost of $50,000, public library with 10,000 volumes, two other libraries with 21,000 volumes, public park, electric street-railway, electric-light plant, 3 national banks with combined capital of $400,000, 2 private banks, and 3 daily, 6 weekly, and 2 monthly periodicals. Near the city is the State penitentiary, a model penal institution, cost over $1,000,000, and 16 miles distant are productive coal mines. The city owns its water-works plant, contains numerous artesian wells, and obtains valuable water-power for manufacturing from the canal. Pop. (1880) 11,657; (1890) 23,264, with suburbs, 34,473.

EDITOR OF "DAILY NEWS."

Joliet, *zhō'li-ā'*, CHARLES: author; b. at St.-Hippolyte, Doubs, France, Aug. 8, 1832; held various positions in the administration until 1863, when he entered literature as a journalist and miscellaneous writer, and attracted great attention both by his *Le roman de deux jeunes mariés* (1866) and *Mademoiselle Cherubin* (1870), and, a little later, by his novels treating of subjects from the Franco-German war of 1870–71: *Les Romans patriotiques* (1871); *Le Train des Maris* (1872); *Trois Uhlans* (1872); *La Foire aux Chagrins* (1873), etc. He has since been an extraordinarily fecund writer, and only a few titles can be mentioned here: *Carmagnol* (1876); *Robinson* (1877); *Diane* (1878); *La Roche d'Or* (1879); *Aurore* (1882); *Curiosités des lettres, des sciences et des arts* (1883); *Le Capitaine Harold* (1886); *Roman incoherent, scènes de la vie d'artiste* (1887).

Revised by A. R. MARSH.

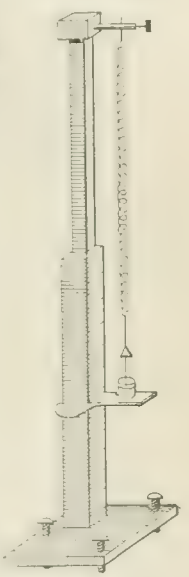
Joliet, LOUIS: explorer; b. at Quebec, Canada, Sept. 21, 1645; was educated in the Jesuits' college in that town, but engaged in the Western fur-trade. Commissioned by Frontenac to explore the Mississippi river, he went in 1673 up the Fox river and down the Wisconsin and Mississippi rivers to a point below the mouth of the Arkansas, thus being the first to ascertain that the Mississippi flows to the Gulf of Mexico and not to the Pacific, and returning to Green Bay viâ the Illinois river. He proceeded alone to Quebec, losing his MSS. on the way; but he prepared a map and narrative of the expedition from memory. By the jealousy of La Salle he was afterward studiously kept away from the Mississippi, though he was appointed royal hydrographer and received the island of Anticosti, of which he was deprived by the British. In 1697 the seigniory of Joliet in Canada was granted to him. D. in Canada in May, 1700. See Parkman, *La Salle* (1869); Pierre Margry, *Mémoires et documents* (Paris, 1876–86); Winsor, *Narrative and Critical History of America* (Boston, 1884–87).

Joliette: town; capital of Joliette co., Quebec, Canada (for location of county, see map of Quebec, ref. 5-B); on L'Assomption river and the Canadian Pacific Railway; 16 miles N. of L'Assomption. It has fine water-power, excellent building-stone, manufactures of lumber, leather, tobacco, boots, and foundry products, college, hospital, convent, mechanics' institute, bank, and a semi-monthly, monthly, and two weekly newspapers. It has a large trade in lumber, grain, and produce. Pop. (1881) 3,268; (1891) 3,347.

Jolin, *yō lēn'*, JOHAN KRISTOFFER: dramatist; b. in Sweden, Dec. 28, 1818; studied at the University of Upsala, Sweden; in 1845 made his *début* as an actor in the Royal Theater, Stockholm. He was engaged there from 1846 till 1868, and in addition he was from 1849–56 literary reader of the theater, and from 1857–68 chief of the school of acting connected with the theater. Jolin has been very active as a dramatist. Besides translating and adapting several plays from the French and German, he has written, among others, the following dramas: *Mäster Smith* (1847); *Barnhusbarnen* (The Foundling Boys, 1849); *Mjölnarfröken* (The Miller's Miss, 1865); the comedies *En komedi* (1845); *En man af verld och en man af värde* (A Man of the World and a Man of Worth, 1846); *Min hustru vil ha roligt* (My Wife wants to have some Fun, 1868); *Smålands-Petter* (1883). Jolin's plays, particularly the earlier ones, are remarkable for their interesting plots, sensational developments, skillful characteristics, and witty dialogue, but they are lacking in deepness of thought, and are somewhat diffuse. Jolin has also written several novels and sketches. In 1845 he was awarded the prize of the Swedish Academy for his poem *Fjellbruden* (The Mountain Bride, 3d ed. 1865). Of his complete works (*Samlade Skrifter*), the first series appeared in six volumes, 1872–81, second series (novels) 1882 and following years. D. in Stockholm, Nov. 13, 1884. P. GROTH.

Jolly, *yō'lĕe*, FRIEDRICH, M. D.: neurologist; b. in Heidelberg, Germany, Nov. 24, 1844; was educated in the University of Munich; was professor in the University of Strassburg 1873–90; has been Professor of Psychiatry, University of Berlin, since 1890. He has published *Hysterie und Hypochondrie* (in Ziemssen's *Handbuch*); *Ueber dem elektrischen Leitungswiderstand des mensch. Körpers* (1884); and has been editor of *Archiv. für Psychiatrie und Nervenkrankheiten* since 1890. C. H. T.

Jolly Balance: a device for the determination of the density of small solids, such as specimens of minerals, by weighing in air and water. It gets its name from Prof. Ph. Jolly, of the University of Munich, by whom it was described in 1864 in a paper entitled *Eine Federwage zu exacten Wägungen* (*Sitzungsberichte der Münchener Akademie*, 1864, i., p. 162). It consists of a long spiral spring (see figure), the length of which, noted by means of the movement of a pointer fastened to one of the lower turns, indicates the weight of any substance placed upon a scale-pan at the bottom of the spring. A second scale-pan is frequently attached, which is suspended a short distance vertically below the first. This lower pan remains submerged in water during the entire process of weighing by means of the balance.



One method of procedure is as follows: (1) The body to be tested, the mass of which must not be great enough to stretch the spring unduly, is placed upon the scale-pan. The position of the pointer is then noted.

(2) The body to be weighed is then removed, and weights are put in place of it until the pointer returns precisely to its position as noted at the end of operation (1). These weights give the weight of the body in air.

(3) The body in question is placed in the lower scale-pan, and the vessel of water is brought up from beneath the apparatus until the body is submerged. The position of the pointer is again noted.

(4) The body having again been removed, weights are placed in the upper scale-pan until the position of the pointer is that at the end of operation (3). The result gives the weight of the body in water.

The Jolly balance does not equal a fine analytical balance in accuracy, and the range of weights for which it can be used is much more limited. For small specimens, however, it affords, when carefully used, a very simple and sufficiently sensitive method of measuring specific gravities.

E. L. NICHOLS.

Jomard, *zhō'maar'*, EDME FRANÇOIS: geographer and archæologist; b. at Versailles, France, Nov. 22, 1777; studied in the École Polytechnique, and in 1798 accompanied an expedition to Egypt as a member of the scientific committee. After his return to Paris, in 1802, he was employed for more than twenty years in the redaction and publication of the celebrated work *Description de l'Égypte*, of which he wrote six volumes himself. In 1821 he assisted in founding the Geographical Society of Paris, and from 1828 he held a position in the geographical department of the Royal Library. He aided in the publication of many valuable works concerning Egypt and Africa. D. in Paris, Sept. 23, 1862.

Jomelli, *yō-mel'lēe*, NICOLO: composer; b. at Naples, Italy, Sept. 10, 1714; studied music in his native city and in Rome, and produced his first opera, *L'Errore Amoroso*, in 1737; visited Vienna, where he became acquainted with Metastasio and produced his best opera, *Didone*; was in 1754 appointed chapel-master to the Duke of Würtemberg; but when, in 1767, he returned from Stuttgart to Naples, he had adopted so much of the German style in his method of

a piece that his countrymen hissed his new opera, *Artaxerxes*, off the stage. His last composition was a *Miserere*, written a few weeks before his death, at Naples, Aug. 28, 1774. Revised by DUDLEY BUCK.

Jomini, zhō'mēē'nee', HENRI: writer of war histories; b. at Payerne, canton of Vaud, Switzerland, Mar. 6, 1779; entered the French army in 1804 with the rank of major; served as aide-de-camp to Marshal Ney in Germany and Spain; was made a brigadier-general in 1808, and distinguished himself on the retreat from Moscow in 1812. He afterward entered the service of the Emperor Alexander, who made him his aide-de-camp; he took, however, no part in the campaign against France, and the rumor that he had revealed the French plans of operation to the allies was denounced by Napoleon himself. In the Russian service he distinguished himself in the war against the Turks in 1828, and was very active in the foundation of the Military Academy of St. Petersburg. During the latter part of his life he devoted himself wholly to literary pursuits. D. at Passy, near Paris, Mar. 24, 1869. His principal works are *Traité des Grandes Opérations militaires, ou Histoire critique des Guerres de Frédéric le Grand, comparées au Système Moderne*; *Histoire critique et militaire des campagnes de la Révolution* (5 vols., Paris, 1806); *Vie politique et militaire de Napoléon* (4 vols., Paris, 1827); *Précis de l'art de la guerre* (Paris, 1838, 2 vols., with an appendix, Paris, 1849). See the biographies by Sainte-Beuve (new ed. 1881) and Lecomte (3d ed. 1888).

Jo'nah [= Heb. *Yonāh*, liter., dove]: a Hebrew prophet; b. at Gath-hepher in the tribe of Zebulun. He was no doubt the Jonah, son of Amittai, who is mentioned in 2 Kings xiv. 25, so that he lived about 800 B. C. The book which bears his name does not contain his prophecies, but a story about him, an incident from his career. Some assert that the story is purely mythical, others that it has an historical foundation, but has undergone the influence of popular tradition; others that it is a poetical invention with a didactic purpose. In any view its didactic purpose is evident. It teaches that man can not escape from God by flight; that man has only to do what he is called to do, and leave results to God; and that God does not, when he employs a human agent to threaten judgment, bind himself not to show mercy lest he should bring his agent to shame.

Jonas, yō'nāas, JUSTUS: originally JOBST KOCH; b. at Nordhausen, in the Prussian province of Saxony, June 5, 1493; studied law; became Professor of Jurisprudence at Erfurt 1516; changed his chair for that of Theology 1519, and as Professor of Theology went to Wittenberg 1521; became ecclesiastical superintendent at Halle in 1541; was expelled by Maurice 1546; became court preacher at Coburg 1551; superintendent at Eisfeld 1553; there died Oct. 9, 1555. He was an intimate friend of Luther and Melanchthon, and one of the most prominent among the German Reformers. He accompanied Luther to Worms, aided him in the translation of the Old Testament, and contributed much to the Reformation by his preaching and by his powerful translations into German of the Latin writings of Luther and Melanchthon. See his *Life* by T. Pressel (Elberfeld, 1862) and by H. G. Hasse in *Leben der Altväter der lutherischen Kirche* (Leipzig, 1864). Revised by S. M. JACKSON.

Jon'athan [Heb. *Yōnāthān*, or *Yehonāthān*, liter., whom Jehovah gave]: a son of Saul King of Israel; became, on the establishment of the kingdom, a conspicuous leader in the wars against the Philistines, which were precipitated by his smiting a Philistine garrison at Geba (1 Sam. xiii. 3, 4). His attachment to David, whom he defended against the jealousy and murderous designs of his father, is the best-known feature of Jonathan's career, and has made his name a synonym for disinterested friendship. Jonathan was killed in battle against the Philistines at Mt. Gilboa (B. C. 1056, Ussher), together with his father and two brothers, and his body was exposed upon the walls of Beth-shan until it was secretly carried away and buried by the men of Jabesh-Gilead, and his remains were ultimately placed in the family sepulcher at Zelah. On the death of Jonathan, David penned an elegy (2 Sam. i. 22, *seq.*) which is one of the most beautiful productions of its kind.

Jonathan ben Uzziel: a Jewish scholar of Palestine; pupil of Hillel; lived near the beginning of our era. To him the Jewish tradition ascribed several Targums, especially that of the Prophets. (See TARGUM.) Although the beginnings of the Targumic literature are involved in obscurity, it may be regarded as certain that Jonathan was not the author of any of the existing Aramaic translations of Old Testament books. Of his life nothing is known beyond the fact that the tradition (Baba Bathra 8) declared him to be the greatest of Hillel's disciples. See Zunz, *Gottesdienstliche Vorträge der Juden*. C. H. TOY.

Jonckbloet, yōnk bloot, WILLEM JOZEF ANDREAS: scholar and critic; b. at The Hague, Holland, in 1817. From 1835 he studied at Leyden, first medicine, then law; but finally he turned entirely to the study of his country's literature. In 1840 he received the doctor's degree; in 1857 he was made professor in the academy at Deventer, remaining there till 1854. In that year he was appointed professor in the University of Groningen, but gave up the post in order to become a member of the upper house of the Dutch Legislature. For some years he took part in the political affairs of Holland, but in 1878 he accepted a professorship in the University of Leyden. D. at Wiesbaden, Oct. 19, 1885. His studies have been of value in two important fields—the Romance and the Netherlandish. In the former he published *Li Chevaliers de la Charrette* (edition of this poem by CHRÉTIEN DE TROIES, *q. v.*, 1850); *Guillaume d'Orange, Chansons de Geste des onzième et douzième siècles* (2 vols., 1854); *Étude sur le roman de Renard* (1863); *Guillaume d'Orange, le marquis au court nez* (trans. into modern French 1867). In the Dutch field he published, besides several editions of mediæval texts, two works of first-rate importance: *Geschiedenis der middeu-nederlandsche dichtkunst* (3 vols., 1851–54) and *Geschiedenis der nederlandsche letterkunde* (2 vols., 1868–70; 2d ed. 1873–74; German trans. by Berg [Lina Schneider], 2 vols., Leipzig, 1870–72). A. R. MARSH.

Jonctijs, yōnk'tis, or **Jonctys**, DANIEL: poet; b. at Dordt, Holland, in 1600. He fitted himself to be a physician, and settled in his native town; but in 1643 his poetic satire against the theologians, *De Hedendaagsche Venus en Minerva*, caused the local Church council to expel him from the city. In Rotterdam he rose to such esteem as to become one of the judges of the municipal bench. He published various poems and prose-writings, but his fame is due to his love-poems, issued from 1620 to 1623 under the title *Rozelyns Oogjes ontleed*. These were greatly admired by his contemporaries, but are now not much esteemed. A. R. MARSH.

Jones, CHARLES COLCOCK, Jr.: lawyer: b. in Savannah, Ga., Oct. 28, 1831. He was educated at South Carolina College, Columbia, and at Princeton, N. J., where he graduated with high distinction in 1852. He went to Dane Law School, Harvard University, where he took the regular degree in the law department in 1855. Returning to his native State, he was admitted to the bar at Savannah, Ga., in 1856. In 1860 he was elected mayor of the city. Soon after the passage by Georgia of her ordinance of secession in 1861, and the beginning of the civil war, he entered the Confederate service and became lieutenant-colonel of artillery. This position he held until the end of the war. He then practiced law in the city of New York until 1877, when he returned to Georgia. Among his published works may be named *Reminiscences of the Last Days of General Henry Lee* (1870); *Antiquities of the Southern Indians* (1873); *History of Georgia* (Boston and New York, 1863); *The English Colonization of Georgia* (1887). D. at Augusta, Ga., July 19, 1893. Revised by C. K. ADAMS.

Jones, HENRY BENCE, M. D., F. R. S.: physician; b. in England, in 1814; was educated at Harrow and Trinity College, Cambridge; studied medicine in London, and in 1846 became physician of St. George's Hospital, London. Has published *Gravel, Calculus, and Gout*; *Animal Chemistry*; *Animal Electricity*; *Life of Faraday* (1869); *The Royal Institution* (1871), and many scientific papers; was a member of many learned societies. D. Nov. 20, 1883.

Jones, HUGH BOLTON: landscape-painter; b. in Baltimore, Md., Oct. 20, 1848; studied first in Baltimore and afterward in Europe, spending four years in France, principally in the artist colony at Pont-Aven, Brittany; became a National Academician 1883; member Society of American Artists 1881, and of American Water-color Society; was awarded a third-class medal at the Paris Exposition of 1889. His work is marked by truth to nature and robust qualities of painting. His subjects of American scenery are generally taken from New Jersey and from the Massachusetts coast. Studio in New York. WILLIAM A. COFFIN.

Jones, INIGO: architect; b. in London in 1572. At the expense of an English nobleman who recognized his apti-

tude for drawing he traveled at an early age in France, Flanders, Germany, and Italy, studying the peculiar characteristics of the architecture of each of these countries. While in Venice he was appointed by Christian IV. of Denmark to be his architect, and went with this sovereign, or perhaps before him, to England, where he remained. He was a great favorite of James I., who made him general inspector of royal buildings, and he did much to improve the classical style of architecture in England. He was a stanch Royalist, and suffered much for his adherence to Charles I. Charles II., after the Restoration, again gave Inigo Jones a prominent position, but death prevented his carrying out any important projects for that monarch. He was called the English Vitruvius. His principal works are the banqueting-house at Whitehall, a magnificent palace for the queen-mother at Greenwich, also Greenwich Hospital, the portico of St. Paul's church, the Royal Exchange, and many palaces. He also wrote treatises on architecture and ancient buildings. D. in London in July, 1651. W. J. STILLMAN.

Jones, JACOB: naval officer; b. near Smyrna, Del., in 1768; entered the U. S. navy as midshipman in 1799; was captured in frigate Philadelphia in 1803 near Tripoli, where he was held a prisoner eighteen months; commanded the U. S. sloop of war Wasp in 1812, in its celebrated capture of the British sloop Frolic, and was himself captured on the same day with both those vessels by the British ship Poictiers of seventy-four guns. Released on parole at Bermuda, Jones received distinguished honors for his bravery, was voted a gold medal by Congress, and was promoted to post-captain in the squadron under Commodore Decatur. After the war he commanded squadrons in the Mediterranean and Pacific. D. in Philadelphia, Aug. 3, 1850.

Jones, JENKIN LLOYD: clergyman and author; b. at Llandyssil, Cardiganshire, Wales, Nov. 14, 1843; was educated at Meadville (Pa.) Theological School; from 1874 to 1883 was pastor of the Unitarian church at Janesville, Wis.; since 1883 has been pastor of All Souls' church, Chicago. He was for some time the secretary of the Western Unitarian Conference and of the Western Unitarian Sunday-school Society, of which he was the founder. Since 1880 he has edited *Unity*, a radical Unitarian newspaper. With the Rev. W. C. Gannett he has published *The Faith that makes Faithful*, and in 1894 *The Seven Great Religions* and *A Chorus of Faith*. Of these, suggested by the World's Fair Parliament of Religions, he is the sole author in one case and editor in the other. JOHN W. CHADWICK.

Jones, JOHN PAUL: naval officer, whose true patronymic was JOHN PAUL; b. at Arbigland on the Firth of Solway, Scotland, July 6, 1747; at the age of twelve was apprenticed to a shipmaster engaged in the American trade; and later became third mate on a slaver, but growing disgusted with the traffic took passage to Kirkcudbright on board a vessel of which he was subsequently made master. After making several voyages to the West Indies he went to Virginia in 1773, and on the outbreak of hostilities in 1775 was appointed senior lieutenant in the navy, and assigned to the flagship Alfred. His first engagement was with the Glasgow, soon after which action he succeeded to the command of the sloop Providence, in which, during a cruise of little more than six weeks, he captured sixteen prizes, besides doing much damage to the fishery and shipping at Canso and Isle Madam. Appointed to command the Alfred on the completion of this successful cruise, he led an expedition which sailed Nov. 2, 1776, to break up the Cape Breton fishery and capture the coal-fleet, in which he was partially successful, arriving in Boston Dec. 15 with four prizes. He was in Jan., 1777, ordered back to the Providence. Angered by the action of Congress in placing other names above his in the list of captains, he complained somewhat arrogantly of the injustice, but in vain. In June, 1777, Congress appointed Jones to the command of the Ranger, a new ship, in which he sailed from Brest in Apr., 1778, and after burning a brig off Cape Clear made a daring descent upon the town and shipping of Whitehaven; he then made a fruitless attempt to capture the Earl of Selkirk, hoping to make him the instrument of obliging Great Britain to agree to a system of exchanges. During this cruise he fell in with the Drake, a vessel superior in crew and armament, which he captured and took into Brest. In Aug., 1779, Jones left France in command of a squadron of seven vessels, his own ship being the Bon Homme Richard. In a month's time they had captured or destroyed twenty-six vessels. On Sept. 23 the squadron, consisting of the Richard, the Alliance, the Pallas, and the Vengeance, when off Flamborough Head sighted a fleet of forty-one sail, which proved to be the Baltic fleet under convoy of the Serapis and the Countess of Scarborough. About 7:30 P. M. the Richard came up with the Serapis, and a terrible engagement, lasting upward of three hours, ensued, during all of which time the vessels were in close proximity, and during the latter part of the fight in actual contact. At the beginning of the action two of the Richard's guns burst, disabling their crews and causing the abandonment of the battery. The Countess of Scarborough surrendered to the Pallas after a short action, and the Alliance now approached the scene of conflict between the Richard and Serapis, but her commander, Capt. Landais, opened an indiscriminate fire on both vessels, killing several of the Richard's crew. Notwithstanding this discouraging circumstance, and the fact that the Richard was in a sinking condition and surrender counseled by many, Jones maintained the conflict until shortly after 10 o'clock, when the Serapis struck. The Richard, being on fire in two places and in a hopeless condition, was abandoned (after the wounded had been removed), and went down at about 10 A. M. of the 25th. The Serapis was taken into the Texel, and Jones was received in Paris and throughout France with the greatest honors, the king bestowing upon him an elegant sword and the cross of the order of Military Merit, which Congress permitted him to accept, and with which he was decorated by the French minister at Philadelphia, where Jones had arrived on Feb. 18, 1781. Congress also gave him a vote of thanks, and by resolution the command of the new frigate America; but as this fine ship was subsequently presented to France to replace the Magnifique, Jones never saw active service at sea again. He was (1783) sent to Paris to recover the moneys due in Europe for prizes taken under his command. In 1787 Jones returned to the U. S., where Congress voted him a gold medal. He returned to Europe, and in 1788 accepted the appointment of rear-admiral in the service of Russia, and rendered important services against the Turks. He became the object of personal enmity among favorites at court, and was retired on a pension, which, however, was not paid. He removed to Paris, where he died July 18, 1792.

Revised by F. M. COLBY.

Jones, OWEN: architect and decorator; b. in Wales in 1809; best known by his studies of the Alhambra in Granada, to which he devoted much time and labor. He decorated the interior of the Exhibition building in Hyde Park (1851) and of the Crystal Palace at Sydenham, where the Egyptian, Greek, Roman, and Alhambra courts were of his design. In 1852 he was made director of decorations for the Crystal Palace Company. St. James's Hall, Piccadilly, was erected by him. He was the author of *Designs for Mosaic and Tessellated Pavements* (1842); *Plans, Elevations, and Sections of the Alhambra* (1848); *An Attempt to define the Principles which should Regulate the Employment of Colors in Decorative Arts* (1851); *The Grammar of Ornament* (1856). D. in London, Apr. 19, 1874.

Jones, WILLIAM, F. R. S.; generally called OF NAYLAND: philosopher; b. at Lowick, England, July 30, 1726; was educated at the Charterhouse and at Oxford, where he became a convert to the Hutchinsonian philosophy (see HUTCHINSON, JOHN); was ordained in 1749; became successively curate of Finedon, vicar of Bethersden, rector of Pluckley, of Paston, and of Hollingbourn, and perpetual curate of Nayland in Suffolk. In 1780 he was elected a fellow of the Royal Society. For many years he labored upon a general system of philosophy, based upon the works of Hutchinson, and he exercised considerable influence by his writings, being endowed with great learning, piety, and versatility, as well as an excellent style. D. Feb. 6, 1800. He wrote, among other works, *The Catholic Doctrine of the Trinity* (1753); *Physiological Disquisitions* (1781); *Art of Music* (1784); *Figurative Language of Scripture* (1787); *Life of Bishop Horne* (1795); and founded *The British Critic* (1793).

Jones, Sir WILLIAM: lawyer and Orientalist; b. in London, Sept. 28, 1746. He entered Harrow in 1753, and University College, Oxford, in 1764; was called to the bar in 1774, and in 1783 was appointed a judge of the supreme court of judicature at Fort William, Bengal. As a lawyer he distinguished himself by his *Essay on the Law of Bailments*, and in India planned and partly carried out a digest of Hindu and Mohammedan laws (finished by Colebrooke after Jones's death). As a judge he exhibited inflexible integrity. His bent, however, was toward linguistic and

literary pursuits. While an undergraduate he began the study of Arabic and Persian, and to these he afterward added Sanskrit. He had more or less acquaintance with over twenty ancient and modern languages. His principal service to literature lay in the impulse he gave to the study of Persian and Sanskrit. By his *Poeseos Asiaticæ commentariorum libri sex* (1774) and his translations from the Sanskrit (*Sakuntalā*, *Hitopadeça*, *Gitagovinda*, *Manu*, 1789–94) he opened the literary treasures of the East to the English-speaking public, and he performed an enduring service in the foundation of the Asiatic Society in Jan., 1784. Other publications of his are his *Persian Grammar* (1770; 9th ed. 1828), his translation of the famous Arabic poems called the *Moallakāt*, and his edition of the text of the Sanskrit poem *Ritusamhāra*, besides a number of English poems. His complete works were published in 1806 (and reprinted in 1807), with a memoir by Lord Teignmouth. The one indiscretion of which he was guilty was his denial of the genuineness of Anquetil du Perron's *Avesta* (1770). D. in India, Apr. 27, 1794. C. H. Toy.

Jonesboro: town; capital of Craighead co., Ark. (for location of county, see map of Arkansas, ref. 2–E); on the K. C., Ft. S. and Mem. and the St. L. S. W. railways; 67 miles N. W. of Memphis, 150 miles N. E. of Little Rock. It is in an agricultural region, and has saw and planing mills, cotton-gins, stave, box, and wagon factories, 2 State banks, and 2 weekly newspapers. Pop. (1890) 2,065; (1893) estimated, 3,800. Editor of "Times."

Jonesville: village; Hillsdale co., Mich. (for location of county, see map of Michigan, ref. 8–J); on the Lake Shore and Mich. S. Railway; 4½ miles N. W. of Hillsdale, 37 miles N. W. of Adrian. The principal industry is the manufacture of carriages and wagons. The village is in a rich agricultural region, and has a library established in 1874 and a weekly newspaper. Pop. (1880) 1,445; (1890) 1,288; (1894) 1,314. Editor of "Independent."

Jongkind, yōng'kint, Johan Barthold: painter; b. at Latrope, in Holland, 1819; studied in France under Isabey, and began to exhibit in 1845. The best known of his pictures are *Port du Mer* (1848); *Vue du port d'Harfleur* (1850); *Souvenir du Havre* (1853); *La Meuse à Dordrecht* (1869); *Intérieur du port à Dordrecht* (1870); *Entrée du port à Dordrecht* (1872), etc. He etched some admirable plates of landscape subjects. D. at Paris, Feb. 17, 1891.

Jongleur' (French pron. zhōñ'glêr'): a French wandering poet, or singer, of the Middle Ages. The form *jongleur* is wholly modern, and is derived from Old French *jugler* (Latin *jocula'ris*) or from O. F. *jogleor*, *jongleor* (Latin *joculator*). Originally the *jocula'tor* was merely one of the popular performers of whom we hear much during the last centuries of the Roman empire, and who bear many different names—*mimi*, *scurræ*, *histriones*, *thymelici*, *saltatores*, etc. These actors, clowns, buffoons, having at first distinct functions, seem to have been merged soon after the fall of the empire into one class of vagrant mountebanks, who amused the populace with music, songs, or tricks, indifferently. The Christian writers of the early Church held them in great horror, and successive councils in the Middle Ages singled them out for special denunciation. It was apparently not until the fifth or sixth century that they began to be known as *joculatores*. From that time, though their other names survive in the Church writers, they seem to have borne chiefly this title; and this alone made its way into the vulgar tongues.

In spite of the disesteem in which they were originally held, some influence seems early in the Middle Ages to have procured for a part at least of the *joculatores* greater respect and a more dignified field for their talents. This influence can hardly be other than the regard shown by the Germanic tribes that invaded Southern Europe in the fifth century for their *scops*, or bards. As is well known, these latter were treated by the Germans with the greatest respect. To them were intrusted the heroic traditions of the race; and it was their duty, by reciting these traditions at banquets or before battles, to incite their hearers to noble deeds. It is now certain that this Germanic practice was introduced into the Roman world, and indeed ultimately gave rise to the whole body of mediæval French epic poetry. (See Epic Poetry). Inasmuch, however, as this poetry was mainly in Romance and not in German, and as the singers of it are at all times called *jongleurs*, it is probable that a part of the old Roman wandering singers took upon themselves the function of producing such poetry, and obtained greater dignity thereby. At any rate, it is certain that a distinction was felt to exist between such poets and other popular entertainers. In the *Penitentiale* of Thomas of Cobham (thirteenth century) these latter are all called *damnabiles*, whereas the others, *qui dicuntur joculatores, qui cantant gesta principum et vitam sanctorum*, are excepted, as persons who *bene possunt sustineri*.

At all times, however, the jongleurs were professional singers, practicing their art as a livelihood; and this gives us the line of distinction between them and the Troubadours and Trouvères (*qq. v.*). Both these latter—the ones in Provence, the others in Northern France—were primarily composers, or poets; and in Provence the chief function of the jongleurs (Prov. *juglars*) was to bring out the poems of the troubadours. For all this, the two classes were from the nature of the case not sharply divided, and it frequently happened that individuals passed from one into the other. The most interesting function of the jongleurs of France proper was the production and transmission from generation to generation of the great national epics, known as the Chansons de Geste (*q. v.*). These the *trouvères*, or aristocratic poets, had nothing to do with; and yet they are, on the whole, the most serious and the noblest productions of the mediæval imagination. The period during which these poems were most rapidly produced was from the eleventh to the thirteenth century. Then they began to decline, and with them went the jongleurs who had had them in their hands. We know that in the early fifteenth century such singers had become rare, and we are told that toward the close of the sixteenth century they disappeared altogether.

This, however, must not be taken to mean that all popular singers disappeared. Quite the contrary is the fact. In France, Provence, as well as in Italy and Spain, even to this day may be found wandering minstrels, who earn a scanty livelihood by singing vulgar ditties to the populace. These are the last survivers of the once numerous army of vagrant poets and ballad-mongers of Roman and mediæval times. See L. Gautier, *Les Épopées françaises* (vol. ii., 2d ed. Paris, 1892–94). A. R. Marsh.

Jön'köping, yön'chö-ping: town of Sweden, named in history as early as the thirteenth century; beautifully situated at the southern extremity of Lake Wetter, and surrounded by pine-clad hills (see map of Norway and Sweden, ref. 12–E). It has large iron-works and paper-mills, but its greatest industry is the manufacture of safety-matches, much used in France, Great Britain, the U. S., etc. The completion in 1832 of the Göta Canal, connecting the North Sea with the Baltic (Göteborg with Stockholm), made Jönköping a seaport, and thus greatly increased its commercial facilities. Pop. (1889) 19,902.

Revised by Rasmus B. Anderson.

Jon'quil [from Fr. *jonquille*: Ital. *giunchiglia*; Span. *junquillo* < Lat. **juncilia*, deriv. of *juncus*, rush, reed]: a name given to *Narcissus jonquilla* and *odorus* (family *Amaryllidaceæ*), garden plants blooming in spring. They are natives of the south of Europe. The flowers of the fragrant kinds are employed in perfumery. The jonquil was one of the most familiar flowers in old-fashioned gardens, and improved varieties are appearing which undoubtedly will again popularize it. Revised by L. H. Bailey.

Jonson, Benjamin: dramatist, generally known as Ben Jonson; b. at Westminster, England, about 1573, a short time after the death of his father. The details of his life before 1596 are uncertain, but his experiences seem to have been varied, like his faculties, and often of a turbulent nature. His mother married a master bricklayer, and for some time he worked with his stepfather as a mason. Later on he enlisted in the army, and made a campaign in the Low Countries. On his return he entered St. John's College, Cambridge, and studied classical languages and literature. In his twentieth year he went upon the stage, and tried to become an actor. At last his talent found its proper field. In 1596 appeared his *Comedy of Humors*, and in 1598 it was recast, and brought out with great success in the Globe theater under the title *Every Man in his Humor*. Then followed, in 1599, *Every Man Out of his Humor*; in 1600, *Cynthia's Revels*; in 1602, *The Poetaster*, which involved him in a very sharp controversy with Decker; in 1603, *Sejanus*, a tragedy; in 1604, *Eastward Hoe*, written in connection with Chapman and Marston, for which he was imprisoned and threatened with the loss of his nose and ears; in 1605, *Volpone*; in 1609, *Epicœne, or the Silent Woman*; in 1610, *The Alchymist*; in 1611, *Catiline*, a trag-

edy; in 1616, *The Devil is an Ass*; in 1629, *New Inn, or the Light Heart*; but the last-mentioned comedy belongs to that part of his works which Dryden called his dotages. After his appearance in literature the life of Ben Jonson is tolerably well known, both in the inns and at court—his tournaments with Shakspeare and the other wits of his age in the Mermaid Tavern in Bread Street, where Sir Walter Raleigh had founded the Mermaid Club; his throne-speeches on literary taste delivered at the fireside of the Devil's Tavern in Fleet Street, where later on he himself founded the Apollo Club; and his "entertainments" or "masques," a kind of dramatic arrangement interspersed with songs and ballets which he wrote with great elegance for the court festivals. In 1619 James I. made him poet-laureate, with a pension of 100 marks, and Charles I. increased the pension to £100, and added a tierce of canary. The last years of his life were nevertheless very clouded. He was poor—not because he had less than he needed, but because he used more than he had. He became bitter in spite of the great success he had achieved. He died in Aug., 1637, and was buried in Westminster Abbey, where his tombstone bears the inscription, "O rare Ben Jonson!" *The Sad Shepherd*, a pastoral drama, he left unfinished. Jonson was the most learned dramatist of his day. His tragedies were classical, but heavy. His comedies were satirical, modeled upon Aristophanes, Terence, and Plautus, carefully constructed as to plot, and dealing largely with "humors" or the passing fashions and manners of the time, as subjects for ridicule. His lyrical poems had a grace and lightness that were wanting in his plays. Revised by H. A. Beers.

Jonsson, Finn: bishop and author; b. at Hitardal, Iceland, Jan. 16, 1704; studied at the University of Copenhagen, and was appointed in 1754 Bishop of Skalholt, where he died July 23, 1789. His *Historia Ecclesiastica Islandica* (4 vols., Copenhagen, 1772–79) is a principal source of the history of the island.

Joost van den Vondel: See Vondel, Joost van den.

Joplin: city; Jasper co., Mo. (for location of county, see map of Missouri, ref. 7–D); on the Mo., St. L. and S. Fran., the K. C., Ft. S. and Mem., the K. C., Pitt, and Gulf, and the Mo. Pac. railways; 168 miles S. of Kansas City. It is in an agricultural region, and is the center of the Southwest Missouri lead and zinc district. It contains smelting-furnaces, white-lead works, paint-works, machine-shops, foundries, boiler-works, and flour-mills, and has an annual output of lead and zinc ores valued at about $1,500,000, while the output of the district is about $4,000,000 annually. The limits of the city have been increased since 1890 by the annexation of its mining suburbs. There are 2 national banks with combined capital of $225,000, 2 private banks, and a State bank with capital of $100,000, and a weekly and 2 daily newspapers. Pop. (1880) 7,038; (1890) 9,943; (1892) estimated, 17,440. Editor of "Herald."

Joppa: See Jaffa.

Jordaens, yōr'daans, Jakob, or James: Dutch painter; b. at Antwerp in 1594. He studied contemporaneously with Rubens in the studio of Adam Van Noort, whose daughter he married. He also became a pupil of Rubens, with whom he worked for many years. He painted for the King of Sweden, Charles Gustavus, twelve pictures representing the passion of Christ. Rubens confided to Jordaens the painting in gouache of his designs for tapestry, the commission of Philip IV. of Spain; the picture of St. Bavone in the Cathedral of Ghent is by his hand, although often attributed to Rubens, as also the *Christ Disputing the Temple* at Saint-Valburga, at Furnes, one of his finest works. His pictures are extremely numerous; although splendid in color, they are deficient in drawing and elevation of subject. D. in Antwerp, Oct. 18, 1678. W. J. Stillman.

Jor'dan [Heb. *Yarden*, the descender, Gr. Ἰορδάνης; called by the Arabian geographers *El-Urdon*, and more commonly *Esh-sheriah*—i. e. the watering-place]: the principal river of Palestine and the most celebrated in biblical geography. It takes its rise from the snows of Mt. Hermon at the northern extremity of the Holy Land, and flows nearly due S. through the center of that country to the Dead Sea. Its total length is 104 miles in a straight line; and in that distance it falls 1,197 feet, well meriting its Hebrew name, "the descender." It has three principal sources: 1, the *Leddan*, called by Josephus the Little Jordan, rising from a great fountain, the largest in Syria, at the base of the hill *Tell-el-Kâdy*, on which are the ruins of the ancient city Dan; 2, the *Baniâsy*, rising at Banias (the ancient Cæsarea Philippi), 4 miles E. of Tell-el-Kâdy, from a cave now concealed by the ruins of a temple built by Herod; 3, the *Hasbany*, rising at Hasbeiya, 12 miles N. of Tell-el-Kâdy, from a pool at the foot of a basalt cliff. The latter is the smallest of the streams, but is the longest and rises from the highest perennial source, 1,700 feet above the level of the sea, while the fountain at Banias is 1,080, and that at Tell-el-Kâdy but 505 feet. The two higher torrents burst through narrow rocky ravines, and unite with the Leddan 4 or 5 miles below its source, forming the Jordan proper, which, 6 miles below, falls into Lake Huleh, called in the Bible the "waters of Merom." From Lake Huleh the Jordan descends with rapidity and violence in a tortuous channel, over a rocky bed with many cataracts, and falling nearly 800 feet within a compass of 11 miles of latitude, enters the Sea of Galilee, otherwise called Gennesaret and Tiberias, now *Bahr-el-Tubariyeh*. The former lake is 7 feet above the level of the sea, the latter 682·5 feet below. In its remaining course from the Sea of Galilee to the Dead Sea the Jordan falls 609·5 feet more—a strange and almost incredible fact had it not been established by careful measurement, the explanation of which is to be found in the extremely tortuous course of the river, which within 64 miles of latitude traverses nearly 200 miles and has twenty-seven considerable rapids. The whole lower stream, or Jordan proper, then, is many hundred feet below the sea-level, which fact alone would make this region unique as a geographical and geological phenomenon. The valley, now called *El-Ghor*, is about 6 miles wide at the northern end, expanding to 8 miles at the southern, is generally level and shut in between steep parallel chains of mountains from 3,000 to 5,000 feet high. Small portions in the north are alone cultivated, the rest is desert, "in spring covered with rank grass and thistles, but in summer parched and bare. The southern section, known as the Plain of Jericho, is covered with a white nitrous crust, like hoar-frost, through which not a blade of grass nor green herb springs." In the midst of this plain the Jordan has cut through the chalky strata a winding ravine varying from 200 yards to half a mile in breadth and from 40 to 150 feet in depth. Five miles below the Sea of Galilee it receives its largest tributary, the Sheriat-el-Mandhur (Hieromax of the Greek geographers), a stream from the east scarcely inferior to the Jordan, 130 feet wide at its mouth; and about half-way between the lakes the Jabbok (Wady Zerka) enters from the mountains of Gilead on the E., being the only other considerable tributary. There are only two bridges over the Jordan now in existence: one, 2 miles S. of Lake Huleh, of the time of the crusades, called Jisr Benat Yakub, the bridge of Jacob's daughters, has been from time immemorial the leading pass from Western Palestine to Damascus; the other, Jisr-el-Mejamia, a quaint Saracenic structure, is 2 miles below the mouth of the Hieromax, and formerly connected the great city of Scythopolis (Bethshean, now Beisan) with the Decapolis. The principal fords above the Zerka are one just below the Lake of Galilee, which must have been traversed by Christ, and that of Succoth, 15 miles below the lower bridge. The latter was undoubtedly the ford by which Abraham and Jacob crossed; it was also probably the Bethabara of John's baptism and of the slaughter of the Midianites and the Ephraimites (Judg. vii. and xii.). Ten miles below the Zerka is a noted ford on the road from Nablous (Shechem) to Es-Salt, and there are two others near the "pilgrims' bathing-place" in the Plain of Jericho. One of the latter must have been the scene of the miraculous crossing of the Israelites under Joshua and of the similar miracles recorded of Elijah and Elisha (2 Kings ii. 8, 14), and the same spot is traditionally regarded as the scene of Christ's baptism. At its mouth the Jordan is 540 feet wide and 1,292 feet below the level of the sea. The valley of the lower Jordan abounds in slime-pits, and thermal springs are frequent, with many other indications of former volcanic or igneous action. Dark basalt is the principal rock in the upper region—trap, limestone, sandstone, and conglomerate in the lower. Cane, oleanders, willows, tamarisks, hollyhocks, and thistles form the most noticeable trees and plants; lions, tigers, and wild-boars formerly made their haunts in the thickets along the river's edge. The course of the Jordan was first explored by Costigan in 1835, next in 1847 by Lieut. Molyneux of the British navy (*Journal Roy. Geog. Soc.*, vol. xviii.), more thoroughly by Lieut. Lynch of the U. S. navy in 1848 (see his *Official Report*), by MacGregor (1868–69) in his Rob Roy canoe, and in

1872–78 by Lieut. Conder and Lieut. Kitchener for the Palestine Exploration Fund. The best sources of information are Robinson's *Biblical Researches*, Thomson's *Land and Book*, Selah Merrill's *East of the Jordan*, the geographical works of von Raumer, Ritter, and Petermann, Stanley's *Sinai and Palestine*, and the publications of the British Palestine Exploration Fund. See PALESTINE.

Revised by S. M. JACKSON.

Jordan: village; Onondaga co., N. Y. (for location of county, see map of New York, ref. 4–F); on the Erie Canal, and the N. Y. C. and H. R. and the W. Shore railways; 17 miles W. of Syracuse. It has five churches, free academy with library founded in 1840, a weekly newspaper, and manufactures of flour, furniture, wheelbarrows, straw-boards, and machinery. Pop. (1880) 1,344; (1890) 1,271; (1893) estimated, 1,400.

EDITOR OF "TIMES."

Jordan, DAVID STARR, Ph. D., LL. D.: naturalist and educator; b. in Gainesville, N. Y., July 19, 1851; M. S., Cornell University, 1872; M. D., Indiana Medical College, 1875; Ph. D., Butler University, 1878; LL. D., Cornell University, 1886. He was instructor in Botany at Cornell University 1871–72; Professor of Natural History at Lombard University, Illinois, 1872–73; principal of the Appleton Collegiate Institute, Wisconsin, 1873–74; student and afterward lecturer in Marine Botany, Anderson School, at Penikese island, Mass., in 1874; teacher of Natural History, Indianapolis, Ind., High School 1874–75; lecturer on Zoölogy, Harvard Summer School, Cumberland Gap, 1875; Professor of Biology, Butler University, 1875–79; naturalist of the geological surveys of Indiana and Ohio 1877; assistant to the U. S. Fish Commission 1877–91; student of ichthyology, British Museum, Museum d'Histoire Naturelle, etc., 1879–81; Professor of Zoölogy, Indiana University, 1879–85; special agent of the U. S. Census Bureau, investigating marine industries of Pacific coast, 1880; lecturer on Comparative Anatomy, Indiana Medical College, 1885; president of Indiana University 1885–91; elected first president of Leland Stanford Junior University, Palo Alto, Cal., 1891; associate editor of *Johnson's Universal Cyclopædia* in charge of the department of zoölogy, comparative anatomy, and animal physiology, 1892–94. President Jordan's publications had, in 1894, reached some 275. Among them are: *Manual of the Vertebrates of the Northern United States* (1876); *Contributions to North American Ichthyology*: 1. *Review of Rafinesque's Memoirs on North American Fishes* (1877); 2. *Contributions to North American Ichthyology, based primarily on the Collections of the United States National Museum*; 3. (*a*) *On the Distribution of the Fishes of the Alleghany Region of South Carolina, Georgia, and Tennessee, with Descriptions of New or Little-known Species*; (*b*) *A Synopsis of the Family Catostomidæ* (1878); *Contributions to North American Ichthyology, based primarily on the Collections of the United States National Museum*; 4. *A Synopsis of the Fishes of North America* (1883); *Science Sketches* (1887); *Report of an Exploration of the Waters of the Yellowstone Park* (1890).

C. H. THURBER.

Jordan, Mrs. DOROTHEA: actress; b. near Waterford, Ireland, about 1762. She made her *début* at Drury Lane, in London, in Oct., 1785, captivating the town. Lamb writes most appreciatively of her acting. In 1790 her connection began with the Duke of Clarence, afterward William IV. This relation was only broken off, without satisfactory explanation, in 1811. She retired to the Continent in 1814, and lived in comparative poverty at St.-Cloud, where she died in June, 1816. King William in 1831 raised her eldest son to the peerage, as Earl of Munster, and gave the other Fitz-Clarences the rank of younger sons and daughters of a marquis. See the *Life* by Boaden (2 vols., 1831).

C. H. THURBER.

Jordan, THOMAS: general; b. in the Luray Valley, Va., Sept. 30, 1819: graduated at West Point, and entered the army as brevet second lieutenant of infantry July 1, 1840; became second lieutenant Dec., 1840; took part in the war with the Seminoles (1842); in the war with Mexico engaged at Palo Alto and Resaca de la Palma; was appointed captain and quartermaster Mar. 3, 1847, serving as such on the Pacific coast 1852–60. He resigned May, 1861, to enter the Confederate service as lieutenant-colonel, and was at once assigned as adjutant-general of forces assembling at Manassas Junction. As chief of staff he accompanied Gen. Beauregard to Tennessee, and was appointed brigadier-general from date of the battle of Shiloh; was temporarily on staff of Gen. Bragg, but resumed his position with Beauregard during the defense of Charleston, 1862–64. Immediately after the war he published in *Harper's Magazine* a critical review of Confederate operations and administration; subsequently (1866) was editor of the Memphis *Appeal*. Invited to organize the military resources of the Cuban insurgents, he was made chief of general staff of that army, and second in command (1869), succeeding to chief command Dec., 1869, and fought a largely superior force at Guaimaro Jan. 1, 1870, inflicting heavy loss. Seeing no probability of being able to organize an effective force, and the supply of arms and ammunition running low, he resigned Feb., 1870, and returned to the U. S. In 1887 he became editor of *The Mining Record*. D. in New York, Nov. 27, 1895.

Jordan, WILHELM: poet and novelist; b. at Insterburg, East Prussia, Germany, Feb. 8, 1819; studied theology, and later on philosophy, at Königsberg; settled at Leipzig, but was expelled from Saxony on account of the radicalism of his political and theological writings. He went to Bremen and Berlin, and was in 1848 elected a member of the National Assembly at Frankfort. After the dissolution of the latter he remained in Frankfort. Jordan's earlier publications, *Ostdeutschland*, *Glocke und Kanone* (Königsberg, 1842), *Irdische Phantasien* (*ibid.*, 1842), *Schaum* (Leipzig, 1846), are of little importance. He gained a wider reputation by his epic poems, *Demiurgos* (Leipzig, 1851–53) and *Nibelunge* (1868–74). While the former is really a philosophical poem, in which the poet seeks to represent the abstruse philosophy of the Young Hegelian school, the latter conforms more strictly to the rules of epic poetry. In the *Nibelunge* Jordan has made the attempt to rejuvenate old Germanic poetry as to contents and form, without, however, succeeding in his efforts. The grand simplicity of the Nibelungenlied and the lays of the Edda is not attained by Jordan's poem, which grows tiresome through the forced artificiality of its metrical form. Besides a number of excellent translations, Jordan published two novels, *Die Sebalds* (Stuttgart, 1885), and *Zwei Wiegen* (1887), which resemble, however, more a series of treatises on scientific subjects than works of fiction.

JULIUS GOEBEL.

Jordan River: a river of Utah, flowing northward from Utah Lake to Great Salt Lake. It has a length of about 40 miles. Its water is extensively used for irrigation, and in dry seasons is entirely diverted by irrigating canals. In 1892 about 22,000 acres of land were served by it.

Joris, or **Joriszoon**, DAVID: See DAVIDISTS.

Jorists: See DAVIDISTS.

Jornan'des, or, better, **Jordanis** (a vulgar form for Jordanes): the historiographer of the Goths. He was himself a Goth by birth, and lived in the middle of the sixth century. Having been converted to Christianity, he became a monk, but he is not to be identified with Jordanes, Bishop of Crotona. He wrote two historical works which have come down to us—*De summa temporum vel de origine actibusque gentis Romanorum*, an outline of the history of the world to the time of Justinian, written about 551, and *De origine actibusque Getarum*, a history of the Goths from the origin of the people to the fall of the Ostrogothic empire in Italy. The former is of very little interest, but the latter is invaluable. It is the principal, nearly the only, source of the history of the Goths and of the great migration of the nations. The history of the Goths had been written before by Cassiodorius, Ablabius, and Dion Cassius, but these works are lost, and we know them only from extracts made by Jordanis. The best critical edition of his works is that by Th. Mommsen (Berlin, 1882). Revised by M. WARREN.

Jortin, JOHN, D. D.: ecclesiastic and author; b. in London, Oct. 23, 1698; studied at the Charterhouse and at Jesus College, Cambridge, of which he became a fellow (1721) after graduating in 1719. While at college he made extracts from Eustathius for the use of Pope in his translation of Homer, and became noted for his facility in Latin verse, of which he published a volume (*Lusus Poetici*, London, 1722). Taking orders in the Church of England (1724) he was presented to the living of Swavesey, near Cambridge (1727), but in 1731 removed to London, and became a much-admired pulpit orator, being successively rector of Eastwell (Kent), of St. Dunstan's-in-the-East, domestic chaplain to the Bishop of London, prebendary of St. Paul's, rector of Kensington (the three in 1762), and Archdeacon of London (1764). He was author of numerous learned philological, critical, and theological works which have maintained a

high reputation, among which were *Truth of the Christian Religion* (1730), *Life of Erasmus* (2 vols., 1758-60); *Sermons* (7 vols., 1771-72); *Six Dissertations upon Different Subjects* (1755); *Remarks on Ecclesiastical History* (5 vols., 1751–73; n. e. by W. Trollope, 2 vols., 1846); and *Tracts, Philological, Critical, and Miscellaneous* (1790). D. at Kensington, Sept. 5, 1770. See his *Life* by J. Disney (1792). His collected works appeared in 11 vols. (1805–10).

Revised by S. M. Jackson.

Jorullo, hō-rool'yō: a volcano of the state of Michoacan, Mexico; in lat. 18° 53′ 30″ N., and lon. 101° 1′ 30″ W. It is one of the rare instances of comparatively recent volcanic mountains. In 1758 its site was a plain, remote from any volcano. After subterranean noises had continued for several months, the earth broke away over a wide area on the night of Sept. 28–29, 1759, emitting flames, smoke, and cinders. Six mountains were formed, apparently by upheaval, and close together, so as to form one mass. On their sides and all around numerous little cones or *hornitos* still emitted smoke when Humboldt visited them in 1803. The present height of Jorullo is 1,475 feet above the plain, or 4,265 feet above the sea, and it has a true crater, which still shows signs of activity. See Humboldt, *Essai politique sur la Nouvelle Espagne*, ii., 290. Herbert H. Smith.

Joseph [from Heb. *Yosēph*, liter., he shall add, increaser]: one of the twelve patriarchs, the elder son of Jacob and Rachel; b. at Haran, in Syria (Padan-Aram); was the favorite son of his father, and envied by his brethren on that account. Their enmity was further excited by two dreams which Joseph related when about seventeen years of age, in which his future greatness was foreshadowed, and this led them to sell him as a slave to some Midianite traders, by whom he was carried into Egypt and sold to Potiphar, an officer of the king. He acquired the confidence of his master, who set him as overseer over all his property, but having repelled dishonorable proposals made to him by his mistress, she accused him falsely to her husband, and caused him to be thrown into prison. Here he interpreted the dreams of two of his fellow prisoners, the chief baker and chief butler of Pharaoh, and when his predictions had been justified by the result, he was summoned by Pharaoh, at the instance of the butler, to interpret two dreams which portended seven years of prosperity followed by seven of famine. The king was so much struck by the wisdom of the advice given by the young Hebrew that he adopted all his suggestions for making preparations for the time of famine, and appointed him ruler over the whole land. The measures taken by Joseph as vizier or viceroy resulted greatly to the advantage of the king and of his people, securing an abundant provision for the time of famine. This calamity extended also to the adjoining countries, and led to the brethren of Joseph being sent into Egypt to buy corn. Joseph recognized his unnatural brethren, and after a series of stratagems, by which he reminded them of, and punished them for, their crime, the whole family was brought into Egypt and established in the land of Goshen. Joseph married a daughter of the high priest of On (Heliopolis), and had two sons, Manasseh and Ephraim, who became the progenitors of the tribes bearing those names, the most powerful of the future kingdom of Israel. The story is found in Genesis xxxvii., xxxix.–l., and is one of the most famous in all literature. Joseph preserved his authority until his death, at the age of 110. His body was embalmed, and at the time of the Exodus was carried to Palestine and buried at Shechem, where his tomb is still shown. The dates are conjectural. Ussher dates his birth 1745 B. C.

Joseph: the husband of Mary and reputed or legal father of Jesus. He was a resident of Nazareth in Galilee, though a descendant of David, and connected by his immediate ancestry, perhaps by birth, with Bethlehem in Judah. His genealogy is given both by Matthew and by Luke, but in the former Gospel he is called the son of Jacob, and in the latter the son of Heli, which may be reconciled by supposing Joseph to have been Heli's son and Mary to have been Jacob's daughter. Joseph was a carpenter, and is supposed to have educated Jesus to his own trade. Little can be ascertained of his character or personal history beyond the well-known circumstances of the announcement made to him by an angel in a dream of the miraculous conception of the Christ, his journey to Bethlehem, flight into Egypt, and return to Nazareth. The last glimpse of Joseph is found in the incident (Luke ii. 42–52) of Jesus when twelve years of age being found with the doctors in the temple. He is represented by early tradition to have been an old man at the birth of Jesus, and apparently had died before the public ministry of Christ began.

Joseph: King of Naples and of Spain. See Bonaparte, Joseph.

Joseph, François Leclerc du Tremblay, Father: propagandist and statesman; b. in Paris, France, Nov. 4, 1577. He belonged to a distinguished family, traveled much in his youth, and served in the army under an assumed name, but in 1599 he entered the Capuchin order, in which he subsequently attained a high position. Attracting the attention of Cardinal Richelieu in 1611, that statesman made Father Joseph his secretary and confidential adviser. In this capacity, and as provincial of his order in France, he wielded immense influence and power for many years, and ably seconded the cardinal's efforts forcibly to "convert" Protestants. He was eager for the defense of Roman Catholicism against the Turks and advocated in a Latin poem a crusade against them. He left several volumes of memoirs, which are still in manuscript in the National Library in Paris. A cardinal's hat was solicited for him by Richelieu, but before the necessary formalities were completed, he died at Rueil, Dec. 18, 1638. See his *Life* by R. Richard (Paris, 1702).

Joseph I.: German emperor; b. in Vienna, July 26, 1678; was crowned King of Hungary 1689; King of the Romans 1690; succeeded to his father, Leopold I., 1705. The great events of his reign were the putting of the electors of Cologne and Bavaria under the ban (1706) and the seizure of their states; the conquest of Naples under Daun, the successful revival (1707–08) of the imperial claims to the great fiefs of Italy, and the victories of Marlborough and Eugene in the war of the Spanish succession. D. Apr. 17, 1711.

Joseph II.: German emperor; b. Mar. 13, 1741; was the son of Francis I. and Maria Theresa; was fond of learning, and became a professed philanthropist: succeeded his father in 1765; took part in the first partition of Poland 1772; succeeded his mother in Hungary and Bohemia 1780; attempted the wholesale reformation of all the empire and his kingdom by edicts abolishing serfdom, declaring for religious liberty, the reform of jurisprudence, the abolition of monasteries, etc.; but as the means employed were violent and unusual, and the changes but ill adapted to the state and feelings of the people, nearly all classes, led by nobles and priests, joined in the opposition, and the emperor was compelled to yield (1790) and withdraw his novel measures. The most fatal mistake he committed, and the one which was most strongly resented by his subjects, was his attempt at fusing the seventeen different nationalities over which he ruled into one homogeneous mass (German). The Hungarians were on the point of revolt, when the emperor died, Feb. 20, 1790.

Josephine: Empress of the French, and first wife of Napoleon I.; originally named Marie Joseph Rose de Tascher de la Pagerie; b. at Trois Islets, in Martinique, West Indies, June 24, 1763; was married in 1779 in France to the Vicomte de Beauharnais, in consequence of an early betrothal by her father. The union was not a congenial one. She became the mother of Eugène Beauharnais and of Hortense, the mother of Napoleon III. The viscount was executed by the Jacobins in 1794, and Josephine's life was saved with some difficulty by Madame Tallien, who rescued her from prison in 1794. In 1796 she married Gen. Napoleon Bonaparte, then a rising officer, afterward appointed to the chief command in Italy. The match was prompted by mutual love, and was long a union of great happiness to both. In 1804 she was crowned empress, and both before and after that event Josephine's wisdom and talents, and the affection with which she was popularly regarded, did much to strengthen Napoleon's position in France; but the fact that the union was childless was likely to be fatal to Napoleon's ambition to become the founder of an imperial line; and in 1809 she was divorced, and retired to Malmaison, where she died May 29, 1814. See three volumes by Imbert de Saint-Arnaud, entitled *Citizeness Bonaparte*, *The Wife of the First Consul*, and *The Court of the Empress Josephine* (trans. New York, 1890).

Josephson, yō'sef-sōn, Ludvig Oscar: dramatist; b. at Stockholm, Sweden, Feb. 20, 1832; was a bookseller in Stockholm 1855–57; made his *début* as an actor in 1858; three years later was appointed on the staff of the Royal theater; in 1864 became stage-manager of the Stockholm Dramatic theater; in 1872 was called to be director of the

theater in Christiania, but resigned the position in 1876. He has written several dramas—*Folkungalek* (1864); *Marsk Stigs döttrar* (1866); *Thord Husle* (1878)—and comedies—*Rivaler genom missförstånd* (Rivals through Misunderstanding, acted 1869); *Familjelif* (Family Life, acted 1871); also opera-texts. Josephson's importance rests chiefly upon his ability as a scenic director and stage-manager. During his activity at the theater of Christiania he first undertook the task, herculean under the circumstances existing there and then, of putting Ibsen's *Peer Gynt* upon the stage in a one-night performance. P. GROTH.

Jose'phus, FLAVIUS [= Lat., the Latinized form of Heb. *Yoseph*. See JOSEPH]: historian; b. at Jerusalem in 37 or 38 A. D., of a noble and wealthy family. After passing through the schools of the three different Jewish sects, and spending three years in the desert with the hermit Banus, he adopted the views of the Pharisees as most congenial to his shrewd, ambitious, and worldly character, and soon attained a prominent position in Jewish society. In 63 A. D. he was sent to Rome on a diplomatic errand, and was introduced to the Empress Poppæa, who favored the Jews, by a Jewish actor belonging to the troupe of Nero. He accomplished his mission with success, and returned with great honor to Jerusalem. During the Jewish revolution he commanded in Galilee, and escaped the massacre after the capture of Jotapata. He fell, nevertheless, into the hands of the Romans, and was a prisoner till the close of the war, but he ingratiated himself by predicting the future elevation of Vespasian to the imperial throne, and was serviceable to his captors as an interpreter and in other ways. He was present in the Roman army at the destruction of Jerusalem, and accompanied Titus to Rome, where he resided for the rest of his life. So long as the Flavian family, in honor of which he adopted the name of Flavius, occupied the throne, he lived in great splendor. Of his life after the death of Domitian (96 A. D.) very little is known, and the date of his own death is uncertain, though it is probable that he was still living in 103 A. D. Of his works the following have come down to us: *A History of the Jewish War* from 170 B. C. to the destruction of Jerusalem, originally written in Syro-Chaldæan, which version is lost, but translated into Greek by himself; *Jewish Antiquities*, a history of the Jews from the Creation to 66 A. D.; *An Autobiography*; and a work *Against Apion*. Of these, the first is by far the most important. It gives first, as an introductory, a short sketch of the history of the Jews from the Maccabees to the beginning of the war, and then a distinct account of the whole struggle from 66 to 73; and of its general trustworthiness there can be no doubt. The best editions of his complete works are those by Dindorf (Paris, 1845); Bekker (Leipzig, 1855–56, 6 vols.; 2d ed. by S. A. Naber, 1888, *sqq.*); and by B. Niese (Berlin, 1885, *sqq.*). Complete translations into English have been given by Lodge (1602), l'Estrange (1702), Whiston (London, 1737; many editions; best ed. rev. by A. R. Shilleto, 5 vols., London, 1889–90); and of *The Jewish War* separately by Robert Traill (1847; n. e. 1862).

Revised by S. M. JACKSON.

Josh'ua [from Heb. *Yehoshūa*, liter., Jehovah his help or salvation]: originally called *Hoshea*; a Hebrew general; the successor of Moses in the leadership of the chosen people, and the conqueror and ruler of Palestine. He was the son of Nun, of the tribe of Ephraim. He first appears in the biblical record as commander of the Israelites in their victorious engagement with the Amalekites at Rephidim, a few months after they left Egypt. In the account of Moses's ascent of Sinai for the tables of the Law, Joshua appears as his "servant" or "minister," accompanying him in a part of the ascent, and first meeting him on the descent. He was one of the twelve "spies" sent to explore the land of Canaan, and one of the two (the other being Caleb) who reported favorably upon the country. For this reason Joshua and Caleb alone of all the adult Israelites were spared to enter the Promised Land. Moses was divinely directed shortly before his death to confer upon Joshua the chief authority over the people, and a solemn charge from Jehovah was addressed to him from the lips of the dying founder of the Hebrew commonwealth. Joshua led the chosen people dry-shod through Jordan (Josh. iii. 17); fortified a camp at Gilgal, where he set up twelve stones from the midst of Jordan as a memorial of miraculous assistance; kept a solemn Passover, during which the daily fall of manna ceased; and received a visit (Josh. v. 13) from a mysterious personage called the "captain of the host of Jehovah," who pronounced the ground whereon he stood holy. The most orthodox commentators identify this "captain" with the second person of the Trinity. Joshua led the Israelites in the taking of Jericho and of Ai, miraculously assisted in both cases, as he was some time later in the celebrated battle with the five kings of the Amorites, when, in the language of the poem cited from the book of Jasher, he commanded, "Sun, stand thou still upon Gibeon, and thou, Moon, in the valley of Ajalon," and was obeyed, obtaining time to finish the destruction of his enemies. It is supposable that the writer of the book of Joshua intended nothing more in this passage than the quoting of a fine hyperbole from a well-known poem; and that his earliest readers so understood him. From 200 B. C., or earlier, the passage has been regarded as an account of a stupendous miracle (Eccles. xlvi. 4). Joshua inscribed the Law upon the altar on Mt. Ebal; in six years overran Canaan in its whole length from S. to N., destroying thirty-one kings, but leaving many isolated strongholds in the hands of the Canaanites; divided the land among the tribes; appointed six cities of refuge and forty-eight Levitical cities; set up the tabernacle at Shiloh, and dismissed the trans-Jordanic tribes to their homes. He fixed his own residence at Timnath-Serah in Mt. Ephraim. He died at the age of 110, having previously given two addresses, in solemn convocations of the elders, and caused them to renew their covenant with Jehovah. He survived Moses more than seven years (Josh. xiv.), and probably not much more, though Josephus makes it twenty-five years. Ussher dates his accession 1451 B. C., and most other chronologists place it within two centuries before or after that date. The career of Joshua has been noticed by many biblical commentators as one of the few recorded in some detail without any blemish being imputed. Many are loath to justify his wholesale slaughter of the Canaanites, but if they believe such action to have been commanded by Jehovah, they can not logically condemn him for the execution of divine vengeance. Others, disbelieving the reality of such command, may, and perhaps do, upon their own principles, doubt the reality of the acts of extermination imputed to him. The name Joshua is in Hebrew the same as *Jesus* in Greek; and certain commentators make much of him as a type of Christ.

Revised by W. J. BEECHER.

Joshua, Book of: the sixth canonical book of the Old Testament. It contains the history of the times of Joshua, the successor of Moses. It consists of twenty-four chapters, the first twelve giving an account of the conquest of Canaan, and the second twelve an account of the division of the land and the subsequent events. So exact is its account of the principal cities, towns, and villages existing in Palestine fifteen centuries B. C. that modern surveys—English, American, and German—have largely identified and verified the data of the book. The authorship and date of the book are in dispute. Early commentators, patristic, Catholic, and Protestant, usually assigned the book to Joshua himself, except the last chapter, which records his death. By modern orthodox critics it is generally assigned to an unknown writer of a period immediately subsequent to the death of Joshua. Dr. Samuel Davidson, in his *Introduction to the Old Testament*, assigns the chief authorship to a writer of the age of Saul. Modern scholars have very generally come to regard the book of Joshua as a part of the same literary unit with the Pentateuch. It is composed of the same sorts of materials, put together in the same way, and is strictly continuous with the Pentateuch. Hence those who regard the Pentateuch as produced by putting together four earlier works, written at various dates, from the time of Jeroboam II. to the time of Ezra, regard the book of Joshua as produced in the same way and at the same dates. The most significant mark of its date is that it freely mentions events that occurred during the first few decades after Joshua, but mentions none that can be proved to be of later date than this. So far as appears, the latest events are such as the naming of Dan (Josh. xix. 47; cf. Jud. xvii.–xviii.); the lifetime of the elders that survived Joshua (xxiv. 31); the death of Eleazar, the son of Aaron (xxiv. 33); the putting of some of the Canaanites to forced labor (xvi. 10, xvii. 13). These phenomena have some value to show that the book was put together within the lifetime of old men who in their youth had associated with Joshua, by an author who habitually introduced references to events up to his own times. (See HEXATEUCH.) The commentaries on Joshua are numerous; it will be sufficient to name as of special value for geographical data those of Keil (1847; Edinburgh

trans. 1857); Knobel (1861); Dr. H. Crosby (New York, 1874); that of Fay, in Lange's series, edited by Dr. Schaff; that of Lias in the *Pulpit Commentary*; that of Maclear in the *Cambridge Bible for Schools and Colleges* (1888); and that in Butler's *Bible Work* (1889). There is a so-called Samaritan book of Joshua, written in Arabic during the Middle Ages, consisting of a compilation from the canonical book, interwoven with strange legends having Joshua for their hero, forming part of a chronicle of Samaritan history down to the Jewish war of Adrian. It was edited with a Latin translation from the only known manuscript (which once belonged to Joseph Scaliger) by G. J. Juynboll, *Liber Josuæ: Chronicum Samaritanum* (Leyden, 1848). The modern Samaritans are entirely ignorant of this compilation, though evidently it was written in the interest of their religious ceremonials and traditions as opposed to those of the Jews. Revised by W. J. Beecher.

Josi'ah [Heb. *Yoshiyāhu*, liter., Jehovah heals]: the sixteenth King of Judah after its separation from the kingdom of Israel, the son and successor of Amon (2 Kings xxii.–xxiii., 2 Chron. xxxiv.–xxxv.). He began to reign at the age of eight years, B. C. 638, and, reversing the conduct of his father, "did that which was right in the sight of the Lord." His reign was at a critical period in the history of Judah, and he is expressly said to have attained a higher standard of religion than any of his predecessors or successors. In this he was aided by several prophets, who exercised great influence upon the measures of his government during his minority. At twenty years of age Josiah began to take vigorous measures against idolatry, then very prevalent in the land, breaking down altars, temples, and images. Six years later, in connection with the renovation of the temple, he pushed these measures yet more vigorously, both in Jerusalem and throughout Palestine. Especially the ancient idolatrous sanctuary at Bethel was thus purified, burning upon the altar the bones of the recreant priests of former generations found there in the sepulchers, in accordance with a prophecy delivered 361 years before (1 Kings xiii. 2, Josephus *Ant.* X. iv. 4). Josiah's exercising jurisdiction in the territory of the northern kingdom has been explained by the theory that he did this by appointment of the Assyrian king, his feudal lord; but, quite as likely, the decay of the Assyrian power left him to do as he pleased. During the reign of Josiah a horde of Scythians conquered the Assyrian empire, and a column of their forces penetrated through Palestine on their way to Egypt. In the historical books of the Old Testament no mention is made of this circumstance, but the prophecy of Zephaniah perhaps alludes to it, and Ewald thinks the fifty-ninth Psalm to have been written by Josiah during a siege of Jerusalem by the Scythians. In the thirty-first year of Josiah, Pharaoh-necho, King of Egypt, marched through Northern Palestine to make war against the Assyrian empire on the Euphrates. Josiah rashly attacked him at Megiddo, was defeated with great slaughter, and was himself mortally wounded. D. at Jerusalem B. C. 608.

While the temple was being renovated the high priest Hilkiah (thought by some to be the father of Jeremiah the prophet) found there "the book of the Law." This incident is important, not only as a turning-point in Josiah's reign, but as the pivotal fact in recent discussions in biblical criticism. The critics of certain schools hold that the book of the Law thus found was the nucleus of the present book of Deuteronomy, that it was written at about that date, and placed in the temple in order to be found, and that the questions as to the dates of the other parts of the Hexateuch depend on their relations to this part. Hence it is here especially important to distinguish between what the accounts say and what they are traditionally supposed to mean. The notion is common that the copy which Hilkiah found was the only copy then in existence; but this is in itself unlikely, and there is no proof of it. To the young king, then twenty-six years old, who had been for some years endeavoring to enforce Jehovah's law, the finding of the mislaid official copy of the book of the Law would be a sufficiently important incident, no matter how many other copies were in existence. The accounts do not represent that he introduced any change of policy in consequence of finding the book, but only that he pursued more vigorously the policy already undertaken. He convoked the people in the temple, to hear the whole "book of the covenant" read, after which the ancient covenant vows were renewed, and a passover celebrated with such pomp and precision as had not been seen for centuries. It does not appear whether the book of the covenant thus read was the whole of the book of the Law that was found in the temple, or only a part of it. Further, throughout the Old Testament the word law, "torah," is used to describe either any communication made by God through the prophets, or the whole body of such communications. Hence the data are lacking to determine whether the book of the Law found in the temple was some section of Deuteronomy or Deuteronomy as a whole, or the Pentateuch, or the Hexateuch, or the recognized collection of prophetic writings (including the Mosaic writings, of course) up to that date. Two things, however, are perfectly clear. One is that the accounts, especially in Chronicles, represent Josiah as in possession of other parts of the Pentateuch and other Old Testament books, and not of Deuteronomy only. The other is that the ideas by which they represent him as influenced are almost exclusively Deuteronomic.

Revised by W. J. Beecher.

Jósika, Miklós: novelist; b. at Torda, in Transylvania, Apr. 28, 1794; entered the army, reaching the rank of captain; then (1818) turned to politics, and finally in 1834 devoted himself to literature. He took an active part in the Hungarian uprising of 1848, fled in 1850 to Brussels, and went in 1864 to Dresden, where he died Feb. 27, 1865. In Sept., 1851, he was, with Kossuth and thirty-five others, hanged in effigy at Pest, but was afterward pardoned. Up to 1848 he produced sixty volumes of romances, illustrating Hungarian life and history. Among his best works may be mentioned: *Abafi* (1851); *Zrinyi a költö* (The Poet Zrinyi, 1843); *Az utólsó Bátory* (The Last Bátory, 1840); *A Csehek Magyaro szágban* (The Bohemians in Hungary, 1845); *Egymagyar család a forradalom alatt* (A Hungarian Family during the Revolution, 1851). Most of his novels have been translated into German, and one of them (*Familie Mailly*, 1852) was written in that language. Profoundly versed in the life of his people, and master of a pleasing style, he achieved a constantly growing popularity. Four volumes of *Memoirs* appeared at Pest in 1865 shortly before his death. C. H. Toy.

Josquin des Pres, zhō'kăñ'dā-prā', Jodocus Pratensis: composer; b. probably at St.-Quentin, Aisne, France, about 1450; served from 1471 to 1484 as chapel-master at the papal court of Sixtus IV. at Rome and then held a similar position under Louis XII. at Paris; received a benefice, and died in 1531 at Condé. He was a prolific writer of masses, motets, and songs, which were highly appreciated throughout Europe, and he is generally considered as the greatest composer before Palestrina.

Jos'selyn, John: traveler; b. in Kent, England; visited New England in 1638, and again in 1663, remaining there eight years. Returning to England in 1671, he published three works: *New England's Rarities Discovered* (1672), *An Account of Two Voyages to New England* (1674), and a *Chronological Table of the Most Remarkable Passages from the First Discovery of the Continent of America to 1673*, appended to the above. The first of these works gives a picture of Boston in 1663; it was reprinted in the U. S. in 1865, with notes by Edward Tuckerman. The *Voyages*, which had been reprinted in volume iii. of the *Massachusetts Historical Collections*, was reissued in 1865 as a companion volume to the *Rarities*. Revised by C. K. Adams.

Jo'tun [Old Norse, *jǫtunn*, pl. *jǫtnar*; Swedish and Danish, *jætte*; in Anglo-Saxon, *Eoten*, later English *Ettin*; probably connected with the idea of "voracious" (Engl. *eat*)]: the giant of Scandinavian and Germanic myths. These giants are probably, in the last analysis, related to the worship of the dead (ancestor-worship); but appear in myth as a race of actual giants living in Jǫtunheim, a remote mountainous region in the realm of darkness and cold. A ray of light will turn them to stone. They are huge, sometimes many-headed and many-handed, of dull, iron-like color, ugly, enormously strong, stupid. They are mainly hostile to men, and opposed to the helpful gods; now and then they are kind, and bring good luck. They are classified as of the air, mountains, forest, or water; later, as of night or of the underworld. The ancestral *jǫtun* is Ymir, though accounts of him in the Eddas are contaminated by foreign influence. Traces of giant-worship, a cult of the *jǫtuns*, remain. Francis B. Gummere.

Joubert, zhoo bār', Barthélemy Catherine: general; b. at Pont-de-Vaux, Ain, France, Apr. 14, 1769; signalized himself by his republican convictions, and was considered as the only man able to counteract Bonaparte's ambition,

and to become the chief of a definitely established republic of France. Joubert enlisted in 1791 as a volunteer, and was promoted on the battle-field, in 1795, to the rank of general of brigade. When he had the command in chief in Northern Italy he hastened to proclaim the revolution in Piedmont. He contributed largely to the success of Bonaparte in the battles of Montenotte, Mondori, and Rivoli; but was killed at the age of thirty, at the battle of Novi, Aug. 15, 1799, where his army was defeated by Souvarow. See the *Biography* by Chevrier (2d ed. Paris, 1884).

Revised by C. H. Thurber.

Joubert, Joseph: philosopher; b. at Montignac, France, May 6, 1754. The eldest of eight sons of a family of moderate means, he received the better part of his classical education in the college of the fathers of the *Doctrine chrétienne* at Toulouse, where he remained, without taking vows, from 1768 to 1776. In 1778 he went to Paris, and was introduced to its literary circles. He came into contact with Diderot, whom he admired without retaining much of his philosophy. He became later an intimate friend of de Fontanes and Chateaubriand, whose works he defended. In 1809 he was, through de Fontanes's influence, made inspector-general of the university. D. in Paris, May 4, 1824. His chief literary productions, *Pensées*, consist of reflections on what he read, saw, and experienced. The purity and penetration of the mind which they reveal and the polished perfection of their form assure them a high place among works of their kind. None were published during Joubert's lifetime; a small collection edited by Chateaubriand in 1838 made him known to the public. They were republished with many additions and selections from his *Correspondance* as *Œuvres* (2 vols., 1842). A. G. Canfield.

Jouffroy, *zhoo'frwăă'*, Theodore Simon: publicist and philosopher; b. at Les Pontets, Doubs, France, July 7, 1796; educated at the College of Dijon and at the Normal School, Paris, where he was initiated into the study of philosophy by Victor Cousin. He held positions as teacher of philosophy at different educational and scientific institutions of Paris, where he died Feb. 4, 1842. He translated Dugald Stewart's *Outlines of Moral Philosophy* and the writings of Dr. Reid into French. His *Introduction to Ethics, including a Critical Survey of Moral Systems*, was translated into English by W. H. Channing. Revised by W. T. Harris.

Jouffroy d'Abbans, *zhoo frwăă'dăă'băăn'*, Claude François Dorothée, Marquis de: inventor; b. in Franche-Comté, France, Sept. 30, 1751; was in his early manhood (1772) a captain of infantry. During an exile of two years in Provence he studied the navigation of sailing vessels, and prepared notes for a work on that subject. The sight of Chaillot's fire-engine (1775) suggested to him the application of steam to navigation. He developed his idea by consultation with Perier and other men of science, and with the assistance of a village coppersmith made a small steam-propeller, which he placed on the river Doubs in June, 1776, but the experiment had only partial success. Continuing his mechanical studies in spite of ridicule, Jouffroy constructed another vessel, which had better success, in 1780, and in 1783 he had so far perfected the invention as to place upon the river Saône at Lyons a small steamboat which on July 15, 1783, stemmed the current of the river in the presence of the members of the Lyons Academy. Still, the vessel was too defective to be available for purposes of actual navigation. The inventor solicited a patent, which was refused by the French Government (Jan. 31, 1784), in consequence of an adverse report made by the Academy of Sciences after an examination of the vessel. At the outbreak of the French Revolution Jouffroy emigrated to England, served in the army of Condé, and took part in political intrigues in favor of the Bourbons. Returning to France under the Consulate, he became acquainted with Fulton, who after some controversy acknowledged the merits of the experiments made in 1783, claiming for himself, as is stated, only an improvement in the engine. In 1816 Jouffroy obtained a patent, formed a company under the auspices of the Count of Artois, published his book, *Les bateaux-à-vapeur*, and addressed a memoir to the Academy. On Aug. 20 of that year he launched on the Seine a steamer, the Charles Philippe, but it could not compete with rival enterprises of the same kind. The marquis passed the remainder of his life in seclusion, and died of cholera at the Hôtel des Invalides, Paris, in 1832.—His son, Achille, b. about 1790, was a voluminous political and historical writer of the Ultramontane school. He wrote an account of his father's inventions (1839), and devoted himself to experiments in steamboat and railway propulsion, without practical success. See Prost, *Le Marquis de Jouffroy d'Abbans* (Paris, 1889).

Revised by R. H. Thurston.

Jougs, Joggs, or **Juggs** [Fr. *joug*, a yoke < Lat. *jugum*]: an instrument of punishment used in Scotland, the Netherlands, and perhaps other European countries, up to about the nineteenth century. It was simply an iron collar placed around the culprit's neck and fastened by a padlock. A short chain ran from the collar to a staple in a tree, wall, or building—often the parish church. The punishment was substantially that of the pillory.

Joule, jowl, James Prescott, D. C. L., LL. D.: physicist; b. at Salford, England, Dec. 24, 1818; was the son of a brewer, associated with his father in business until 1854. His scientific education was entirely conducted by himself at home, with the exception of a course of private lessons in physics he received thrice a week for three or four years from Dr. John Dalton, the celebrated author of the atomic theory. He became enthusiastically fond of original research, and at the age of nineteen had manufactured an electro-magnetic engine, a description of which he published in the *Annals of Electricity* for Jan., 1838. Further research into the phenomena of heat evolved by electricity showed that his engine could not advantageously replace the steam-engine as a motor, and led to the discovery of the laws of the evolution of heat by electric currents, the relations between heat and chemical affinity, and the mechanical nature of the origin of heat. In 1841 he gave in a lecture at Manchester the results of the important experiments made by himself and Jacobi, of St. Petersburg, into the magnetic forces as a motive-power. These experiments were continued by Joule and by Mr. Scoresby, and led in 1843 to ascertaining the exact proportion between the mechanical powers of steam and electro-magnetism, and the equivalency of heat with mechanical force, ultimately fixed by him, after further experiments with various fluids, at 772 foot-pounds per unit of heat. The scientific applications of this principle were numerous, and Joule soon accumulated data for his important communication to the Royal Society *On the Change of Temperature produced by the Rarefaction and Condensation of Air*, which brought him into prominence as an investigator, and led to his association in further experiments with other eminent scientists, especially Prof. Thomson (now (1894) Lord Kelvin), of Glasgow, and Dr. Lyon Playfair. With the former he began in 1852 a series of researches upon the thermal effects of fluids in motion, which were continued for many years, the results of which were communicated to the Royal Society in four memoirs (1853–62), printed in the *Philosophical Transactions*. With Dr. Playfair he made a careful investigation of the space occupied by the same bodies in a solid and in a liquid state, the results leading to important modifications of the theories of molecular physics. The discoveries of Dr. Joule were intimately related to the remarkable theories of the correlation of forces developed by Dr. Meyer and Helmholtz, of Germany, Seguin, of France, Faraday and Grove, of England. The doctrine of energy, which is the outgrowth of those theories, has its foundation upon experimental results largely due to his labors. In recognition of his important services to science, Dr. Joule received the royal medal of the Royal Society in 1852, and in 1860 the Copley medal, besides all the honors which could be conferred by degrees from Oxford, Dublin, and Edinburgh Universities, membership of the Institute of France and all the chief scientific corporations throughout the world, and the presidency of the British Association for the Advancement of Science in 1873. His experiments were very numerous, and he invented many scientific processes and instruments, especially in relation to a more accurate measurement of forces. D. near Manchester, Oct. 11, 1889. Revised by E. L. Nichols.

Joule's Law: in electricity, a law which concerns the work done by the electric current in overcoming the resistance of the circuit. It was first definitely pointed out by James Prescott Joule (*q. v.*). Joule's law is as follows: In any circuit through which a current I (in ampères) flows, the heat energy developed is proportional to I^2R where R is the resistance of the portion of the circuit under consideration. The expression I^2R represents the activity of that portion of the circuit expressed in watts. An activity of one watt, however, implies the development of ·24 calories of heat per second. A complete expression of the heat set free in the electric circuit is therefore $H = I^2R \times ·24$ calo-

ries, or (from Ohm's law) $IE \times .24$ calories per second. This law was experimentally verified by Joule during researches upon the conservation of energy. E. L. Nichols.

Joule, The: practical unit of work chiefly employed by writers on electricity. The absolute unit of the C. G. S. system is altogether too small to be convenient in computations involving the expenditure of appreciable amounts of energy. There has come into use in consequence a practical unit which is equivalent to 10,000,000 absolute units. This practical unit was officially adopted by the international congress of electricians which met at Chicago during the World's Columbian Exposition in 1893. In honor of James Prescott Joule, they recommended "as a unit of work the joule, which is equal to 10^7 units of work in the C. G. S. system, and which is represented sufficiently well for practical use by the energy expended in one second by an international ampère in an international ohm."

E. L. Nichols.

Jourdan, zhoor'dăăn', Jean Baptiste: marshal; b. at Limoges, France, Apr. 29, 1762. In 1778 he entered a regiment of infantry, and fought in North America under d'Estaing. He returned to France in 1784, settled in his native city, married, and opened a milliner's store, but at the outbreak of the Revolution became captain of the national guard at Limoges, and thus began his very active and even brilliant military career. As chief of a battalion he distinguished himself under Dumouriez; was made a brigadier-general in 1793, a general of division in the same year, and commander-in-chief of the Army of the North. Oct. 16, 1793, he defeated the Austrians at Wattignies, and June 26, 1794, at Fleurus, driving them back to the other side of the Rhine. In the campaigns of 1795 and 1796 he was less successful. On Sept. 6, 1795, he crossed the Rhine at Düsseldorf, but on Oct. 11 he was defeated at Höchst by Clerfayt. In June, 1796, he crossed the Rhine a second time, and penetrated with a victorious and well-equipped army into the Upper Palatinate, but having been defeated by Archduke Charles at Amberg, Aug. 24, and at Würzburg, Sept. 3, 1796, he resigned his command. Elected a member of the Council of Five Hundred, he was twice chosen its president, and planned and established the system of military conscription. In 1799 he commanded the Army of the Danube, but having been defeated by the Archduke Charles at Ostrach, Mar. 21, and at Stockach, Mar. 25, he was superseded. Napoleon never gave him an active independent command, but appointed him governor of Piedmont in 1800, and made him a marshal in 1804. Louis XVIII. made him a count in 1815, chief of the Seventh Military Division, and peer of France in 1819. During the July revolution he was charged with the ministry of Foreign Affairs, but only for a very short time. D. Nov. 23, 1833, as governor of the Hôtel des Invalides. He published *Opérations de l'Armée du Danube* (1799) and *Mémoires pour servir à l'Histoire de la Campagne de 1796* (1819). Revised by C. K. Adams.

Journalism: See Newspapers.

Joust, jŭst [M. Eng. *juste*, from O. Fr. *jouste*, deriv. of *jouster*, to joust < Late Lat. *juxta're*, approach, come together, tilt, joust, deriv. of Lat. *juxta*, near, hard by]: in the Middle Ages, a contest between two mounted and armed warriors, especially with the lance. This tilting with the lance was the special exercise and sport of the knight and noble, exactly as the charge with leveled lances was their chief attack in war. In the joust, then, the lance was held under the right arm, and was steadied and partly supported, at least in the fourteenth century and later, by the rest; its point was directed somewhat diagonally toward the left, so that the two horsemen passed one another to the right, the shield being held or hung on the left side and receiving the blow of the adversary's lance. It was common to arrange a series of jousts, each pair of combatants to ride three courses with the lance, and in some cases the tilting was followed by the combat of sword and mace. See Tournament. Russell Sturgis.

Jouvenet, zhoo've-nā', Jean: painter; b. at Rouen, France, in 1647; showed from early youth a remarkable talent; moved to Paris; attracted the attention of Le Brun; was employed at Versailles; and became a member of the Royal Academy in 1675, a professor in 1687, and its perpetual rector in 1707. D. in Paris, Apr. 5, 1717. The gallery of the Louvre contains a great number of his works; one of the most celebrated is *The Miraculous Draught of Fishes*, engraved by Andrau.

Jouy, zhoo'ee', Victor Joseph Étienne: author; b. in 1764 at Jouy, Versailles, France; entered the army very early, fought in South America, East Indies, and the campaigns of the Revolution, but gave up his military career in 1797 and devoted himself exclusively to literature. He wrote novels, vaudevilles, and opera-texts, of which *La Vestale*, composed by Spontini (1807), was the first, and *Guillaume Tell*, composed by Rossini (1828), the last. He also wrote tragedies—*Tippoo Saïb* (1812) and *Sylla* (1822); and in 1815 he was chosen a member of the Academy. But his reputation chiefly rests on his vivid and elegant, though often superficial and inexact, studies of contemporary life, collected in the following series of publications: *L'Hermite de la Chaussée d'Antin* (5 vols., 1812–14); *Le Franc-parleur* (2 vols., 1814); *L'Hermite à la Guyane* (3 vols., 1816); *L'Hermite en Province* (14 vols., 1818–27); *Les Hermites en Prison* (2 vols., 1823, written with Antoine Joy); *Les Hermites en Liberté* (1824, with the same). Written in a liberal and even Voltairean spirit, these sketches attracted much attention, especially during the Restoration, on which Jouy made unceasing war. In 1823 he paid for this by three months in prison, ostensibly because of an article on the brothers Faucher. In 1831 Louis Philippe gave him the sinecure librarianship of the Louvre. D. Sept. 4, 1846.

Revised by A. R. Marsh.

Jovellanos, chō-vel-yaa'nōs, Gaspar Melchor, de: statesman and author; b. at Gijon, Oviedo, Spain, Jan. 5, 1744. Of distinguished family, he was destined for the higher dignities of the Church, and to this end studied at Oviedo, Ávila, and Alcalá de Henares. At the very moment when his studies were completed, however, and when he had already received the first tonsure, he was persuaded by his friends at Madrid, and above all by his uncle, the Duke of Losada, to abandon the ecclesiastical career. Through the efforts of the same persons he was appointed by Carlos III. an alcalde of the royal court of Seville (1767). Here he both performed his duties with marked success and also gained the acquaintance with literature and the fine arts, on the one hand, and with jurisprudence and the principles of government on the other, that all his life distinguished him. To this period belong his excellent prose comedy *El delincuente honrado* and his poetical tragedy *Pelayo*, besides shorter compositions in verse. In 1778 he was called to an honorable post at the court in Madrid, where he was welcomed by all the friends of letters and art. The learned societies sought his membership, and his friendship with Campomanes and Caburrus gave him a foremost place in society. In 1780 he was promoted to the Council of Orders, where for nearly ten years he labored assiduously for the intellectual and political improvement of Spain. A large number of treatises directed to this end proceeded from his pen, of which his famous *Informe sobre la ley agraria* alone is sufficient to prove him a just and far-sighted statesman. The death of Carlos III. (Dec. 14, 1788), and the succession of Carlos IV., however, brought a great change for him and all his friends. In 1790 Count Caburrus fell, and was imprisoned, while Jovellanos, as his friend, was sent to the Asturias, into virtual exile, though ostensibly charged with an investigation of the mines and other resources of that province. Here he remained eight years. But in 1798 the notorious Godoy (*q. v.*), who had intrigued himself into power, found himself compelled to restore Caburrus to favor, and with him Jovellanos, the latter being made Minister of Justice. The very next year, however, Godoy's dislike overcame his discretion, and Jovellanos was sent back to the Asturias. Even this was not enough, and in 1801 he was hurried across Spain and carried to the island of Majorca, where for seven years he endured many hardships and indignities. The French invasion of Spain and the abdication of Carlos IV. led to his immediate recall, and efforts were made by the invaders to attach him to their cause. These he indignantly rejected, and at the first signs of organized resistance among his fellow-countrymen he threw in his lot with them. When the Central Junta organized itself at Seville, he represented his province in it, and became the leading spirit of the enlightened patriots. It was largely through him that in 1810 the Junta laid down its powers in favor of the Supreme Council of the Regency. Then, broken in strength by his labors and sufferings, he retired to his native city, where, in answer to the attacks of his enemies, he wrote his admirable defense of his political course in the preceding two years, *D. Gaspar de Jovellanos á sus Compatriótas* (Corunna, 1811). He was not, however,

even now to die in peace. In Nov., 1811, the French under Bonnet suddenly overran the Asturias, and Jovellanos was forced to seek safety by sea. A violent storm in the Bay of Biscay endangered for eight days the small vessel in which he was, and when at length he was able to disembark at the obscure port of Vega, his strength was so exhausted that he lived less than forty-eight hours, dying on Nov. 27. In the dark and troublous period in which he lived he had been almost the only Spaniard of lofty personal character, enlightened patriotism, and true statesmanship. His works were published in 1830–32, 7 vols.; again in 1845, 5 vols. The most important are also printed in vols. xlvi. and l. of Rivadeneyra's *Biblioteca de Autores Españoles*. See also Augustin Ceau Bermudez, *Memórias de Jovellanos* (Madrid, 1814). A. R. Marsh.

Jovia'nus, Flavius Claudius: a Roman emperor; son of Varronianus, a distinguished general. Jovianus was captain of the life-guards of the Emperor Julian in the Persian campaign, in which the latter was killed (June 26, A. D. 363), and was proclaimed as his successor the following day by the choice of the generals. In the midst of an embarrassed and hazardous retreat from the Persian territory beyond the Tigris, terms of peace were proffered by the Persian king, Sapor II., which, though humiliating, were gladly accepted by the new emperor. During his slow retreat toward Constantinople, Jovianus promulgated edicts re-establishing Christianity as the dominant religion, but protecting the pagans. On the journey he was found dead in his bed at Dadastana, a village in Galatia, Feb. 17, 364. Whether he was the victim of poison or of accidental suffocation by the fumes of charcoal is disputed.. His successor was Valentinianus I. Revised by G. L. Hendrickson.

Jowett, Benjamin, D. D., M. A., LL. D.: educator and author; b. at Camberwell, England, in 1817; was educated at Oxford, where he became a fellow in 1838, while still an undergraduate; tutor in 1842, and Regius Professor of Greek in 1855. He was ordained in 1842; became in 1849, and again in 1853, examiner of classical schools, and in 1854 a member of the commission on examinations for the Indian civil service, along with Macaulay and Lord Ashburton. Their elaborate report, published in 1855, was written by him. In the same year Prof. Jowett published a commentary on Paul's Epistles to the Thessalonians, Galatians, and Romans, and in 1860 he contributed to the *Essays and Reviews* an article *On the Interpretation of Scripture*, for which he was tried and acquitted before the chancellor's court of the University of Oxford on a charge of heresy. *The Dialogues of Plato translated into English, with Analyses and Introductions* (5 vols., third completely revised edition, 1892), his most famous work, is deservedly regarded in the light of an English classic. Prof. Jowett became master of Balliol College in 1870. In 1881 he published a translation of *Thucydides*, with notes, in 2 vols.; in 1885 a translation of the *Politics of Aristotle*. In 1882 he was elected vice-chancellor of the University of Edinburgh. D. in Oxford, Oct. 1, 1893. Revised by A. Gudeman.

Jowf: an oasis of marvelous fertility in Arabia; a deep, well-watered depression in the desert, almost 70 miles long and 12 miles wide, between 29° and 30° N. lat. and 39° and 41° E. lon. The climate is uniform and temperate. The gardens are famous for their vegetables and fruit, the dates, figs, grapes, and melons being, the Arabs say, unequaled elsewhere. The inhabitants, comprising 34.000 in the chief towns, Jowf and Sekakah, and 6,000 in seven or eight villages, are Arabs of the finest physical type, and are celebrated for their generosity and courage.

Edwin A. Grosvenor.

Joyce, Isaac W., D. D., LL. D.: a bishop of the Methodist Episcopal Church; b. in Hamilton co., O., Oct. 11, 1836. At the age of fourteen he removed with his parents to Tippecanoe co., Ind. He graduated at Hartsville University and joined the Northwest Indiana conference in 1859. He served in the pastorate from that time until 1888, except four years spent as presiding elder. In 1880 he was transferred to the Cincinnati conference and appointed to St. Paul's church and subsequently to Trinity, in Cincinnati. He was a member of the general conferences of 1880 and 1888, and at the latter was elected bishop. He resides at Chattanooga, Tenn. Albert Osborn.

Joyce, Robert Dwyer: poet and physician; b. in County Limerick, Ireland, in Sept., 1836. He was educated as a physician in the Queen's University, Dublin, and practiced medicine in that city till 1866, when he removed to Boston, Mass. Among his publications are *Irish Fireside Tales* (1870); *Ballads of Irish Chivalry* (1872); and *Deirdre* (1876). D. in Dublin, Oct. 23, 1883. H. A. B.

Juan' Fernan'dez (Sp. pron., hwaan' fär-naan'dāz): a group of islands belonging to Chili; in the Pacific Ocean, between 33° and 34° S. lat., and 78° 30′ and 80° W. lon. It consists of three islands: Mas-á-tierra, or Juan Fernandez proper, 351 miles from the Chilian coast, and 12½ miles long by 5¼ miles in greatest width; Mas-á-fuera, 100 miles farther W. and 10 miles long by 2¼ wide; and the islet of Santa Clara, 1 mile S. W. of Mas-á-tierra; total area, 72 sq. miles. All are high and rugged. The peak called El Yunque, on Mas-á-tierra, is 3,225 feet high, and one of the peaks of Mas-á-fuera reaches 6,070 feet. They are of volcanic origin, but apparently have no active craters, though there are reports of flame and smoke seen over the mountains. All the islands are heavily wooded; the valleys are fertile, yielding wheat, potatoes, and other crops, and there is good pasturage; goats have run wild, and exist in great numbers, especially on Santa Clara. The plants and animals are remarkably different from those of the continent. Mas-á-tierra has the advantage of good anchorage ground, not possessed by Mas-á-fuera; both are well watered. The climate is mild. The group was discovered by a Spanish pilot, Juan Fernandez, probably about 1583. It became the resort of buccaneers, and later of whalers. Alexander Selkirk lived in solitude on Mas-á-tierra from 1704 to 1709. Later this island was a penal settlement of the Spanish colonies, and during the war for independence, 1810–17, many political prisoners were kept on it. Since 1877 all the islands have been farmed out to private speculators. The population is very small. See Sir Woodbine Parish in *Journ. Roy. Geog. Soc.* (1834); King, *Narrative of the Voyages of H. M. S. Adventure and Beagle* (1839); Vicuña Mackenna, *Juan Fernandez* (1883).

Herbert H. Smith.

Juarez, hoo-aa'rez: the name of several villages and towns in Mexico, all named, probably, in honor of ex-President Juarez. The most important one is that formerly called Paso del Norte, across the Rio Grande from El Paso, Texas, and terminus of the Mexican Central Railway (see map of Mexico, ref. 1–E). It is in the customs "free zone," and has a considerable trade. Pop. 8,000. M. W. H.

Juarez, hoo-aa'rāz, Benito Pablo: politician; b. in the village of Guelatao, Oajaca, Mexico, Mar. 21, 1806. He was of a poor Indian family, and up to the age of twelve could not read nor write, and spoke only the Zapotec language. A man with whom he took service sent him to school, where he quickly distinguished himself, and in 1834 he was admitted to the bar. He early joined the liberal party, held various judicial and civil offices in his native state, was deputy in the national Congress 1846, and governor of Oajaca 1847 to 1852, his honest and successful administration winning him fame throughout Mexico. In 1853 he was banished by Santa Anna; returning in 1855 he assisted in Santa Anna's overthrow, and in October of that year became Minister of Justice under Alvarez. To him was due the suppression of the ecclesiastical and military courts by what was called the Alvarez law. In 1857 he was elected president of the Supreme Court, and hence, by the new constitution, vice-president; he was thus compelled to resign the governorship of Oajaca, to which he had also been elected by a brilliant majority. Soon after (Oct. 1857), Comonfort nominated him Minister of the Interior. Congress had given President Comonfort extraordinary powers, which he abused by favoring the political conspiracy called the Plan of Tacubaya. Juarez and others who had opposed him were arrested, and Congress was dissolved, but not until after it had decreed Comonfort's deposition (Dec. 17, 1857). A revolt followed, Comonfort was overthrown, and the reactionists seized the presidency; but Juarez, who had been released, had become acting president, *ex officio*, and was proclaimed at Guanajuato (Jan., 1858). In the civil war which followed his forces were at first defeated, but the victory of Calpulalpan (Dec. 22, 1860) decided the war in favor of the liberals, and a regular election having been called, Juarez was chosen president (Mar., 1861). Civil war continued, and, the treasury being depleted, the Government was forced to suspend payment on the national debts. France, England, and Spain interfered in favor of the foreign bondholders, and an allied army invaded Mexico in Dec., 1861. In face of this danger thousands of all parties joined the army of Juarez. But the country had been weakened by civil wars, and though the

British and Spanish soon withdrew, and the French were defeated in their first attempt on Puebla (May 5, 1862), the invasion was at length successful, and in June, 1863, Juarez fled from the capital. Soon after, with the French support, Maximilian was proclaimed Emperor of Mexico. Juarez kept up a civil organization in the north, but his army, though sometimes successful, was at length reduced to scattered bands in the mountains, and Juarez himself was driven to the northern frontier. The representations of the U. S. forced the withdrawal of the French troops in Jan., 1867. Maximilian, left to his own resources, quickly lost ground, and was at length defeated and captured at Querétaro by Escobedo (May 17, 1867). Juarez refused all appeals for mercy, and Maximilian, Miramon, and Mejia were shot (June 19). Meanwhile Juarez's constitutional term had run out, but he assumed the presidency *ad interim*, and in Aug., 1867, was regularly re-elected. Opposition and insurrections continued throughout his term, but he steadfastly adhered to his policy of reform, and with some success. In 1871 he was re-elected by a plurality, and confirmed by a vote of Congress. Diaz and others declared against him, and the northern states were still in a state of insurrection when Juarez died suddenly of apoplexy, at Mexico, July 18, 1872. Throughout his career he preserved a reputation for honesty and earnestness. He was unexcitable and taciturn, but determined, and always hopeful, even during the worst reverses. See Baz, *Vida de Benito Juarez* (1874); *Biografía del Ciudadano Benito Juarez* (Puebla, 1867); H. H. Bancroft, *History of the Pacific States* (*Mexico*), vols. v. and vi. HERBERT H. SMITH.

Juarez Celman, hoo-aa'rāth-sāl-maan', MIGUEL: statesman; b. at Córdoba, Argentine Republic, Sept. 29, 1844. In 1870 he graduated doctor of jurisprudence at the University of Córdoba. Adhering to the liberal party, he was elected to several provincial offices, was governor of the province in 1880, and senator in the national Congress in 1884. In 1886 he was elected president of the republic by the votes of independent branches of the two political parties. The era of wild speculation, vast public works, and inflated currency culminated during Celman's administration, and brought about the financial panic of 1890, the effects of which were felt throughout the world. Celman and his cabinet were accused as the authors of this disaster. It was proved that vast sums had been taken from the treasury by dishonest means, and the president himself was accused of having obtained a fortune in this way. The resignation of his cabinet did not allay the discontent, which broke out in open revolt at Buenos Ayres, July 26, 1890. The president proclaimed a state of siege, and for several days fighting continued in the streets and suburbs. At length, on Aug. 6, Celman resigned, leaving the vice-president, Dr. Pellegrini, to finish the term. HERBERT H. SMITH.

Ju'ba: King of Numidia; succeeded his father Hiempsal in 62 B. C. In the civil war of Cæsar and Pompey Juba took the side of the latter, through hatred of Cæsar as well as from ancient guest-friendship with Pompey. He shared in the defeat of the aristocratic party at Thapsus, and fleeing with the Roman general Petreius to his own city, Zama, found it closed against him. They thereupon put an end to their own lives.—His infant son, JUBA, graced Cæsar's triumph at Rome in the same year, 46 B. C. He received a liberal education, and became the friend of Augustus, who restored him to his father's kingdom in 30 B. C., and gave him in marriage Cleopatra Selene, the daughter of Antony and Cleopatra. In 25 B. C. he was transferred from Numidia, which was now made a Roman province, to the kingdom of Mauretania, which under his tranquil sway and protected by Roman arms developed a considerable prosperity. As a writer the fame of Juba was even greater than as a ruler. He was distinguished for the many-sidedness of his learning, evidence of which is the works of historical, geographical, and antiquarian character cited under his name. Some of the most important were his histories of Rome, of Africa, and of Oriental countries, and a work called *Analogies* (Ὁμοιότητες), a comparison of Roman institutions and customs with those of other peoples. He is frequently cited by Pliny, Plutarch, Appian, and Dio Cassius. He wrote in Greek, and the scant fragments of his works which have been preserved by citation are collected by Müller in the *Fragmenta Hist. Græc.*, iii., pp. 465–84. His death is placed in the year 23 A. D. G. L. HENDRICKSON.

Juba: a Latin writer of the second century A. D., who composed a valuable treatise upon meters in at least eight books, of which only fragments are extant.

Jubbulpore: a province, district, and town of the Central Provinces, British India. See JABALPUR.

Jubilee [M. Eng., from O. Fr. *jubile* < Lat. *jubilæ'us* (sc. *annus*, year), the jubilee year, from Heb. *yōbēl*, trumpet-blast, shout of joy, jubilee year announced by a blast of trumpet. The Lat. confused with *jubila're*, shout for joy]: among the ancient Hebrews in Palestine, the fiftieth year, the year succeeding every seventh sabbatical year. During this year all lands lay fallow, all Hebrew slaves were set at liberty, and all lands reverted to the heirs of the original owners, to whom the lands had been parceled out in Joshua's time. In the Roman Catholic Church, Boniface VIII. in 1300 established a jubilee to be held once a century; Clement VI. (1343) ordered it to be held once in fifty years; Urban VI. (in 1389), once in thirty-three years; Paul II. (in 1470) fixed the interval at twenty-five years.

Jubilees, Book of, also called **The Smaller Genesis**, because it is on the same theme, but has less authority: an important pseudepigraphical book, originally written in Hebrew, probably in the first Christian century. It was translated at an early date into Greek, was prized by the early Christian Church, but both Hebrew and Greek texts were lost (except fragments of each) before the thirteenth century. In 1844 Dr. Krapf discovered in Abyssinia an Ethiopic version from the Greek. Of this Dillmann published in Ewald's *Jahrbücher der biblischen Wissenschaft* for 1850 and 1851 a German translation, and in 1859 at Leipzig the Ethiopic text. This book is regarded as canonical by the Abyssinian Church. It pretends to be a revelation made to Moses. It is named from the fact that it treats of biblical history in *jubilees*, or periods of fifty years. The unknown author's design was to furnish a commentary upon Genesis and Exodus. He has borrowed freely from the Hagadah. The critical value of the work is very considerable, as it shows the popular conceptions of the Judaism in which Christ labored. It may be regarded as a part of the Hagadah. An attempt to translate it back into Hebrew was made by Rubin (Vienna, 1870). See H. Rösch, *Das Buch der Jubiläen* (Leipzig, 1874); Eng. trans., of Dillmann, by G. H. Schodde, *The Book of Jubilees* (Oberlin, O., 1888). See PSEUDEPIGRAPHA.

Revised by S. M. JACKSON.

Juch, EMMA: opera singer; b. in Vienna, Austria, July 4, 1861, of naturalized American parents; developed a fine soprano voice; studied for the concert and operatic stage under Mme. Murio-Celli; sang in many concerts under the management of her father Justin Juch, Theodore Thomas, and others; sang in the Wagner festival concerts in 1884 under Thomas, and also was a member of Mapleson's Italian Opera Company; joined the American Opera Company in 1886 as leading soprano. After the failure of the American Opera Company she organized the Emma Juch Opera Company, which has traveled successfully through the U. S.

D. E. HERVEY.

Judæ'a, or **Judea** [= Lat. *Judæ'a* = Gr. Ἰουδαία (sc. γῆ, land) from Heb. *Yehūdāh*, land of Judah, Judah. See JUDAH]: a name first used in ancient geography for the kingdom of Judah, in contradistinction to the kingdom of Israel; after the return from the captivity, and up to the times of the Romans, it denoted the whole of Palestine. The Romans used it partly in a general sense, signifying the land of the Jews; thus Herod was styled King of Judæa, though he ruled over countries not belonging to Palestine; partly in a restricted sense, denoting the southernmost division of Palestine, bounded N. by Samaria, E. by the Jordan and the Dead Sea, S. by Idumæa, and W. by the Mediterranean. It was part of the province of Syria and ruled by a procurator.

Revised by S. M. JACKSON.

Ju'dah [from Heb. *Yehūdāh*, liter., praised, celebrated]: one of the twelve patriarchs, the fourth son of Jacob by Leah; b. at Haran (Padan-Aram) in Syria; was esteemed the progenitor of the tribe of the same name, which became so predominant in Palestine as to give its name to the kingdom of Judæa, and ultimately to the whole race of the descendants of Abraham (Jews). Judah appears to have exercised a kind of leadership among his brothers; it was he who persuaded them not to kill Joseph, but to sell him to the Midianites, and on the journey to Egypt to buy corn it was Judah who acted as spokesman. As such, he offered himself to Joseph as a slave to ransom his half-brother Benjamin. He had married a Canaanite woman, and left three sons, Shelah, Pharez, and Zerah, from the

second of whom David, and ultimately Christ, were descended. Of the life of Judah in Egypt nothing is known except that he was living at the time of his father's death, and received that splendid blessing (Gen. xlix. 8-12) which foretold the glory of his lineage.

Judah ben Samuel, called *Ha Levi*, or *The Levite*, and known among Arabic writers as Abul Hassan: Hebrew physician, theologian, and poet; b. in Castile about 1080. His Hebrew sacred songs have been several times translated into German since 1800. His secular poetry is given (in Hebrew and German) by Kraempf in his *Nichtandalusische Poesie andalusischer Dichter* (1858). His principal work, however, was in Arabic, *Kuzari*, being discourses on religion between a king of the Khazars, a race of the Crimea, and a Jewish rabbi. It was translated into Hebrew (by Ibn Tibbon), Latin (by Buxtorf), Spanish, and German. The latest edition (Arabic and Hebrew) is that of H. Hirschfeld, 1887. A convenient German translation is that of D. Cassel, 1869, made from the Hebrew. The work is a mine of mediæval Jewish philosophical-religious thought. Rabbi Judah made a pilgrimage to Jerusalem, and, according to tradition, was assassinated by a Mohammedan in the Holy Land about 1140. Revised by C. H. Toy.

Ju'das Iscar'iot [from Gr. Ἰούδας Ἰσκαριώτης from Heb. *Yehūdāh ish Kerioth*, Judas of (the city of) Kerioth. See JUDAH]: one of the twelve apostles, and the betrayer of his Master; was a son of Simon, who is by some supposed to be Simon Zelotes, or the Canaanite, who was also an apostle. He was the treasurer of the apostles, participated with the others in the mission to preach the Gospel and in receiving power to work miracles, was a witness of the whole career of Jesus up to the last Passover, in which he took part, and betrayed Christ to the chief priests for thirty pieces of silver, with which he purchased a field, but shortly after hanged himself in remorse for his crime. Opinions have differed for centuries as to the precise nature and motives of the crime of Judas. It could not have consisted simply in identifying the person of his Master, for Jesus was well known; but when his enemies could not arrest him in public, because he was in favor with the people, Judas, who knew his private resorts, conducted them thither to arrest him. This leaves no room for the theory that his treachery consisted in disclosing the esoteric teachings of Jesus, to be used as evidence against him. As to his motives, the plain inference from the language of the Gospels and the Acts seems to be that he was actuated by avarice, jealousy, and perhaps disappointed ambition. Yet there have not been wanting theologians who have attempted some defense of, or at least apology for, his conduct. An early Christian sect, the Cainites, remarkable for the Antinomian inversions of Scripture which led them to worship Cain and the Serpent, while refusing to worship the Jehovah of the Old Testament, honored Judas as the only true apostle, alleging that he alone perceived the necessity of taking steps for the fulfillment of prophecy and the salvation of mankind by the death of the Messiah. Modern apologists, without going to this extreme, argue that Judas's object was to place his Master in such a conflict with the authorities as would lead him to exert his miraculous powers and establish the "kingdom of the Messiah," in which he of course looked for personal advancement, in accordance with the promise that the apostles should "sit on twelve thrones, judging the twelve tribes of Israel." It is even alleged that by virtue of name and descent (being the only apostle not a Galilean), as well as in reward of his political sagacity, he expected a kind of premiership as judge over the royal tribe of Judah. On this theory his remorse and suicide simply imply that the result of his action, so contrary to his expectations, first opened his eyes to the enormity of his offense. Archbishop Whately has presented a view similar to this in one of his *Essays on some of the Dangers to Christian Faith* (1839); but it must be admitted that this view is difficult to reconcile with the text of the biblical narrative. One of the numerous apocryphal writings of the second century was a *Gospel of Judas*, which the Cainites adduced in support of their opinions. Revised by W. J. BEECHER.

Judas Maccabæus: See MACCABEES.

Judas-tree: popular name of the *Cercis siliquastrum*, a small tree of the family *Leguminosæ*, having rose-colored flowers, round leaves, handsome wood; it is used in joinery. It is a native of Europe and Asia. There was anciently a dispute as to whether Judas Iscariot hanged himself on this or on the elder-tree. The Judas-tree or redbud of the U. S. (*Cercis canadensis*) resembles the Judas-tree of Europe, but has pointed leaves and smaller flowers. Its abundant flowers, of a peach-blossom color, appear in spring and are very beautiful. The wood is soft and brittle, but handsome. See CERCIS CANADENSIS. Revised by L. H. BAILEY.

Judd, GARRITT PARMLEE: Hawaiian statesman; b. at Paris, Oneida co., N. Y., Apr. 23, 1803; studied medicine, and went in 1828 to Honolulu as physician in the service of the American mission. In 1842 he dissolved his connection with the mission, and became interpreter to the government of Kamehameha III. In 1843 he organized the first cabinet government which had ever been formed in the state, and himself held the Ministries of Foreign Affairs, Interior, and Finance, which he filled with great sagacity for ten years. D. July 12, 1873. Revised by C. K. ADAMS.

Judd, ORANGE: editor and publisher; b. near Niagara Falls, N. Y., July 26, 1822. He graduated from the Wesleyan University, Middletown, Conn., in 1847, and after teaching until 1850, entered Yale to study analytical and agricultural chemistry. In 1853 he became editor of *The American Agriculturist*, and in 1856 its owner and publisher. From 1855–63 he was also agricultural editor of *The New York Times*. For some years he was president of the Orange Judd Company, publisher of *The American Agriculturist* and books on rural subjects. In 1863 he served with the sanitary commission at Gettysburg. He was one of the projectors of the present system of railways on Long Island. In 1883 he retired from the Orange Judd Company, and the year following founded in Chicago *The Orange Judd Farmer*. In 1862 he originated a series of Sunday-school lessons upon which later popular lessons are largely founded. He built the Orange Judd Hall of Natural Science at Wesleyan University, and made other gifts. D. in Chicago, Dec. 27, 1892. L. H. BAILEY.

Judd, SYLVESTER: author; b. at Westhampton, Mass., July 23, 1813; graduated at Yale in 1836; studied at the Cambridge Divinity School, and was 1840–53 pastor of a Unitarian church in Augusta, Me., where he died Jan. 26, 1853. He is best known by his *Margaret* (1845), one of the most noteworthy works of fiction ever written in the U. S. His *Philo*, a poem (1850), *Richard Edney*, a romance (1850), and a volume of discourses on *The Church* (1854), all illustrate the strong purposes of their author's life. He was a hearty opponent of war, capital punishment, intemperance, and slavery. He left a MS. drama, *The White Hills*. See his *Life*, by Mrs. A. Hall (Boston, 1854).
Revised by H. A. BEERS.

Jude, or **Judas** [from Gr. Ἰούδας, from Heb. *Yehūdāh*. See JUDAH]: name of two of the twelve apostles: (1) Judas, the brother of the Lord (Matt. xiii. 55), called also Thaddæus, of which Lebbæus was probably a corruption (Matt. x. 3; Mark iii. 18), probably the same as the "brother" or "son" of (R. V.) James (Luke vi. 16; Acts i. 13); took part in the colloquy at the Last Supper (John xiv. 22), and wrote the Epistle of Jude (Jude 1). Of his life nothing is known with certainty; different traditions mention different places in which he is said to have preached and died. (2) Judas Iscariot (Matt. x. 4; Mark iii. 19; John vii. 71; xiii. 2, 26), the "Man of Kerioth" (Josh. xv. 25). See JUDAS ISCARIOT. Revised by S. M. JACKSON.

Jude, The Epistle General of St.: an epistle probably written in Palestine about 62. It is directed against heretics and false teachers. It is written in impassioned language, recalling that of St. Peter's second Epistle. The authority of this Epistle was contested in the early times of the Christian Church, because it contains citations of apocryphal writings, and recent critics have doubted its genuineness. Most commentators, however, maintain that it was by Judas Thaddæus, and that he was the brother of the Lord.

Judex: See ROMAN LAW.

Judge [M. Eng. *juge*, from O. Fr. *juge* < Lat. *judex, judicis*, judge, liter., law-declarer; *jus*, law + *dic-* appearing in *dicare*, point out, and *in'dex*, pointer]: a public officer who is invested with authority to hear and determine litigated causes. It is a maxim of the common law that "no one can be a judge in his own cause." Impartiality in the administration of justice requires necessarily that the judge should be an entirely disinterested party. This disqualification applies not only in regard to cases in which the judge is a party of record, but as well to causes in which he has some private or pecuniary interest. For instance, a judge who is a stockholder in a corporation can not do any judicial act

in a cause in which that corporation is a party. A judgment or decree rendered in a suit in which the judge was interested would be voidable without any proof that he had been prejudiced or misled by considerations of his own advantage. In the U. S., statutes have been passed embodying this common-law prohibition, and extending the same principle to other analogous cases in which a judge's personal interest in a cause is likely to be aroused.

In the trial of a cause it is the province and duty of a judge to decide upon the admissibility of evidence. If his rulings are deemed erroneous, objection may be made to them by counsel, and exceptions taken, upon which a motion for a new trial or an appeal may subsequently be based. Credibility of the testimony is to be determined by the jury. So the judge decides upon the competency of witnesses offered to be sworn. There are some forms of legal business which may be transacted only before a court acting as such, while others may take place out of court, and before an officer acting as a judge. A distinction is thus drawn between a court and a judge, the latter word being used to indicate that business before the officer is transacted out of court. See CHAMBERS. Revised by F. M. BURDICK.

Judge, WILLIAM QUAN: theosophical leader; b. in Dublin, Ireland, of Irish parentage, Apr. 13, 1851; was educated in theosophy as a child; emigrated to the U. S. with his father in 1864; was admitted to the bar in New York 1872, and practiced law there until 1880; founded with H. P. Blavatsky and Col. H. S. Olcott the Theosophical Society of America, becoming its first secretary; traveled to South America and West Indies several times, also to Mexico and California, Central and South India 1884, and to Europe in the interests of the Theosophical Society; was an intimate friend and pupil of H. P. Blavatsky. D. in New York, Mar. 21, 1896.

Judge Advocate: as the name is most frequently used in the U. S., the person (a military officer save in very exceptional cases) who prosecutes before a general court martial or military commission in the name of the U. S. He is detailed by the authority which appoints the court. Some of his principal duties are to prepare the case for trial, summoning the necessary witnesses; to see that the accused has the opportunity to exercise his right of challenge; to administer to the members of the court, in the presence of the accused, the oath prescribed by the 84th Article of War; himself to take that prescribed by the 85th; to see that the charges are technically accurate; to arraign the prisoner; to administer the oath to witnesses, and to present the evidence for the prosecution; to consider himself counsel for the prisoner so far as to object to any leading questions, or to any question to the prisoner the answer to which might tend to criminate himself (Art. 90); to give legal advice to the court when called on; to keep an accurate record of the proceedings, and to forward the record, properly authenticated, to the convening authority. The judge advocate has power to compel the attendance of witnesses, and he may employ a reporter to record the proceedings and testimony.

There is also in the U. S. army a judge advocate-general's department consisting of one judge advocate-general with the rank of brigadier-general, one assistant (colonel), three deputies (lieutenant-colonels), and three judge advocates (majors). They are generally stationed at department headquarters as legal advisers to the department commander, but are subject to detail by him for court-martial duty.

In the British service the duties of prosecutor devolve upon a staff officer ordered to perform them, or upon the prisoner's commanding officer, or at minor courts martial upon the adjutant. The officer detailed for this duty is called the deputy judge advocate.

Revised by JAMES MERCUR.

Judge Advocate-General: in the U. S. army an officer at the head of the bureau of military justice at Washington, with the rank of brigadier-general, whose duties, as defined by Sec. 1199 of the Revised Statutes, are to receive, revise, and cause to be recorded the proceedings of all courts martial, courts of inquiry, and military commissions, and such other duties as heretofore performed by that officer in the U. S. army. The office of judge advocate-general has existed in England since the days of the Stuarts. The Articles of War of James II. prescribed that in all criminal causes which concerned the crown, his Majesty's advocate-general or judge advocate of the army should inform the court and prosecute on his Majesty's behalf. He is now the legal adviser to the crown in all cases requiring the sovereign's action as confirming officer of the proceedings of general courts martial. He exercises the power of a supreme court of review as regards the proceedings of inferior courts. He is conservator of the proceedings of military courts authorized by the Mutiny Act, and he is a subordinate member of the administration, and quits office with it. He is provided with a deputy learned in military law, who is selected from among barristers of eminence, and who is permanent.

Revised by JAMES MERCUR.

Judges, The Book of: an historical book of the Old Testament; the seventh in order of the canonical books. It derives its name from a class of rulers or chiefs who ruled in Israel during the period which its record covers. The twelve tribes after entering Canaan formed only a loose confederation, without unity or national feeling or dignity. They had no head. They were at the same time engaged in such wars as all conquerors must maintain with those whom they displace, and they were also harassed by foreign foes. In emergencies men (or women) of talent and energy took the lead, their only authority being their ability. They were regarded as "raised up" or divinely sent. The name given to them is the same which we meet with in the Phœnician, "suffetes." When one had gained authority by displaying ability in a crisis, he became a "judge" in the forensic use of the term. This period was not one to awaken the national pride out of which history is born, or to produce historical records. In some cases, as in that of Samson, the judge became a popular hero, and the subject of song and poetry. Certain records of this time are collected in the book of Judges. They are fragmentary and imperfect, as is abundantly shown by the state of their chronology. In the Talmud this book, grouped with Ruth and the two books of Samuel, is said to have been written by Samuel. In a strict sense, he can not have been the author of them; but he may have been the author in the sense of being the leading spirit in the literary movement which produced them, doing parts of the literary work himself.

Revised by W. J. BEECHER.

Judgment: the legal determination of an action. It may be either interlocutory or final. In case something is reserved for future judicial decision, although the main questions at issue have been adjudicated, the judgment is interlocutory—as when there is an accounting to be had, a question of damages to be ascertained, or a reference required to fix the amount of rent due for use and occupation; but a judgment in an action to foreclose a mortgage is final, and not interlocutory, when it directs the sale of the premises and the application of the proceeds thereof upon the judgment debt, and that the defendant pay any deficiency appearing after the report of the sheriff as to such sale. Here the proceedings subsequent to the judgment are purely ministerial and nothing remains for the court to decide. In many jurisdictions this distinction between final and interlocutory judgments has been modified by statutes which should be examined.

The final determination of the rights of the parties in an equity suit was called a decree. In England and in most of the U. S. the distinction between common law and equity procedure has been abolished, and the term judgment has superseded "decree"; but while legislation has assimilated the forms of procedure of the two systems, it has not changed the nature of either. Although but one name is applied to the final determination of an action, whether the action is for a common-law remedy or for equitable relief, the judgment itself will vary according to the nature of the suit. If the proceeding is instituted for common-law redress the judgment will be brief and inelastic, ordinarily directing the recovery of specified property or a stated sum of money; while if equitable relief is sought and obtained the judgment may be long and minute, settling the rights of all parties and adjusting the equities between plaintiffs or between defendants as well as between the plaintiffs and defendants.

A judgment is to be distinguished from an order, or, as it is usually termed in England, a special rule. This is the decision of a motion, or particular application, which may be made either before or after judgment, settling a point of practice or some question collateral to the main issue or to the enforcement of the judgment. The doctrine of *res adjudicata* does not apply to an order with the same strictness as to a judgment. *Riggs* vs. *Pursell*, 74 New York 371.

Classification.—Judgments have been variously classified. If considered with reference to the state of the proceedings when they are rendered, they may be divided into four classes: (1) Judgments upon issues of law, or the various

judgments upon demurrer. (2) Judgments upon issues of fact after the trial and decision thereof. (3) Judgments where no issue has been made by the party required to plead. This class includes not only judgments by default and by confession, but those *non obstante veredicto*, which are given when the defendant has pleaded in confession and avoidance, and the matter set up in avoidance is found by the jury in his favor, but is insufficient in law to raise an issue. (4) Where before or after the joining of an issue of law or of fact the plaintiff abandons or withdraws his prosecution. Freeman *On Judgments*, § 6.

Entering.—The judgment may be rendered orally or in writing. This is a judicial act, and is to be distinguished from the entry of the judgment, which is purely ministerial. In some cases statutes provide that as against a party confessing or offering judgment, or as against one making default in pleading, judgment may be entered by the clerk without an application to the court. Here the declaration of the statute takes the place of a direction from the court. In litigated cases the attorneys for the prevailing suitor usually draft the formal judgment, pursuant to the terms of the judicial decision, and submit it to the court for approval before it is entered. Sometimes a judgment is entered *nunc pro tunc*—that is, so as to take effect as of a day prior to its actual entry. Where the judgment has been actually pronounced and its terms are certain, but no record thereof has been made by the ministerial officer, the party in whose favor it was given has a right to the entry as of the day of rendition, unless he has been negligent in the matter; but such entry will not be permitted to affect the rights of third persons acquired without notice of the judgment. In still other cases the judgment is ordered to be entered as of a day prior to its rendition—as where the cause has been finally submitted to the court, but before a decision is reached one of the parties dies. Here the delay is treated as that of the court, for which the parties are not chargeable, and if the court deems that the justice of the cause requires judgment to be rendered and entered as of a day prior to the death, it will so order.

Amendments.—The common law recognized the right of the court to modify a judgment during the term at which it was given. This right has been extended, and courts do not hesitate now to correct the entry of a judgment at any time so that it shall conform to the judgment actually rendered, if its terms appear anywhere in the record. In many of the U. S. the rule has been still further extended, and courts amend judgments when satisfied by evidence even outside the record that they are incorrect. In a few cases the courts have even added to the judgment provisions not contemplated when it was rendered, where they are of a kind that would have been granted as a matter of course had they been brought to the attention of the court at the time of its original decision.

Effect.—If the judgment is rendered by a court which has not jurisdiction of either the subject-matter of the suit or of the person against whom judgment is given, it is null. Even where the court possesses jurisdiction of the parties and the subject-matter, if it has no jurisdiction to render the particular judgment, it will be a nullity. This is exemplified by *Ex parte Lange*, 18 Wallace (U. S.) 163. The prisoner was liable under a statute to a fine or imprisonment. He was sentenced to both. He paid his fine and sued out a writ of *habeas corpus*. When brought into court under the writ the judgment was changed to one of imprisonment only. Such judgment was declared void and a nullity, as the court had no power to render such a judgment, and it deprived the prisoner of a constitutional right. Whether a court acquires jurisdiction of a party by the appearance of an unauthorized attorney has been differently decided, but the better doctrine seems to be that it does not.

When a judgment is voidable and not void, it has the effect of a valid one until it is vacated. This may be accomplished either on an Appeal (*q. v.*) from the judgment, or by a motion, or by a suit to set it aside.

A valid judgment generally operates to extinguish the original cause of action, in accordance with the doctrine of Merger (*q. v.*). In certain cases, however, this effect has been denied to it, in order to prevent the defeat of the equitable rights connected with the original relations of the parties. For example, where a creditor of a bankrupt obtains judgment after bankruptcy upon a debt contracted before, the debt is not so merged in the judgment as to prevent the creditor from proving it against the estate, nor as to prevent the bankrupt's discharge freeing him from its obligation. A valid judgment is conclusive evidence of the existence of that state of things which it necessarily affects. If a deed, given by the plaintiff to the defendant, be adjudged void because of the grantor's weakness of mind, the judgment will be conclusive on all the world as to the nullity of that deed. Further, it will be conclusive upon the parties and those in privity with them (see Privity) as to all matters actually litigated; and in many jurisdictions to all matters so closely connected with the main controversy as to be substantially involved in it. (See Evidence, Estoppel, and Foreign Judgments.) In England, the term parties to a judgment is generally confined to those who appear as such upon the record. In the U. S. the prevailing view is that it includes all who are directly interested in the proceedings, with the right to control them and to appeal from the decision. Thus a principal would be bound by a judgment in an action brought or defended in his agent's name, but on his account. On the other hand, one who institutes a proceeding to have another declared a lunatic is not a party to an inquisition of lunacy made therein, as he acts on behalf of the public and has no right of appeal from the determination. The same is true of one who procures the indictment of a criminal. Here the state is not only the complainant on the record, but has exclusive control of the action. The conviction or acquittal of the accused is not admissible for or against the prisoner in a civil action brought by the informer against him upon the same transaction.

Lien.—Judgments for the payment of money ordinarily become a lien on the real estate of the debtor as soon as they are docketed in the proper office. The means by which this lien is acquired, the property upon which it attaches, and the period of its continuance are matters of statutory regulation which can not be enumerated here. See Lien.

Enforcement.—Money judgments are generally enforced by Execution (*q. v.*), which at common law had to be issued within a year and a day, and if not issued within that period can not be issued without a proceeding to revive the judgment. The period within which it may issue without application to the court is now regulated by statute. If a judgment was not enforced by an execution or other appropriate Writ (*q. v.*), an action could be brought upon it. This right was so frequently abused that it is now controlled by statutory provisions. In some States summary proceedings supplementary to execution are authorized, by which property that can not be taken under an execution may be obtained and applied upon the judgment debt.

Satisfaction.—This may be effected by the voluntary compliance of the defeated party with the directions of the judgment, or by the compulsory enforcement of all of its provisions, or by a release under seal. Payment of a money judgment by one not a party thereto will extinguish it, unless he occupies the position of a surety for the judgment debtor and pays for his own protection, when the law will subrogate him to the rights of the judgment creditor; or unless the party paying buys the judgment. If the judgment is for trespass to goods, or their conversion, its satisfaction operates as a sale of the goods from the time it is satisfied. Upon the satisfaction of a judgment, entry thereof should be made on the record. However, some courts have held that a sale under a satisfied judgment is void, even against a *bona fide* purchaser.

Obligation.—Judgments are often spoken of as contracts of record. Undoubtedly, when an action is brought upon a judgment it may be described as a contract, and such an action is *ex contractu* instead of *ex delicto*, even though the judgment was obtained in an action for a tort. Some courts have even decided that it partakes so largely of the nature of a contract that it will be void if obtained against a person incapable of contracting a debt (*Morse* vs. *Toppan*, 3 Gray, Mass. 411); and the term "implied contract" in a statute has been construed by the New York court of appeals to include a judgment. On the other hand, it has been frequently ruled that as a judgment is not an agreement of the parties, but most commonly subjects the defeated one to an obligation against his will and in spite of his most strenuous opposition, it can not be deemed a contract. Accordingly, the Supreme Court of the U. S. has declared that the obligation of a judgment is not within the provision of the Constitution prohibiting a State from passing any law impairing the obligation of contracts; and the court of appeals of New York, in construing the interest statute, decided that a judgment was not included in the phrase "contract or obligation made before the passage of this act." The obligation of a judg-

ment is imposed by the law. It does not originate in the agreement of the parties. FRANCIS M. BURDICK.

Judgment [from O. Fr. *jugement* < Lat. *judicamen'tum*, a judgment, deriv. of *judica're*, judge, deriv. of *ju'dex*, a judge. See JUDGE]: the mental act of making an assertion or statement. The second great stage after conception in the process of thought is judgment. In the judgment the discovery and assertion of relations between mental states, and, through them, between the things they represent, becomes the important event in consciousness. It proceeds upon the basis of conception, for its elements are concepts in different stages of growth. In its broadest definition, therefore, *Judgment is the mental assertion of the degree and kind of relationship already arrived at in some stage of the process of conception. John is a man* is a judgment. It asserts that the general concept man has reached that stage of development in extension or generalization that it includes the single concept John; or, to express the same relation conversely, this judgment asserts that the single concept John has reached such a stage of development in intention that its essential attributes include those of the general concept man. That is, by a psychological assertion it is indicated that the qualities of the concept man have become attached to the concept John. The expression of identity between the two, found in the verb *is*, therefore, is merely the sign of this mental movement. Indicating by *a* the sum of the intensive marks already gathered up in the logical subject (John), and by *b* the marks now added by the assertion in judgment, the psychological formula of judgment becomes

$$a \text{ is } (=) \; ab.$$

Law of Judgment.—The sign (=), in this formula, is used as equivalent to the word *is*, since, in the judgment, the fact that I use former experience as identical with (or as representative of) new experience, is still acted upon; indeed, it becomes a conscious principle of reasoning, in the form of the *law of identity* or *non-contradiction*. The formula exhibits the constant endeavor of the mind to keep its experiences consistent. In the first member of this equation of identity, *a* means the reality denoted by the object of which the assertion is made, in the second member *a* denotes my former concept of this same object; *b* denotes the addition which I now find this former concept must undergo to be true to, or identical with, the new experience of *a*. Of course the act of judging takes place only after this new experience, so that what I really do by judgment is to bring my former inadequate concept up to my new light. Expressed in language, a judgment is called a PROPOSITION (*q. v.*). Propositions considered as formal statements of judgment fall within the province of LOGIC (*q. v.*).

Unity of the Judgment.—We are led by the above to see that the content of judgment is not two concepts at all, but one, a concept *full of relations*. This is shown by throwing the judgment into the form of the modified concept *ab*, above. For example, the judgment, *the dog is fierce*, considered psychologically, amounts to the adding of the quality fierce, *b*, to the marks of dog, *a*, and the product, *ab*, is the single concept, *fierce dog*. This aspect corresponds to the real object, which is only one. As far as this point is concerned, the judgment is not distinguished either from the presentation or the concept: they are all different stages in the progressive growth of apperception. This unity of the judgment, as a mental product, is further seen in simple judgments of existence, i. e. *giants exist*; where the predicate is not an attribute or mark, but simply expresses the fundamental assumption of all judgment, belief in reality.

The essential feature of judgment, in contrast with conception, is therefore this, that it sets forth in a conscious contemplative way the actual stage of the thought movement. It brings out and emphasizes the belief which attaches to the concept in its progressive stages. In the generalizing of the concept this belief was present, as each new precept was brought within its range; and in the judgment each such belief becomes explicit, *John is a man, James is a man*, etc. Asserted belief is, therefore, necessary to judgment, and constitutes its distinguishing mark. For the nature of belief, see PSYCHOLOGY.

Parts of the Proposition.—The verbal judgment, or proposition, may be said to be made up of three parts or terms: the *subject*, that concept of which the relation in question is asserted; the *predicate*, those elements of conception which are asserted to bear this relation to the subject; and the *copula*, the verbal sign of the relation between subject and predicate. In the judgment, *Napoleon conquered Europe*, these three parts are seen in the usual order: subject, copula, predicate.

Kinds of Judgment according to their Meaning.—Judgments may be considered with reference to their structure as being of two kinds: *analytic* and *synthetic*. Psychologically, these aspects of the judgment indicate different stages in the further development of the concept. The analytic judgment consists in an expansion of the subject in an assertion whose predicate has been before included in the intensive marks of the subject. For example, *trees have trunks* is an analytic judgment, since the marks represented by the word trunk are a necessary part of the concept tree, and its assertion is merely an expansion of that concept. This form of judgment, therefore, represents the development of the concept in the stage of abstraction which is called analysis. The vague first-notion tends toward definition and differentiation, by the dropping of accidental marks, and the confirmation and assertion of those found to be essential. The synthetic judgment, on the other hand, is the product of the building up or synthetic process of abstraction. It asserts predicates before undiscovered, or unincluded in the notion as before made up. For example, *cows are ruminating animals* is a synthetic judgment. The quality of rumination is added to the notion cow, as a mark. And synthetic judgments are constantly passing into analytic. To the naturalist, the ruminating quality is essential to the notion cow, and the judgment which asserts it is analytic.

This distinction may be viewed also from the side of extension. The continuous growth of concepts, through the formation of successive synthetic judgments, is seen in the process of education. The pupil's conception of the thing in hand is constantly enriched by all the predicates of his instructor's knowledge.

Classification of Judgments according to Belief. 1. *Categorical Judgments.*—The simplest form of mental assertion in which an affirmation or negation is made is the categorical judgment.

a. Simple categorical: the ordinary synthetic and analytic judgments already spoken of.

b. The existential judgment rests upon a deeper mental movement than either analysis or synthesis, and represents the assertion, in a special way, of the belief which characterizes judgment. It goes beyond belief in the consistency and adequacy of concepts and their relations, and attaches itself to belief in the external reality, in nature, of what the concept represents. *The moon exists* is an existential judgment. The existential judgment brings out not only the natural tendency to believe in the facts of mind; it supposes some question aroused, and its refutation, through what we call evidence. There is no psychological meaning in the judgment *mermaids exist*, unless I have, or have had, some reason to doubt their existence. The judgment rests, therefore, upon the removal of this doubt by evidence. Here we are brought face to face with the conscious working of a great law of thought, regulating and making consistent the content of representation, i. e. the law of *sufficient reason*. In the judgment of existence, the ground or reason which consciousness has for accepting, rejecting, etc., for the first time becomes evident to itself; and we find that we can not explain further the fact that consciousness must work under such a principle.

c. The disjunctive judgment is a form of categorical statement, in which a disjunction, or assertion of alternatives, expresses the attitude of the mind with respect to belief, toward a certain class of facts. That is, the ground of the statement is of such a nature that more than a single relation among the elements involved may be possible. The assertion, therefore, has reference to all these possible cases. For example, *this man is either a minister or a lawyer* is a disjunctive judgment, the reason of its assertion being adequate to either conclusion, say the dress, manner, conversation, of the person involved. Further search, or clearer definition of the ground of the assertion, eliminates all but one of these alternatives, and the judgment takes the regular categorical form.

2. *Hypothetical Judgments.—Hypothesis.* The hypothetical judgment stands, with reference to belief, midway between the ordinary assertion of the analytic and synthetic judgments, and that of the existential. The former expresses only belief in the truth of the relations brought out in analysis or synthesis; the existential judgment expresses only belief in a reality of the object denoted, but the hypothetical judgment has reference to both these phases of be-

lief. In the hypothetical the ground, or sufficient reason, is cited, as the mental condition upon which belief in the statement made goes out. For example, *If the morals of the people are corrupt, the republic will not live*, is a hypothetical judgment. The belief in the hypothesis (synthetic) *the republic will not live*, rests upon the belief (existential) in the evidence *the morals of the people are corrupt*. The failure of this belief in the sufficient reason, or *antecedent*, removes the ground of belief in the result, or *consequent*, and the mind is left in a state of uncertainty. The attitude of the mind in this judgment may therefore be called one of *contingent* belief. Any judgment which rests upon such contingent belief is an *hypothesis*. Hypotheses in science are judgments put forth as true when the evidence is admitted to be inadequate or contingent.

The theory of judgment is extremely important, both in logic and in psychology. For the further exposition of the view presented above, see Baldwin, *Handbook of Psychology* (2d. ed. New York, 1890), vol. i. chap. xiv., and *Feeling, Belief, and Judgment*, in *Mind*, 1892, p. 403. Other discussions are: Brentano, *Psychologie vom empirischen Standpunkte*; Hillebrand, *Die neuen Theorien der categorischen Schlüsse*; Bosanquet, *Logic* (Oxford, 1888), chap. i., vol. i.; Venn, *Empirical Logic* (London, 1889), pp. 196–264. See also the systematic works given under PSYCHOLOGY and LOGIC.

J. MARK BALDWIN.

Judiciary [from Lat. *judicia'rius*, of or belonging to a court of justice, deriv. of *judi'cium*, judgment, court of justice, deriv. of *judex*, judge. See JUDGE]: the organ of government by which the law is declared and applied in litigated controversies. In primitive communities it exists, if at all, in a very rudimentary form. If they are monarchies, its functions are exercised by the king, who is also the legislator and the executive. Where they are organized upon a popular basis, all these powers are wielded by the assembly. The history of ancient states shows that a people may attain a high degree of civilization while this organ of government remains imperfectly developed. Aristotle recognized the fact that "every polity comprises three departments"—"the deliberative body," or the legislature; "the officers of State," or the executive; and "the courts of law," or the judiciary. (*Politics*, bk. 6, chaps. xiv.–xvi.) His description of each discloses, however, what history also teaches, that the Greek states never developed a judiciary worthy of its name. A tribunal, such as the Athenian dicastery, whose presiding officer was chosen by lot from the mass of citizens, and whose body consisted of 500 or more average citizens, also selected by lot, to whom all questions both of law and of fact were finally submitted, might or might not do justice in a particular case, but was absolutely certain neither to know the law nor to declare nor to apply it scrupulously in its decision. In the Roman republic the functions of government were considerably differentiated. Still the republican prætor always exercised administrative and priestly, and even legislative, powers, as well as those which were judicial, and under the empire the various functions of government, which theretofore had been put into commission and allotted to various magistrates and assemblies, were again united in the prince, who became the supreme legislator, executive, and judge.

During the Middle Ages all that had been gained by the Roman state in the development and separation of the functions of government was lost. Not only every king, but every petty prince and assembly reverted to the primitive habit of exercising judicial as well as executive and legislative power, and the process of judicial evolution had to begin again. In England and France, as the central authority of the king increased, it constantly encroached upon that of local lords and municipalities. A body of officials, with special training in the law, soon grew up around the royal court, to whom the king naturally looked for advice when controversies involving legal questions came before him for decision. As such controversies multiplied, it became necessary to depute persons to hear and decide them. Such deputies of the king would be selected, of course, from the body of trained lawyers. After a time the deputies became permanent tribunals. Thus originated the superior COURTS (*q. v.*) of England and the PARLIAMENTS (*q. v.*) of France.

In neither of these countries, however, was the judiciary entirely separated from the other departments of government until a very recent period. In fact, its separation in England is not yet complete. The House of Lords still remains the court of last resort, although its judicial functions are performed by a few of its members known as "law lords." These include only those who have personally held, or are at the time actually holding, important judicial positions. Again, the lord chancellor is a member of the cabinet as well as a judge, and is charged with a variety of administrative and political duties. Since the Revolution the French judiciary has had no organic connection with the other branches of government. Prior to that epoch, while it was largely independent of the executive, it claimed and exercised a share in legislation.

One of the earliest writers on political science to insist upon the importance of a separate and independent judiciary was BODIN (*q. v.*), but the author whose views upon this subject have been most influential is MONTESQUIEU (*q. v.*). He declares that "if legislative and executive powers are united in the same person, or even in the same body of magistrates, there is no liberty, because people are afraid that the monarch or the senate may make tyrannical laws in order to administer them tyrannically. There is no liberty, again, if the judicial power is not separated from the legislative and executive; if it is joined to the legislative power the life and death of the citizens may be arbitrarily disposed of, for the judge will be legislator; if it is joined to the executive power the judge may have the force of an oppressor." (*Esprit des Lois*, xi., 6.) This argument, based on considerations of personal freedom and security, has been re-enforced by the experience of modern states, which has demonstrated that each function of government is most efficiently exercised in those communities where a special organ has been developed therefor.

Separation of the Judiciary.—While modern states are generally agreed that the judiciary should be separated from the other branches of government, they differ as to the consequences which should follow from such separation. In the first written constitution of France, and the laws of the constituent assembly thereunder, Montesquieu's doctrine was applied with the utmost rigor. Not only were the legislative, the executive, and judicial functions apportioned to different classes of officers, but it was distinctly affirmed that neither class could interfere with the affairs of the other without violating the constitution. Although during the last 100 years France has tried as many as sixteen constitutions, she has held fast to the doctrine that the ordinary courts have no right to set aside an act of the legislature, nor, as a rule, to call in question the acts of any administrative officer. Her practice has been adopted by most of the states on the Continent. They trust to explicit limitations in the constitution on the legislature, and to public opinion as checks upon this department of government. In case administrative officers exceed their constitutional powers, they can not be called to account before the regular judiciary; but any one injured by such illegal acts is not without redress. He may apply for relief to the administrative courts. These tribunals are composed of administrative officers, and decide the controversies brought before them, not in accordance with the rules of law which prevail in the regular courts, but in accordance with *droit administratif*. While they exercise at least *quasi* judicial functions, they are accounted not a part of the judiciary, but a part of the executive department. On the one hand it is claimed that this system lowers the dignity and diminishes the influence of the regular judicature, while it also fails fully to protect the private citizen against official abuse. (See Dicey's *Law of the Constitution*, lect. 5.) On the other hand it is asserted that the system has developed a series of remedies which are cheaper and more effective than any that can be found in the ordinary courts. See 2 Goodnow's *Administrative Law* (pp. 221–234).

In English-speaking countries the separation of the judiciary from the other departments of government has not resulted in ousting it of jurisdiction over their illegal acts. If a prime minister, a collector of customs, a sergeant-at-arms of the House of Representatives, or any other officer, injures an individual without legal justification, he can be brought before the courts and be punished or be subjected to the payment of damages as any other citizen. Undoubtedly the possession and exercise of such authority have done quite as much to render the bench dignified and powerful as to secure personal liberty to all classes. Since the British Parliament has unrestricted power of legislation, its acts are binding on the courts. It is true the judges, under color of interpreting the laws, have at times nullified them, as in the case of the famous statute of uses (see USE and

TRUSTS) and of the Gaming Act of 1845 (see *Gambling and the Law, Nineteenth Century* for July, 1891); but they have no authority to declare an act of Parliament unconstitutional. In the U. S., however, the judiciary does possess such remarkable power. It had been exercised by the courts of several States before the adoption of the Federal Constitution, the earliest case probably being that of *Holmes* vs. *Walton*, decided by the Supreme Court of New Jersey in Sept., 1780. (See *State* vs. *Parkhurst*, 4 Halstead (N. J.) 444, and 5 *Political Science Quarterly*, 233.) But their right to exercise it was stoutly denied, and as late as 1807 two judges of the Supreme Court of Ohio were impeached and barely escaped conviction for declaring an act of the State Legislature unconstitutional. The question was settled for the Federal judiciary by the decision of the Supreme Court in *Marburg* vs. *Madison*, 1 Cranch 137. A brief extract from the celebrated opinion of Chief Justice Marshall will show the ground upon which this power rests: "This original and supreme will organizes the government and assigns to different departments their respective powers. The powers of the Legislature are defined and limited, and that those limits may not be mistaken or forgotten the Constitution is written. The Constitution is either a superior paramount law, unchangeable by ordinary means, or it is on a level with ordinary legislative acts, and, like any other act, is alterable when the Legislature shall please to alter it. If the former part of the alternative be true, then a legislative act contrary to the Constitution is not law. It is emphatically the province and duty of the judicial department to say what the law is. If two laws conflict with each other the courts must decide on the operation of each. This is the very essence of judicial duty. If, then, the courts are to regard the Constitution, and the Constitution is superior to any ordinary acts of the Legislature, the Constitution, and not such ordinary act, must govern the case to which they both apply." The argument of the chief justice was unanswerable, and his conclusion has been accepted not only by the Federal and State courts, but by all departments of government. In the self-governing colonies of Great Britain the same rule obtains. Their legislative acts, if in conflict with the colonial charter or any act of Parliament, may be nullified by the courts.

As it is the essence of judicial duty to declare the law and not to do justice irrespective of law, courts will not adjudge a statute unconstitutional because it is unjust, nor because it violates the spirit of the State's institutions, nor because it impairs any of those rights which it is the object of a free government to protect, provided it does not conflict with some provision of the Constitution. *Sharpless* vs. *Mayor*, etc., 21 Penn. State Reports 147.

A supervisory power by the judiciary over legislation is not necessarily incident to a written constitution. Many of the European states have put their fundamental law into writing. Some of these instruments do not either expressly or by implication prohibit the courts from passing on the constitutionality of legislative acts, yet the judges have never presumed to declare void a regularly enacted statute. Nor does the power in question originate in a federal system of government. Switzerland and the German empire are federations, but in neither can the judiciary annul a legislative act.

Independence of the Judiciary.—Not only must the judiciary be separated from the other organs of government if its highest usefulness is to be secured, but it must be freed from their domination. The common-law courts of England were detached from the legislative and executive departments, but as their members were appointed and removable by the crown, they were generally subservient to its whims. Not until the Act of Settlement, in 1689, secured to the judiciary fixed salaries and a tenure of office during good behavior was it able to gain the confidence of suitors and the respect of the bar. In Germany the judges early became independent of the executive, because they were elected by the estates. In France they attained independence in a different way. Originally they were removable at the king's will, but an ordinance of 1467 prohibited the monarch from exercising this power. Early in the following century judgeships became salable, and upon the establishment by Sully of the paulette—the annual tax on these offices—they became assignable and hereditary. From this time the judiciary was a caste—the noblesse of the robe. But while the king could not remove the judges he could multiply the judgeships, and this he did without hesitation whenever he needed additional revenue. Some of these offices commanded enormous sums. The presidency of the Parliament of Paris was sold for 1,000,000 francs. As the judges were paid for their services by fees and not by salaries, their independence of the executive was complete. An independence thus achieved, however, rendered them unpopular and distrusted.

The fearlessness and independence of the judiciary are further promoted by limiting their legal responsibility. It is a principle which has been said to have a "deep root in the common law" that judicial officers shall never be liable to a civil action for acts done in the performance of their legal duties and within the province of their legitimate jurisdiction, even though they act corruptly and oppressively. Nor are they liable, under similar circumstances, to a criminal prosecution. The impartial administration of justice requires that those who dispense it should not be exposed to any influences which would make them timid, hesitating, and over-cautious. "It is better," says an able English judge, "that an individual should occasionally suffer a wrong than that the course of justice should be impeded and fettered by constant restraints and apprehension on the part of those who are to administer it." The regular remedy against a judge who is guilty of criminal disregard or violation of duty or perversion of justice is impeachment. See IMPEACHMENT.

Appointment and Tenure.—In modern states judges are appointed by the executive or elected by the people. The former method of selection prevails in Europe and in the British colonies, although the members of special tribunals, like the courts of commerce in France and Germany, are elected by the votes of a prescribed class. Prussian judges are appointed by or on the recommendation of the Minister of Justice, and are removable only by the courts for cause. The judges of the lower courts of the present German empire are appointed under the supervision of the Minister of Justice. Those of the Reichsgericht are appointed by the emperor upon the recommendation of the Bundesrath. Their fitness for office is determined by two examinations—the first of which must be preceded by three years spent in the study of jurisprudence in a university, and the second by three years of practice as an attorney. They can be removed by the courts only.

In France all members of the regular judiciary are appointed by the chief executive. Justices of the peace are removable at his will, but other judges can be removed only in accordance with law. A judge must be a licentiate in law, and must have had at least two years' experience as an *avocat*. The number of counselors is limited. They are appointed by the chief executive on the presentation of an *avocat* who retires from the profession, or on that of the personal representatives of one deceased. High prices are paid for these appointments. It is said that the market value of these positions amounts to a billion francs.

In Great Britain judges are appointed by the executive. With the exception of the Lord Chancellor, who is a cabinet minister, with a consequent tenure of office which is uncertain, the judges of the superior courts are appointed for life, and can be removed only in the case of misbehavior or an address to the crown by both houses of Parliament. Similar rules govern the appointment and tenure of colonial judges.

The federal judges of the U. S. are appointed by the President, "by and with the advice and consent of the Senate," and hold office during good behavior. A few of the States observe the same practice, but most of them have an elective judiciary, the term of office varying from two to twenty-one years. This change in the method of selecting judges has caused much controversy. While it has not produced the evils predicted by its opponents, there is at present a tendency either to abandon it or to lengthen the terms for which the judges are elected. See Bryce's *American Commonwealth*, ch. 42.

Salaries.—The compensation of judges ought never to depend upon fees. When it does the judiciary inevitably degenerates, and is distrusted and unpopular, as in the case of the French Parliaments and seigneurs. Generous salaries should be provided in order that the best legal talent may be attracted to the bench. In this respect Great Britain acts wisely. Her lord chancellor receives an annual salary of £10,000; each of the law lords, £6,000; the lord chief justice, £8,000; the master of the rolls, £6,000; each lord justice, £5,000; and each county court judge, £1,500. On the Continent judicial service is not largely rewarded. Judges of first instance in France receive from 2,400 to 5,000 francs per year. The salaries of the imperial judges of

Germany vary from M. 4,000 to M. 20,000. An account of the salaries paid by the U. S. Government to its judges is given in the article on COURTS (*q. v.*). In the States judicial salaries vary greatly. Oregon is at the bottom of the scale, with a salary of $2,000 for her chief judge, while New Jersey pays her chancellor $10,000, and some of the Supreme Court justices of New York receive $15,000.

Many questions relating to the judiciary are considered in other articles. See ADMIRALTY, APPEAL, CHAMBERS, CONSTITUTION, COURTS, EQUITY, JUDGE, JURISDICTION, JURISPRUDENCE, and TRIAL. FRANCIS M. BURDICK.

Judicium: See ROMAN LAW.

Ju'dith [Heb. *Yehudith*, feminine form of Judah]: the heroine of one of the apocryphal books of the Old Testament, in which she is represented as inhabiting Bethulia, a town of Samaria, when it was besieged by an Assyrian army under Holofernes, chief general of King Nebuchadnezzar. The famished inhabitants were on the point of yielding when Judith resolved to deliver her people, and accordingly contrived to enter the Assyrian camp with her maid. Her beauty and artful speech won the favor of Holofernes, and her offer to show him the access to the city was accepted. He invited her to a banquet at which he drank himself into a stupor, and when alone with him Judith cut off his head, which she bore from the camp in a bag. The inhabitants of Bethulia next day attacked the enemy, who, discouraged by the loss of their leader, were easily routed. Judith died at Bethulia at the age of 105. That the book of Judith is historical in its character is maintained by the Roman Catholic Church, it being included in their biblical canon, but has been denied by most Protestant critics, chiefly, it would seem, from the difficulty of making its statements harmonize with any scheme of chronology. The Assyrian king called Nebuchadnezzar in the book of Judith has been identified in turn with almost every one of the Persian monarchs from Cambyses to Artaxerxes Ochus, but there are insuperable objections to each which have taxed the ingenuity of the historical school of commentators. On the alternative hypothesis that the book is a kind of religio-patriotic romance, intended to raise the courage of the chosen people at some period of grievous oppression by a foreign tyrant, there are two leading views—one, represented by Luther and Grotius, looks upon the book as an allegorical account of the Jewish sufferings under Antiochus Epiphanes. The Tübingen school of criticism and other recent German authorities (Volkmar, Baur, Hitzig) generally regard it as a production of the second century A. D., making Nebuchadnezzar stand for Trajan, Nineveh for Antioch, Assyria for Syria, Arphaxad for the Parthians, Ecbatana for Nisibis, Holofernes for the Roman general Lucius Quietus, and Judith for Judæa. The occasion is assigned to 117–118 A. D., when the Jews and Parthians obtained a victory over Quietus. The book of Judith is not a part of the Jewish canon of Scripture. According to Origen, it was unknown to the Jews, and never existed in Hebrew. The Greek text, however, shows traces of a Hebrew original. Lessons from it are read in the Church of England. See Volkmar, *Das Buch Judith* (Tübingen, 1860); Wolff, same title (Leipzig, 1861), and E. C. Bissell's volume on the Apocrypha, in the American Lange Series (1880). Revised by W. J. BEECHER.

Judson, ADONIRAM, D. D.: missionary; son of a Congregational minister; b. at Malden, Mass., Aug. 9, 1788; graduated as valedictorian of his class at Brown University, Rhode Island, in 1807; studied for the Congregational ministry at Andover Theological Seminary, graduating in 1810. While teaching a private school in Plymouth, Mass., he published in Boston, 1808 and 1809, his *Elements of English Grammar* and *Young Ladies' Arithmetic*. Feb. 6, 1812, he was ordained as a missionary to Burma, being a member of the first band ever sent from the U. S., as he had been a member of the famous band who by the haystack in Williamstown, Mass., in Feb., 1810, dedicated themselves to the foreign missionary field. He married Ann Hasseltine (b. at Bradford, Mass., Dec. 22, 1789), teacher in the academy at Bradford, Mass., and with her sailed for Calcutta, Feb. 19, 1812. On the voyage he paid particular attention to the subject of baptism in order that he might meet in possible controversy the English Baptist missionaries in India, and in consequence his views regarding the ordinance underwent a change, and on reaching Calcutta he identified himself with the Baptist denomination, giving reasons for his action in *Judson on Baptism*, which was republished in the U. S. This led the Baptists of the U. S. to interest themselves in foreign missions, and to the formation of the society now known as the American Baptist Missionary Union. Under the auspices of this society he became the founder in Burma of one of the most successful missionary enterprises of modern times. Settling first at Rangoon, Judson labored for nearly forty years in Burma, two of which he spent in prison, manacled and daily expecting execution. He translated the Bible into Burmese, and at his death had nearly completed a dictionary of that language in two volumes. Before his death he was surrounded by thousands of native converts and by many missionaries, both native and foreign. Mrs. Judson died in Amherst, Burma, Oct. 24, 1826, and Apr. 10, 1834, he married Mrs. Sarah Hall Boardman (b. at Alstead, N. H., Nov. 4, 1803; married to George Dana Boardman, July 4, 1825; left a widow, Feb. 11, 1831), who died in the port of St. Helena, Sept. 1, 1845. June 2, 1846, at Hamilton, N. Y., he married Miss Emily Chubbuck (b. at Eaton, N. Y., Aug. 22, 1817), who died at Hamilton, N. Y., June 1, 1854. He died at sea four days out from Maulmain, Apr. 12, 1850. Memoirs of Judson were published by W. Hague (discourse, Boston, 1851), J. Clement (Auburn, N. Y., 1852), D. T. Middleditch (New York, 1854), Mrs. H. C. Conant (under title *The Earnest Man*, Boston, 1856), but principally by Francis Wayland (2 vols., Boston, 1853) and Edward Judson (New York, 1883). See also the *Memoir of Ann H. Judson* (Boston, 1829), by Prof. J. D. Knowles—which incidentally illustrates the origin and early growth of American Baptist missions in India; the *Memoir of Sarah B. Judson*, by Mrs. Emily C. Judson (New York, 1849); and the *Life of Emily C. Judson*, by Prof. A. C. Kendrick, D. D. (New York, 1861). The last mentioned, Emily Chubbuck Judson (*Fanny Forrester*), published three volumes of essays, sketches, and poems.

Revised by S. M. JACKSON.

Judson, EDWARD, D. D.: clergyman and author; b. Dec. 27, 1844, at Maulmain, Burma, where his father was laboring as missionary; graduated at Brown University 1865, and studied theology at Hamilton, N. Y. He has held the following positions: Principal of the seminary at Townshend, Vt., 1865; Professor of Latin and Modern Languages, Madison University, 1867; pastor Baptist church, Orange, N. J., 1875–81; and of the Memorial Baptist church, New York city, 1881, *sqq.* He published *The Life of Adoniram Judson* (New York, 1883). W. H. WHITSITT.

Juggernaut: See JAGGERNAUT.

Jugglers and **Jugglery** [M. Eng. *jugler*, from O. Fr. *joglere* > Fr. *jongler* < Lat. *jocula'tor*, jester, juggler, deriv. of *jo'culus*, dimin. of *jo'cus*, a jest, joke]: Juggling, which in the early ages of the world was, under the name of thaumaturgia or wonder-working, the principal aid to priests in performing their false miracles, has in modern times degenerated into a source of mere amusement, or one which only provides marvels to mislead the superstitious and ignorant. The principal art in juggling is legerdemain or sleight-of-hand and substitution, technically called among its professors *hankı-panki*. As the gypsies also call theft by substitution *honki-pokī* or *hukkni-pokī*, it is possible that we have in this the origin of *hocus-pocus*. Many distinguished jugglers have been gypsies, and the Nāts or true gypsies of India are all jugglers, acrobats, or dancers. The juggler among the Romans was called *præstigiator*; with the Greeks he was a *thaumatopoios*. Athenæus in his *Deipnosophistæ* describes an entertainment where naked girls vomited fire and jumped or rolled among swords, and he gives the names of the most celebrated jugglers of his time. From his account it appears that among the ancients, as at the present day in Egypt, drollery and dramatic art formed an important element in such conjuring. Trickery with cups, or thimble-rig, was known to the ancient Egyptians. The old-fashioned thimble-rig, performed by adroitly taking away the pea with the fingers of the same hand which held the cup, has of late been modified by an improved style of French thimble of vulcanite. The ordinary juggling tricks were common among the Anglo-Saxons. Strutt gives an interesting chapter on the *joculator* or *jongglour* of England in the Middle Ages. From passages in Chaucer, Sir John Mandeville, Froissart, and Benvenuto Cellini, it is evident that the jugglers of the fourteenth and fifteenth centuries were familiar with the magic lantern, and were in fact far in advance of the science of the learned of their days. "Sometimes," says Chaucer, "in a large hall they will produce water, with boats rowed up and down upon it. Some-

times they will bring in the similitude of a grim lyon or make flowers spring up as in a meadow; sometimes they cause a vine to flourish bearing red and white grapes; or they show a castle built with stone; and when they please they cause the whole to disappear." The jugglers of old—whether priests or *tregatours*, as they were called in England, or *jogelours*—formed a very close corporation and kept their secrets well. Even King James I. believed that they were aided by the devil. All of the ordinary miracles related of ancient wonder-workers, such as making heads speak, showing men whom no ropes could bind, and the like, are now performed with great ease. Among the Babylonians and Arabs it was usual to make arrows leap up and indicate the direction in which the king should advance against an enemy. This was done by means of a hair. The modern Japanese juggler makes a butterfly flit around him by attaching to it a perfectly invisible silk thread.

A great principle in juggling is to attract the attention of the audience by some trifling movement, and thereby at that instant distract it from the hanky-panky or adroit substitution of one article for another. In India a naked juggler will produce from a cup or bag several objects. These he has hidden under a false skin, his own having been gradually peeled away, and then laid on in a flap. By snapping his fingers or by pointing to anything the attention even of those forewarned is drawn away. A very trifling deviation of sight suffices for this, and by its aid an object may be brought out and then concealed before the audience perceives it. One of the best juggling feats is that of the so-called second sight, popularized by Robert Houdin. It consists in one or more persons blindfolded or isolated telling the names of many objects supposed to be concealed from them, or else what is written on a paper. It is varied in many ways, and there are as many methods of performing it, the best consisting of wires with a galvanic battery and plates, by means of which signals are transmitted through the feet of the accomplices. When Reginald Scot wrote his celebrated *Discoveries of Witchcraft* (London, 1584) he found it necessary to explain how the juggling tricks were done by which so-called diabolical deeds were effected. Of late years science has not disdained to assist this art, and many of the illusions now shown are really interesting, both as to skill and their association with the pretended miracles of a higher class of wonder-workers.

In ancient times a number of philosophers wrote against the thaumaturgy of the priesthood, and exposed their juggling tricks. Unfortunately, all their books are lost. The principal of these was by Celsus, whose work against the Magi is believed to have been a very able exposure of all the tricks of the ancient conjurers. Other writers of this kind are mentioned by Diogenes Laertius, and Suidas quotes the *Magikon* of Antisthenes. Among the many modern works which treat of juggling and wonder-working of every kind one of the best is *La Magie blanche dévoilée, ou explication des tours surprenants, etc.*, by M. Decremps (Paris, 1788). This was followed by a *Supplement*—the *Testament de Jérôme Sharp*, the *Codicile de Jérôme Sharp*, and *L'Explication des Tours Extraordinaires*, by the same author. To these may be added the *Récréations mathématiques et physiques d'Ozanam* (4 vols., Paris, 1735); *Les Récréations mathématiques et physiques de Guyôt* (3 vols., 1790). In 1858 Prof. J. N. Ponsin published among the *Manuals* of Roret *La Sorcellerie ancienne et moderne expliquée*, a very excellent work, contemporary with the *Magie Naturelle*, by M. Vergniaud, the *Physique amusante*, by Julie de Fontenelle and Madame Malepeyre, and *Sorciers, ou la Magie blanche dévoilée par les découvertes de la Chimie, de la Physique, et de la Mécanique*, by Comte and Julie de Fontenelle. See also *Breslaw's Last Legacy, or the Magical Companion* (London, 1784); *Natural Magic*, by Philip Astley, riding-master (1785); *Magic*, by J. S. Halle (Berlin, 1783); *Hanky-Panky, the Conjurer* (London, 1859); *Magic and Pretended Miracles* (London, 1848); the *Conjurer's Guide* (Glasgow, 1850); Robert Houdin's *Les Tricheries des Grecs* (1868); and Prof. Hoffmann's *Modern Magic*.

Revised by R. Lilley.

Jugur'tha: King of Numidia; an illegitimate grandson of Masinissa; was adopted by his uncle, King Micipsa, in 149 B. C., and attracted much attention from the people by his popular qualities. Sent with a Numidian force into the Roman service (134), he gained fresh distinctions, and after the death of Micipsa murdered Hiempsal, the king's oldest son, and put Adherbal, a younger son, to flight. Adherbal appealed to the Roman senate, but the bribes of Jugurtha secured (117) for him the larger and better part of the kingdom. Not content with this he soon began to harass the kingdom of Adherbal, and finally succeeded in routing him in open battle and shutting him up in the city of Cirta. On the capitulation of this place, Adherbal, along with the inhabitants, including some Italian merchants, was put to death. The news of this event filled the senate with consternation and rage, so that in 111 B. C. war was declared against Numidia; but after one or two insignificant successes, Jugurtha bought off the Roman commander and a peace was arranged. That this result had been attained by bribery was so obvious that the tribune Memmius demanded that Jugurtha should be summoned to Rome to render account of the matter. The investigation led to a renewal of the war, in which Roman misfortunes succeeded each other rapidly, until the command was placed in the hands of Metellus and Marius. Under their leadership some progress was made against Jugurtha, but the war was not brought to an end until, in 106 B. C., by popular demand, the supreme command was transferred to Marius; but even Marius succeeded in gaining possession of Jugurtha only by treachery, and in thus terminating the inglorious contest. Jugurtha was led as a captive in the triumph of Marius (104 B. C.), and perished soon after in the dungeon of the Tullianum on the Capitoline hill.

G. L. Hendrickson.

Ju'jube [from Fr. *jujube* < Lat. *ziziphum* = Gr. ζίζυφον, jujube, from Arab. *zizuf*, jujube-tree]: the fruit of *Zizyphus vulgaris*, family *Rhamnaceæ*, a small tree of Southern Europe and Africa. The fruit was formerly used for making "jujube paste," a confection, which is now made of gum-arabic, sugar, water, and egg-albumen, without jujubes. Jujube sirup and dried jujubes have useful pectoral qualities, and make an agreeable drink for the sick. *Z. vulgaris*, *Z. jujuba*, *Z. lotus*, and *Z. spina-christi* are among the species of this genus which bear pleasant fruits. The jujube is occasionally grown in the southern parts of the U. S.

Revised by L. H. Bailey.

Jujuy (Sp. pron. hoo-hoo-ee'): the northernmost, smallest, and least populous province of Argentina; bounded N. by Bolivia, and E., S., and W. by the state of Salta. Area about 22,000 sq. miles. The Eastern Andes traverse it from N. to S., divided into two main and several lesser ranges, with many snowy peaks. W. of the mountains is an arid table-land, 12,000 feet above the sea, and forming part of the great Bolivian plateau; its surface is broken by salt marshes and lakes. E. of the mountains the land is lower, with isolated hills, and portions are continuous with the plains of the Gran Chaco. The river San Francisco, or Rio Grande de Jujuy, flows from N. to S. between the main mountain ranges, then curves E. and N. E. and joins the Bermejo on the northern boundary of the province. The climate is cold on the plateau, temperate in the valleys, and hot in the eastern plains. The inhabitants, in great part of Indian stock, are industrious and thrifty, and are engaged in agriculture and stock-raising. Salt is collected on the plateau, and gold is washed on a small scale; there are rich but unutilized deposits of silver, copper, and petroleum. The roads are mere mule-tracks. The exports, nearly all to Bolivia, are cattle, mules, wool, vicuña, and chinchilla, skins, salt, and gold-dust. Jujuy was invaded by Spaniards in 1592; the Humahuacas Indians kept up a brave resistance for sixty years. During the revolution this region was the scene of many engagements between the patriots and Spaniards. The province was separated from Salta in 1834. Estimated population (1890) 90,000. Jujuy, or San Salvador de Jujuy, the capital, is situated on the Rio Grande, in the southern part of the province, 1,077 miles N. of Buenos Ayres, and 4,000 feet above the sea. It was founded in 1592, but has never been populous, and at present (1893) probably has not more than 5,000 inhabitants. Ledesma, in the eastern lowlands, is a place of some importance.

Herbert H. Smith.

Jukes, Joseph Beete, F. R. S.: geologist and naturalist; b. near Birmingham, England, Oct. 10, 1811; graduated at St. John's College, Cambridge, in 1836. In 1839 he was appointed geological surveyor of Newfoundland, and from 1842 to 1846 was naturalist on H. M. S. Fly, in the survey of the great barrier-reef along the east coast of Australia. He published volumes giving the results of these explorations. Having joined in 1846 the geological survey of Great Britain, he wrote for it important memoirs on several districts, especially one on *The South Staffordshire Coal-field*

(1853). In 1850 he became director of the geological survey of Ireland, and was for many years Professor of Geology to the Royal Dublin Society and the Royal College of Science at Dublin. His investigations on coral reefs, the distribution of mollusca, and the formation of river-beds were important contributions to science. He wrote several elementary works on geology, as well as an elaborate article in the *Encyclopædia Britannica* (8th ed.), and contributed largely to the journals of learned societies. D. in Dublin, July 29, 1869. Revised by G. K. Gilbert.

Ju'lia: daughter and only child of the Roman emperor Augustus by his second wife, Scribonia; b. in 39 B. C. She was distinguished as much for her intelligence as for her beauty, and was married to Marcellus in 25 B. C., after his death to Agrippa in 22 B. C., and after his death to Tiberius in 12 B. C. Her dissipation and profligacy by degrees assumed such a character and such a publicity that her marriage was dissolved, and she was banished in 2 B. C., first to Pandataria, an island near Naples, and then to Rhegium, where she died in 14 A. D. in want. Of the five children whom Julia bore to Agrippa, only the two daughters survived her, one of whom was Agrippina, the wife of Germanicus; of the three sons, two died in their early manhood, and the third, Agrippa Postumus, was put to death by Tiberius. Revised by G. L. Hendrickson.

Julian the Apostate, Flavius Claudius Julianus: Roman emperor; b. at Constantinople, Nov. 17, 331 A. D.; was the son of Julius Constantius. In infancy he was imprisoned by Constantius II., but was well educated and trained in the Christian faith; in 355 he was allowed to reside at Athens unconfined, and in the same year was proclaimed Cæsar, married to Helena, daughter of Constantine the Great, and sent to govern Gaul, where he showed himself a just and wise ruler, an able general, and a man of high character. Constantius began to interfere unduly in the affairs of Gaul, and Julian yielded to the clamor of his troops, who proclaimed him Augustus at Paris in 360, and after fruitless negotiations with Constantius he marched with strong armies across Europe toward Constantinople. Constantius died in 361, and Julian was hailed with universal joy as emperor, and soon afterward avowed himself a pagan. He did not persecute Christianity, but tolerated all the sects, at the same time decidedly favoring paganism by his edicts, and forbidding Christian teachers to lecture on the monuments of classic literature. In Mar., 363, he set out upon his Persian expedition, and after defeating the enemy in many engagements was mortally wounded in battle, and died June 26, 363. This able ruler was in supreme authority only eighteen months, and yet his reign was one of the most memorable of antiquity. Julian was a writer of unusual talent, and though his Greek is too artificial, too reminiscential, he is, next to Lucian, the cleverest author of later Greek literature. His extant works comprise sundry orations and a large number of letters, the letters especially important for the history of his times; a satirical work of decided merit called the *Cæsars*; *Misopogon*, a satire upon the people of Antioch; a few epigrams, notably one on beer, and a celebrated work, *Against the Christians* (Κατὰ Χριστιανῶν), of which Theodosius II. destroyed all accessible copies, so that the work is lost, excepting some fragments preserved by Cyril and others. The chief edition of the collected works is still that of Spanheim (2 vols., Leipzig, 1696). A critical edition was undertaken by Hertlein for the Teubner Library (2 vols., Leipzig, 1875–76). See the translations in Bohn's Library. There is a complete French translation (Paris, 1863). Some of the more important works on Julian are registered in Gildersleeve's *Essays and Studies*, p. 355. One of the most recent is W. Schwartz, *De vita et scriptis Iuliani imperatoris* (1888). Revised by B. L. Gildersleeve.

Jülich, yü'lich: town of Rhenish Prussia; at the influx of the Ette into the Roer; 20 miles by rail N. E. of Aix-la-Chapelle (see map of German Empire, ref. 5–C); has some manufactures of leather, soap, and vinegar. Pop. (1890) 4,869. The district of Jülich formed an independent dukedom in the fourteenth century, which was united to Berg and Cleves in 1511. In 1609 the ducal line became extinct, and succession disputes began between Brandenburg and Neuburg, which, although settled in 1666 by a division of the country, were not brought to a final conclusion until 1814, when the whole territory was given to Prussia.

Julien, zhü'li-ăñ', Stanislas: Sinologist; b. at Orleans, France, Sept. 20, 1799; studied first modern European languages, Latin, and Greek, but was attracted to the study of Chinese by the lectures of Abel Rémusat, whom he succeeded in 1832 as Professor in Chinese at the Collège de France in Paris. Besides several grammatical works on Chinese, designed to aid the student, he translated a great number of Chinese novels, dramas, historical, philosophical, and scientific writings. D. in Paris, Feb. 14, 1873.

Julius I., Saint: Bishop of Rome; was consecrated Feb. 6, 337, and took part with Athanasius in his struggle for the Alexandrian bishopric. D. Apr. 12, 352.—Julius II., pope (*Giuliano della Rovere*), b. in 1443; a nephew of Sixtus IV., was made Bishop of Carpentras and a cardinal Dec. 15, 1471, when only twenty-eight years old, and held no less than eight bishoprics besides the archbishopric of Avignon. As papal legate to France, however, he proved himself an exceedingly able man, and his influence even increased during the pontificate of Innocent VIII. During the reign of Alexander VI. his position was somewhat difficult, but after the death of Pius III. he carried the papal election (Oct. 31, (1503), by the aid of Cæsar Borgia, and ascended the papal throne. His career henceforth was chiefly military, his aim being to drive the foreigners out of Italy and free the holy see from the domination of the great secular powers. His two great diplomatic exploits were the formation of the league of Cambray, in 1508, between Louis XII. of France, the Emperor Maximilian, and Ferdinand of Aragon, against Venice; and the Holy League, in 1512, between the Venetians, Ferdinand of Aragon, and the emperor, against France. The ambitious pontiff was a liberal patron of Raphael, Michaelangelo, and the other great artists of his time, and laid the corner-stone of St. Peter's church at Rome. D. in Rome, Feb. 21, 1513.—Julius III. (*Giovanni Maria del Monte*), b. at Arezzo, Sept. 10, 1487; became a cardinal Dec. 22, 1536; was papal legate to the Council of Trent 1545; chosen pope Feb. 7, 1550, and was thenceforth chiefly remarkable for luxurious habits. D. in Rome, Mar. 23, 1555.

Jul'lunder: a province, district, and city of the Punjaub, India. See Jalandar.

Ju'lus, or **Iulus**: a genus of thousand-legged worms (*Diplopoda*) which occur in decaying logs, stumps, etc. These forms are not poisonous, but they possess a series of glands along the sides of the body which secrete an offensive-smelling substance. A common name for the species, of which there are several in the U. S., is galley-worm. See Myriapoda. J. S. K.

July' [from O. Fr. *julie* > Mod. Fr. *juillet* < *Julius* (sc. *mensis*, month), July, liter., the month of Julius, named after *Julius* Cæsar]: the seventh month of the Gregorian, and the fifth of the old, calendar. The ancient Romans called it *Quintilis*—that is, the fifth month.

Jumna: an affluent of the Ganges. See Jamna.

Jumping Hare, or **Cape Hare**: a name given to *Pedetes caffer*, the largest of the jerboas, of the sub-family *Pedetinæ*, and replacing the true jerboas in Southern Africa. It is about 2½ feet in total length, and looks like a bushy-tailed hare. From this, and its great leaps, sometimes exceeding 20 feet, it has received its popular name. F. A. L.

Junction City: city; capital of Geary co., Kan. (for location of county, see map of Kansas, ref. 5–H); at the confluence of the Smoky Hill and Republican rivers, which here unite and form the Kansas river; on the Mo., Kan. and Tex., and the Union Pac. railways; 62 miles N. W. of Emporia, 71 miles W. of Topeka. It has excellent water-power for manufacturing, and extensive quarries of limestone largely used for buildings. The city contains flour-mills, agricultural-implement works, carriage-factories, two national banks with combined capital of $200,000, a State bank, and five weekly newspapers. Pop. (1880) 2,684; (1890) 4,502; (1895) 4,709. Editor of "Republican."

Jundiahy, zhoon-dĕe-ăă-ee': a town of the state of São Paulo, Brazil; on the left bank of a river of the same name, affluent of the Tieté; 34 miles N. E. of São Paulo city, and 2,270 feet above the sea. Pop. about 6,000. It is an important railway center, has a large trade in coffee, and is growing rapidly. H. H. S.

June [M. Eng. *June*, earlier *Juyne*, from O. Fr. *juin* < Lat. *Ju'nius* (sc. *mensis*), June, liter., the Junian month, deriv. of *Ju'nius*, a Roman surname]: the sixth month in the Gregorian year; in the old style, the fourth month. During this month the sun reaches the northern solstice, which is marked by the first point of the sign Cancer. Hence the tropic is

called the tropic of Cancer. Among the principal days observed in this month are June 11, St. Barnabas; June 24, Midsummer day; and June 29, St. Peter.

June, JENNIE: See CROLY, JANE.

Juneau: a village of Alaska; port for a mining district; lat. 58° 20′, lon. 134° 30′ W.; on the promontory between Taku river and Lynn channel, opposite Douglas island (see map of Alaska, ref. 3–H). There are excellent silver and gold mine prospects in the vicinity. The work can be carried on only in the summer because of the high latitude. Pop. 1,300.

June-berry: popular name of several wild shrubs or small trees found throughout the U. S. and in Canada. They bear a considerable resemblance in their characteristics to the apple and pear. The species belong to the genus *Amelanchier*, the commonest one being *A. canadensis*. The june-berry is cultivated for its flowers. The fruit, which is of purple color, is sweet, and about the size of the largest currants. The dwarf june-berry (*A. oblongifolia*) is now in cultivation for its fruit. The size of the tree differs greatly in the varieties, from 30 feet high down to 3 or 4. Various names are given to the june-berry in different localities, such as shad-bush, service-berry, and mountain whortleberry. The flowers are white, early, and abundant, and on that account the june-berry is valued as an ornamental tree. Revised by L. H. BAILEY.

June Grass: See BLUE GRASS.

Jung, yoong, JOACHIM: naturalist and writer on scientific subjects; b. at Lübeck, Germany, Oct. 21, 1587; was Professor of Mathematics at Giessen 1609–14; studied medicine at Padua, graduating in 1618; settled at Rostock as a physician, becoming a professor there in 1625, and rector of the Johanneum at Hamburg in 1628. He was a very distinguished naturalist, ranked by Leibnitz in the same class of philosophers with Copernicus, Galileo, and Descartes. His researches in physical science incurred for him persecutions, on the supposition that he belonged to the Rosicrucian fraternity. Dr. Jung anticipated Linnæus in proposing a binomial nomenclature for plants, and wrote largely on philosophy, mathematics, mineralogy, invertebrates, and botany, but many of his works were destroyed or rendered extremely scarce by a fire. Those which remained were edited by Albrecht under the title *Opuscula Botanico-physica* (Coburg, 1747). D. in Hamburg, Sept. 17, 1657. See his *Life* by Guhrauer (Stuttgart, 1851) and by Avé-Lallemant (Breslau, 1882). Revised by CHARLES E. BESSEY.

Jung Bunzlau: See BUNZLAU, JUNG.

Jungerman'nia [Mod. Lat., named in honor of Prof. Ludwig Jungermann (1572–1653), a German botanist]: a large and important genus of scale-mosses. (See MOSSWORTS.) It gives name to the order *Jungermanniaceæ*, which to the essential characters of the liverworts (*Hepaticæ*) join a moss-like habit. There are many species in the U. S.

Jungfrau, yoong'frow [Germ., liter., maiden; *jung*, young + *frau*, woman]: one of the highest peaks of the Bernese Alps (13,672 feet), and, on account of the beauty of its outline and the dazzling brightness of the everlasting snow which covers its top, one of the most remarkable mountains of Switzerland. The summit was first reached in 1811; Louis Agassiz made the ascent in 1841. Since that time the mountain has been climbed many times.

Junghaus, yoong'hows, SOPHIE: novelist; b. at Cassel, Germany, Dec. 3, 1845; lived as a governess for a number of years in England, traveled in Germany and Italy, and finally settled at Cassel. She published a collection of lyric poems (1869) and a number of novels which indicate a thorough knowledge of human life and great powers of representation. Among her stories may be mentioned *Haus Eckberg* (1876); *Helldunkel* (1885); *Der Bergrat* (1888); *Zwei Brüder* (1889); *Schwertlilie* (1893). JULIUS GOEBEL.

Junghuhn, yoong'hoon, FRANZ WILHELM: naturalist; b. at Mansfeld, Prussian Saxony, Oct. 26, 1812; studied medicine and botany at Halle and Berlin; served as a physician in the Prussian army, then in the French army in Algeria, and since 1835 in the Dutch colonies of Java. Here he made very extensive studies of the geographical, geological, botanical, and ethnological relations of the country, and his works on these subjects attracted great attention. In 1849 he visited Europe, but returned to Batavia in 1855, and died at Limbang, Apr. 20, 1864. His chief work is *Java, seine Gestalt, Pflanzendecke und innere Bauart* (3 vols., Leipzig, 1852); besides this he wrote *Die Battaländer auf Sumatra* (Berlin, Leyden, 1847); *Landschaftsansichten von Java* (Leipzig, 1853); and in 1851 began a description of the plants and fossils of Java, entitled *Plantæ Junghuhnianæ*.

Jungle [from Hind. *jangal*, forest, jungle < Sanskr. *jañgala*, dry, desert]: in the East Indies, a name applied to those tracts of land, frequently very extensive, where the vegetation is rank, and often impenetrable. The jungles abound in tigers, elephants, monkeys, serpents, deer, boars, wild cattle, and other creatures, and are often very unhealthful. In the East they speak of "jungle-fowl," "jungle cows," "jungle fevers," etc. The term *jungle* is used with latitude, and much country which is sparsely settled, but by no means a wilderness, is thus designated.

Jungmann, yoong'män', JOSEF: scholar; b. at Hudlice, near Beroun, Bohemia, July 16, 1773; was educated at Beroun, and studied philosophy and law at Prague. In 1799 he became assistant professor at the gymnasium of Litoměřice, and in 1815 was called to the academic gymnasium at Prague, of which he became president in 1835. He obtained the degree of Ph. D. in 1816, was elected dean of the philosophical faculty of the University of Prague in 1827 and again in 1838; and in 1840 was chosen president. He retired in 1844, after a serious illness, and died Nov. 16, 1847. He was one of the small group of zealous Bohemians who, after many sacrifices, succeeded in arousing their nation from the intellectual torpor into which it had sunk during two centuries of Hapsburg oppression. Many of Jungmann's contemporaries had given up all hope that the Bohemian nationality might be revived, but he worked patiently, gathering the remnants of Bohemian books which had survived the ravages of war and the persecutions of the Jesuits, collecting words and phrases, encouraging the weak, and teaching the faithful. He accepted the new orthography suggested by Dobrovský; and, to show the elasticity and riches of the Bohemian tongue, he first gave the public excellent translations of foreign literary masterpieces (notably Chateaubriand's *Atala* (1805), Milton's *Paradise Lost* (1811), and Goethe's *Hermann und Dorothea*). Models of correct prose were exhibited in his *Slovesnost* (1820; revised 1845), in which he created a new scientific terminology. In 1821 he and PRESL (*q. v.*) established the *Krok*, a scientific journal, which soon numbered the foremost Bohemian savants among its contributors. His next great work was a history of Bohemian literature and language, the *Historie literatury i jazyka českého* (1825), a work somewhat resembling Allibone's *Dictionary of Authors*, and exhibiting the entire range of Bohemian literature since the earliest times. Then came the crowning work of his career, the *Slovník*, a complete dictionary of the Bohemian language, representing his arduous labors of more than thirty years. This work embraces the entire word-treasure of the Bohemian language, words and phrases gathered by Jungmann from books old and new and from the people's lips. The *Slovník* was published in 1834–39, in five large quarto volumes, by the *Matice Česká*. J. J. KRÁL.

Jung-Stilling, yoong'stil'ling, JOHANN HEINRICH: author; b. at Grund, in Hesse-Nassau, Germany, Sept. 12, 1740. He was successively a charcoal-burner, schoolmaster, tailor, private tutor, etc. A Roman Catholic priest gave him a secret remedy for certain eye diseases, and in 1771 he succeeded in going to Strassburg to study medicine and get a diploma. Here he made the acquaintance of Goethe, who has given a charming picture of him in *Aus meinem Leben*. From 1787 to 1806 he held a chair in Political Economy at the Universities of Marburg and Heidelberg, but this part of his activity was not very influential. The last part of his life he spent at Carlsruhe, at the court of the Grand Duke of Baden, who gave him a pension. His writings have all a mystic, religious, half-apocalyptic character, even his romances, *Geschichte des Herrn von Morgenthau* (2 vols., 1770), *Florentin von Fahlendorn* (3 vols., 1781), but still more his directly religious writings, *Theobald, Das Heimweh, Theorie der Geisterkunde* (1808), etc., which abound in mystical nonsense. His most interesting work is his autobiography, *Heinrich Stillings Jugend* (1777), which was published by Goethe. He was three times married. D. at Carlsruhe, Apr. 2, 1817. His collected works were published in Stuttgart in 14 vols. in 1838. There are English translations of the *Leben* (London, 1835) and the *Theorie der Geisterkunde* (London, 1834; New York, 1851), by Samuel Jackson, and of *Theobald; or, The Fanatic* (Philadelphia, 1846), by Rev. Samuel Schaeffer. Revised by JULIUS GOEBEL.

Juniat'a River: a river in Pennsylvania. It rises near Altoona, 1,155 feet above sea-level, and flows some 150 miles through the parallel-ridged mountains of Southern Central Pennsylvania, which rise from 800 to 1,500 feet above the valleys (the latter often from 200 to 400 feet above the stream). It flows into the Susquehanna at Duncannon, 345 feet above the sea, and receives as its principal affluent the Raystown branch, a beautiful and very tortuous stream.

Junil'ius: an official and author; a native of Africa and a contemporary of Cassiodorius. He spent most of his life in Constantinople, where, during the reign of Justinian, he held a high position in the administration. He wrote about 550 a book (*Instituta regularia divinæ legis*; generally, but erroneously, called *De partibus divinæ legis*, the title of its first chapter), which is one of the first attempts in the field of biblical introduction. In the dedication of the book the author states that he is indebted for the principal portion of the contents to a certain Paulus, a native of Persia and a teacher at the school of Nisibis. (See Migne, *Patr. Lat.*, lxviii.) The above work has been separately edited by Kihn (Freiburg, 1880). See Beeker, *Das System der Kirchenvaters* (Lübeck, 1787), and Kihn, *Theodor von Mopsuestia und Junilius Africanus* (Freiburg, 1880).

Revised by M. Warren.

Junin, hoo-neen': a central department of Peru; bounded N. by Huanuco, E. by Loreto and Cuzco, S. by Ayacucho and Huancavelica, and W. by Lima and Ancachs. Estimated area, 43,333 sq. miles. Some recent maps add to the department the whole region east to the frontier of Bolivia, but this addition, if official, will not affect the statistics of population, as the region in question is inhabited only by a few roving Indians. The western portion of the department lies in the Andes, but E. of the Western Cordillera. The Eastern Cordillera, entering the department from the south, passes northwest and divides at Cerro de Pasco, forming the head of the Huallaga valley. West of the Eastern Cordillera is the high valley of Jauja and the Lake of Junin. All the eastern portion of the department lies in the *Montaña* or forest land, including the lower portions of the mountain slopes and the plains of the Ucayali, properly a continuation of the great Amazonian depression. This region is warm, very damp, and covered in great part with tangled forest, frequented only by cinchona and rubber gatherers, and by wild Indians. Junin is the richest Peruvian department in mineral wealth, except perhaps Ancachs; the silver mines, especially of Cerro de Pasco, are famed throughout the world. Gold, copper, quicksilver, and other metals are abundant, but are either neglected or mined only on a small scale. The Jauja valley, now united to Lima by the Oroya Railway, supplies the markets of that city with cattle and provisions. Pop. of department (1876) 209,871, probably but little increased in 1894. Herbert H. Smith.

Junin: a town of Peru, department of Junin; near the southeast end of Lake Junin; 13,560 feet above the sea. It is about 100 miles E. N. E. of Lima (see map of South America, ref. 5–B). Pop. about 2,000. It gave its name to a battle fought on a plain south of it, Aug. 6, 1824, in which the patriot army under Bolivar won a brilliant victory over the royalist forces of Canterac. H. H. S.

Junin, Chinchay-cocha, or **Laguna de Reyes**: a lake of Peru, in the western part of the department of Junin, S. of Cerro de Pasco, and 13,000 feet above the sea. It is 37 miles long by 7 wide, and is the largest lake entirely within the republic; the banks are marshy and overgrown with rushes, the resort of countless water-fowl, but the central part is very deep and abounds in fish. A small steamboat has been placed upon it. Its outlet is the Jauja or Mantaro river, which flows at first S., then breaks through the Eastern Cordillera and joins the Ucayali. Paz Soldan supposes that this is the Lake Lauricocha represented on old maps as the source of the Amazon, but that name appears to belong properly to a much smaller lake at the source of the Marañon. H. H. Smith.

Juniper [readapted to Lat. *juni'perus*, from O. Fr. *genievre* < Lat. *juni'perus*, juniper; perhaps from *juncus*, twig + *pa'rere*, produce, bring forth]: a genus of conifers, of the family *Pinaceæ* and tribe *Cupressineæ*, characterized by having its small cone fleshy and berry-like. The common juniper (*Juniperus communis*) is a small evergreen shrub, native of Europe and the U. S., where it grows on dry, sterile, hilly ground from New Jersey to Maine and along the Great Lakes and in the Rocky Mountains. It is important for its fruit, which is used in medicine and in making gin, to which spirit it gives the peculiar flavor and diuretic action. This fruit is bluish purple, about the size of a pea, of a pleasant aromatic odor and sweetish terebinthinate taste, due to the presence of a volatile oil, in which also reside the medicinal virtues. Juniper is a gentle irritant, being in proper dose cordial to the stomach, and specially exciting to the function of the kidneys. It is accordingly used as a diuretic, but generally only to assist the action of more potent drugs of that class. In overdose it may cause great irritation of the urinary organs, with strangury and suppression of secretion. *Juniperus virginiana*, or red cedar, is an indigenous and important evergreen tree growing on dry, rocky hills in all latitudes of the U. S.

Revised by Charles E. Bessey.

Ju'nius, The Letters of: a series of letters on political affairs which appeared in a London newspaper, *The Public Advertiser*, from the middle of the year 1766 to the middle of 1772. They displayed a pungency, a vehemence, an intrepidity, and a power of invective such as had never before been shown by any English political writer. The first of these letters (Apr. 28, 1767) appeared under the signature of "Poplicola." "Memnon," "Lucius," "Junius," "Philo Junius," "Brutus," and other signatures were subsequently resorted to, but the celebrity of the collection is concentrated upon the name of "Junius," affixed to the most remarkable letters, and to those which alone (the letters signed "Philo Junius" excepted) the writer authenticated by himself giving them to the world. The identity of the authorship of the rest is indeed a matter of inference, though of inference so irresistible as to be now not disputed by any one. In 1772 the correspondence suddenly ceased.

Subject of the Junius Letters.—This may be briefly defined as the vindication of the public liberties. "The submission of a free people," so begins the first letter published under this celebrated signature, "to the executive authority of government is no more than a compliance with laws which they themselves have enacted." This strikes the keynote of the whole. Every leading political occurrence of the day is turned to a vindication of popular liberty. It may truly be said that the British Constitution never had a bolder champion than Junius, nor in the majority of cases a more learned or discriminating advocate. The amount of his legal and constitutional knowledge is extraordinary, especially if, as there is every reason to believe, he was not a lawyer. The characteristics of his style are energy, brevity, impetuosity, and the striking employment of metaphor. The principal drawback to the enjoyment of such talents applied in so good a cause is the writer's rancor and ferocity, and his incessant aspersions on private character. Yet this indignation, if excessive, may still have been honest. This question, however, depends partly on the solution of another enigma, which, more even than their literary excellence, has contributed to maintain the popularity of the letters. This is the mystery of their authorship.

Authorship.—Apparently, Junius had no confidants. The only person with whom he entered into anything like confidential relationship was Woodfall, the printer of *The Public Advertiser*. To him he wrote frequently in amicable and condescending terms, but always in the same feigned hand. Woodfall may have guessed the secret; it almost certainly was not intrusted to him. According to one account, the truth eventually became known to the Government. George III. is reported to have said, "We know who Junius is. He will write no more." The anecdote, however, is probably apocryphal. The mystery naturally excited intense curiosity in the public mind, and abundant pains have from that time to this been bestowed on unraveling it. The letters have been attributed, among others, to Burke, Dunning, W. G. Hamilton, Lord George Sackville, Dr. Butler, Bishop of Hereford, Wilkes, H. M. Boyd, Philip Rosenhagen, Lord Temple, and Gen. Lee. Out of the whole of this list, Burke, Dunning, Lord Temple, and Wilkes are the only persons that can be credited with sufficient intellectual power to have produced the letters of Junius, and the evidence of place and circumstance, of sentiments and opinions, of political connections and of handwriting, seems decisive against them all. It is now generally admitted that either the authorship remains an impenetrable enigma, or that it belongs to one whose name was not mentioned in connection with it for forty years subsequently—Sir Philip Francis. Philip Francis, the son of a clergyman and schoolmaster of some literary repute, was born in Dublin in 1740, and when the publica-

tion of the Junius letters began had for some years been a clerk in the War Office. This circumstance supplied the clew to the discovery originally announced by John Taylor in his *Discovery of the Author of the Letters of Junius*, published in 1813, during Francis's lifetime, and never contradicted by him. This work ascribed the letters to Philip Francis and his father. So accurate is the knowledge of War Office business betrayed by the writer that the conviction of his having been engaged in that department appears irresistible; nor can any other person in a similar position capable of having written the letters of Junius be pointed out. Many of the letters, in fact, are written on War Office paper. The general opinion has been that the hand is feigned, and that before Francis's claims can be admitted unreservedly it is necessary to identify the simulated hand with his. An investigation was made in the most painstaking manner by Mr. Chabot, an eminent expert in handwriting, who, at the instance of the Hon. Mr. Twisleton, compared not merely the acknowledged handwriting of Francis, but that of every other claimant of mark, with the hand of Junius. His results, with copious plates, were published by Mr. Twisleton, and seemed to leave little doubt that, so far as the evidence of handwriting is concerned, the identification of Junius with Francis was tolerably complete. On the other hand, M. Charavay, a French expert who made an investigation at a later date, asserts that the handwriting of the Junius MSS. is a natural one, and is not like that of Francis. (See *The Athenæum*, Apr. 30, 1892.) Much has been made of the fact that at a time when Francis was visiting his cousin and intimate friend, Tilghman, at Bath, a Miss Giles of that city received a copy of verses in the feigned hand of Junius. It was inclosed in a letter, still preserved, written by Tilghman; hence the inference that Francis was the poet, but desired to conceal the fact. It is a remarkable coincidence that about 1814, during Sir Philip's courtship of the lady who became his second wife, he sent her several specimens of his youthful poetry, one of which was a copy in his ordinary handwriting of the verses forwarded to Miss Giles. On this coincidence H. R. Francis, the grandson of Sir Philip, bases his chief claim that Junius and Francis were the same. See *Junius Revealed* (1894).

Another important link in the chain of evidence, according to Mr. Francis, was the discovery by Mr. Parkes that four of the five seals used for the sealing of the Junius letters appear on private letters written (1764–78) by Francis. Other arguments are based on several facts in the later life of Francis. 1. He was appointed by the Government to a lucrative office in India in 1774. 2. In the exercise of this office he was vehement, combative, opinionated, disdainful, sarcastic, and disinterestedly devoted to his duties. 3. When in 1813 his name was first associated with that of Junius he would neither deny nor admit the authorship.

It must still be concluded that the evidence, though very clearly pointing to Francis, is largely circumstantial and not absolutely conclusive. Francis died in 1818.

LITERATURE.—The best authorities on the question of Junius are Mr. Taylor's *Discovery of the Author of the Letters of Junius*; Dr. Mason Good's essay, prefixed to the most recent editions; Mr. Twisleton's elaborate investigation of the handwritings of the various candidates; the excellent *Life* of Sir Philip Francis, begun by Joseph Parkes and completed by Herman Merivale; and the biography of Francis by Leslie Stephen in *The Dictionary of National Biography*. Mr. Parkes leaves no stone unturned to establish Francis's authorship, but attributes to his hero numerous letters and pamphlets which he certainly did not write. See also the articles on *Junius* in Dilke's *Papers of a Critic*. For the theory which identifies Junius with Lord LYTTELTON, see LYTTELTON, THOMAS. Also see John Wade, *Junius, including Letters by the same Writer under other Signatures* (1850, 2 vols.).

Revised by C. K. ADAMS.

Junius, FRANCISCUS: theologian; otherwise called FRANÇOIS DU JON; b. at Bourges, France, in 1545; studied classical philology and Protestant theology at Geneva; was pastor of a Walloon congregation at Antwerp, and became in 1568 chaplain to the Prince of Orange. In 1573 he was called to Heidelberg by the elector to aid in a translation of the Old Testament; he was also Professor of Theology at Heidelberg, and afterward at Leyden, where he died in 1602. His principal work was the translation of the Old Testament into Latin in conjunction with Tremellius (Frankfort, 5 parts, 1575–79), passing through twenty editions, the best being that of 1724. The other works of Junius were collected at Geneva in 1607 (2 vols. folio, 2d ed. 1613)—*Opera Theologica*, with an autobiography written in 1595. See Haag, *La France Protestante*, s. v.

Revised by S. M. JACKSON.

Junk-Ceylon', or **Salanga**: an island on the west coast of the Malay Peninsula, belonging to Siam; in lat. 7° 46′ N., lon. 98° 18′ E. It is 20 miles long and 10 miles broad, and exports tin, edible birds' nests, and sapan-wood to the British settlements in the Strait of Malacca.

Junker, yoon'ker, WILHELM, M. D.: an African explorer; b. in Moscow, Russia, Apr. 18, 1840, of German parentage; was early taken to Göttingen, and took the degree of M. D. at Göttingen in 1865. His first journey was to Iceland in 1869. In 1873–74 he was in Tunis; 1875–78 in the equatorial province and on the upper waters of the Welle; 1879–86 in the basins of the Bahr-el-Ghazal and of the Welle. His explorations were made from purely scientific motives, and were unusually complete geographically. He never used weapons in dealing with the natives. His geographical results were published in Petermann's *Mittheilungen* (1879–91), but he completed a three-volume account of his travels just before his death. D. at St. Petersburg, Feb. 13, 1892.

MARK W. HARRINGTON.

Ju'no [Lat., a fem. form from the same root *div-*, bright, which appears in *Jovis*, gen. of *Jupiter*]: in the Roman mythology, the queen of heaven and the wife of Jupiter; identified at a later time with the Greek goddess Hera. That she was originally worshiped as a goddess of the moon the ancient epithet *Lucina* (cf. *Luna* from **Luc-na*) indicates, and thus she became the goddess of menstruation and parturition. The transition from this conception to the thought of her as a goddess of marriage and wedlock, and finally as a patroness of all womanhood, was an easy one. Under the title of the admonisher, *Moneta*, she was worshiped, especially on the kalends of each month, as the ideal of female modesty and prudence, and from this epithet the English words *mint* and *money* are indirectly derived, since the temple of Juno Moneta was the building used at Rome for the coining of gold and silver. G. L. HENDRICKSON.

Juno: the third in order of discovery of the asteroids. It was found by Harding at the Lilienthal observatory, near Bremen, Sept. 1, 1804. It shines as a star of the eighth or ninth magnitude, and is of a whitish color, and not nebulous. Its sidereal revolution is performed in 1,592·66 mean solar days. Its orbit is inclined to the ecliptic 13° 1′ 20″. Its diameter and magnitude are not well known.

Junot, zhü'nō, ANDOCH, Duc d'Abrantès: general; b. at Bussy-le-Grand, Oct. 23, 1771; studied law at first, but entered in 1792 a battalion of volunteers; distinguished himself at the siege of Toulon; accompanied Napoleon as aide-de-camp in Italy and Egypt, and was made general of division and commander-general of Paris in 1800. Somewhat displeased at the prodigality and lack of discretion which he (and especially his wife) showed, the emperor sent him in 1805 as ambassador to Lisbon; but he very soon left his post, repaired to the army in Germany, and distinguished himself in the battle of Austerlitz. In 1806 he was once more made commander-general of Paris, but in the next year Napoleon was compelled to send him and his wife away again. He was placed at the head of a small army-corps destined to invade Portugal, and his success was so brilliant in this undertaking that Napoleon made him Duke of Abrantès. Defeated at Vimeiro by Wellington, he concluded the convention of Cintra with the English, which highly displeased Napoleon, and during the campaign of 1812 he was mentioned as "wanting energy" in one of the emperor's reports. In 1813 he was made governor of Illyria, and his mental derangement now became apparent. He was brought to France, and at Montbard he threw himself out of a window, dying a few days after, July 22, 1813.—His wife, LAURETTE DE SAINT-MARTIN-PERMON (1784–1838), has some literary reputation through her *Mémoires* (18 vols., 1831–35) and several minor works. Her beauty and accomplishments made her prominent in Paris and Rome, but she died in poverty in a house of charity. Revised by C. H. THURBER.

Junqueira Freire, zhoon-kā'i-rā'ă-frā'i-rā, LUIZ JOSÉ: poet; b. at Bahia, Brazil, Dec. 31, 1832. Being even in his childhood of an extremely serious turn of mind, as soon as he had completed his studies he entered the Benedictine Order (Feb. 10, 1851), and the following year took the vows, with the name Fr. Luis de Sancta Escolastica. He was not long

however, in finding that he had made a great mistake. His mind was so far from having the religious assurance implied by the step he had taken that it required all his energies to retain any belief whatever in the midst of the perplexities of the universe. Accordingly, in 1854 he demanded his release from his vows and obtained it. His spiritual struggles, however, had broken his health, and he died June 24, 1855. His poems, which appeared at Bahia in 1855, with the title *Inspirações do Claustro*, reflect his mental condition, but contain many passages of great beauty and power.

A. R. Marsh.

Jupati (joo-pă'ta-tee') **Palm**: popular name of a curious palm (*Raphia tædigera*) found in the lower Amazon valley. Its trunk is barely 8 to 10 feet high, but it puts up a magnificent crown of pinnately compound leaves, some of which are often 60 feet long. The dried leaf-stalks contain a pith which is used instead of cork, and the hard and light outer crust is very useful in joinery.

Ju'piter, or **Diespiter** [*Jupiter* is originally a vocative, corresponding exactly to Gr. **Ζεῦ πάτερ**, while *Diespiter* is a true nominative, cf. **Ζεύς**, Skr. *Dyāus*. The spelling *Juppiter* occurs quite as often down to the time of the empire, and prevails almost universally after that time]: in Roman mythology, the supreme god of heaven, whose name is connected etymologically with the Greek *Zeus* (**Dieus*), with whom at a later time, in literature at all events, Jupiter is completely identified. As god of the sky, Jupiter was worshiped under a variety of epithets characterizing him as the god of thunder, lightning, rain, and other natural phenomena. In moral relations he was conceived of especially as the protector of the laws of hospitality and of good faith between individuals as well as states; but among all the various Jupiters thus worshiped under epithets characterizing the manifestation of one sort of power or another, there gradually arose to a pre-eminent position the worship of Jupiter as the supreme protector and guardian of the state under the epithets *optimus maximus* (best and greatest). With the growth of Rome's power a political significance of great importance was assumed by this cult, which may be described briefly as consisting in rites recognizing the god as the origin and cause of all the prosperity and successes of the Roman people, and in the rendering of suitable offerings in return. The temple of Jupiter Optimus Maximus was located on the Capitoline, and was begun by the last of the kings, Tarquinius Superbus. It was a triple temple, in which, according to ancient conception, Juno and Minerva, the other occupants, were the guests of the greater god. The central cella contained a clay statue of Jupiter standing, holding a thunderbolt in his right hand.

Literature.—Article *Jupiter*, by Aust, in Roscher's *Ausführliches Lexikon der Mythologie* (Lieferung 21 and 22, Leipzig, 1892).

G. L. Hendrickson.

Jupiter: the fifth of the major planets, in the order of distance from the sun, and the largest of all of them. In volume it is more than 1,000 times the size of the earth, and in mass more than 300 times as heavy. Indeed, its mass is more than double that of all the other planets combined. No planet has been studied by astronomers with more assiduity than this, and the surface of no other offers such a variety of phenomena. Telescopic observations show very clearly that the surface of Jupiter which we see is not a solid like that of the earth. It is sometimes surmised that the condition of the planet is intermediate between that of the earth and the sun, that the interior is still in a molten state, and that no permanent crust has yet formed upon it. Its globe is surrounded by cloud-like belts, variable in width and in color, which are sometimes supposed to be clouds floating in the Jovian atmosphere. Examined carefully with good telescopes under good conditions the belts are seen to be very complex in structure, having numerous spots and streaks, both bright and dark. The rotation of the planet on its axis is extremely rapid, a revolution being performed in about nine hours fifty-five minutes. It is therefore possible, when the planet is near opposition, to see it perform a complete rotation between sunset and sunrise. It is found, however, that all the features visible on its surface do not rotate in absolutely the same time, the general rule being that those very near the equator, notwithstanding the greater circuit they have to perform, make a revolution in perhaps five minutes less than those in middle latitudes. In this respect Jupiter shows a remarkable analogy to the sun. The most curious thing about this difference is that the time of rotation does not seem to diminish regularly from the poles toward the equator, as in the case of the sun, but in an irregular way not reducible to any law.

About the beginning of 1879 a conspicuous red spot, which does not seem to have been before noticed, formed on the southern hemisphere of the planet. It continued, with some change of size, for perhaps ten years, then nearly faded away, but afterward brightened up again, and is occasionally visible even at the present time. Dr. Lohse, during the years 1879 to 1881, found the following times of rotation of this spot, and other temporary features, on the two hemispheres of the planet:

The red spot	9 h. 55 m. 36 s.
Bright spot in northern hemisphere	9 h. 55 m. 35 s.
Dark spot in northern hemisphere	9 h. 55 m. 32 s.
Bright spot in north polar zone	9 h. 55 m. 42 s.

On the other hand, a bright cloud or spot near the equator was found to perform its revolutions in nine hours fifty minutes six seconds. From this it would seem to follow that the time of revolution is nearly the same for the whole of the planet on both sides of the equator, while in the equator itself there is a zone which rotates in five minutes less, although the zone itself, owing to its greater extent, revolves in a larger circle. Dr. Loshe finds that if this more rapid rotation of the equatorial belt is due to a wind blowing in the direction in which the planet rotates, its velocity is 250 miles an hour. That there are winds of this velocity can hardly be doubted, as spots in nearly the same latitude are sometimes seen to overtake each other at this rate. The condition of the surface of the planet is, however, so variable from time to time that the investigation of the law of change on it is very difficult, and no positive conclusions have yet been reached that can be stated in a categorical form. *The Observatory* (a London paper) has published a great number of observations on Jupiter.

Owing to the rapid rotation of Jupiter the disk of the planet is decidedly elliptical in form, the compression being about one-fifteenth. The ratio of the mass of Jupiter to that of the sun is about 1 : 1,047·9. This mass is known as that of Bessel's, and no certain correction has yet been found to it.

Satellites of Jupiter.—The most remarkable feature of the Jovian system is its five satellites, four of which were discovered by Galileo, and the fifth by Barnard at the Lick Observatory in Sept., 1892. This new satellite is so very faint that it can be seen only with the most powerful telescopes. In the remarkable resemblance of the central body, with its retinue of satellites, to the solar system as conceived by Copernicus, Galileo very justly saw a strong confirmation of the truth of the Copernican system. A good opera-glass is sufficient to show the four Galilean satellites, and the phenomena of their eclipses, occultations, etc., are very interesting subjects of study with a moderate-sized telescope. The following is the order of their occurrence during one revolution of a satellite around the planet: Suppose the satellite apparently to approach the disk of the planet on the side nearest the earth. Its entrance upon the disk is called an *ingress*. Sometimes before and sometimes after ingress, according to the relative situation of the planet and the earth, the shadow of the satellite will be seen thrown upon the disk of the planet as a round dark spot, and may be watched all the way across the disk. As the satellite itself passes over the disk it generally appears a little brighter than the planet when it first enters, and a little darker near the center. This arises from the fact that the planet itself is brighter at the center than near the circumference of its disk. But the brightness of the satellites themselves seems to change quite rapidly, and the visibility and relative tint is of course affected by any bright or dark spot over which the satellite may pass. After the satellite has passed off the disk it proceeds in its revolution to the point of greatest elongation, then returning toward the planet it passes behind it, and is said to suffer an occultation; but before the occultation it may enter the shadow of the planet, and be completely lost to sight. After a certain number of hours it emerges from the shadow, and again becomes visible; but either the immersion in the shadow or the emersion from it may be invisible, in consequence of the satellite then being hidden behind the planet. The orbit of the outer satellite is so much inclined to that of the planet that at certain times it passes above or below the shadow without being eclipsed at all. At other times both the immersion and the emersion of one or the other of the three outer satellites may be seen at the same eclipse. This occurs when the planet is near quad-

rature, and therefore seen in a different direction from that in which the shadow is thrown.

Observations of the eclipses of Jupiter's satellites were formerly much used to determine longitude. There is no difficulty in making such a determination within a minute of time, which corresponds to 15 miles on the earth's surface. An accurate determination in this way is not possible, because the satellite enters the shadow or emerges from it so gradually that an exact instant can not be fixed when it appear or disappears.

The American Ephemeris gives for every year a diagram showing the position of the orbits of the satellites, and the configuration of the satellites themselves at some convenient hour of every night, as well as the times of all the phenomena that can be advantageously observed. The following is a table of the periods and distances from Jupiter of these satellites:

SATELLITE.	Synodic revolution.	Distance from Jupiter's center.
V	0 d. 11 h. 57 m. 28 s.	112,000 miles.
I	1 d. 18 h. 28 m. 36 s.	260,000 "
II	3 d. 13 h. 17 m. 54 s.	414,000 "
III	7 d. 3 h. 59 m. 36 s.	661,000 "
IV	16 d. 18 h. 5 m. 7 s.	1,162,000 "

Revised by S. NEWCOMB.

Jupiter Ammon: See AMMON.

Jupurá: See JAPURÁ.

Ju'ra: one of the Inner Hebrides, belonging to Argyleshire, Scotland. Area, 143 sq. miles. The western coast is rugged and precipitous; the eastern, sloping and pleasant. Oats, barley, and flax are raised and black cattle reared. Pop. (1881) 773. Between Jura and Scarva is the whirlpool of Corrievrekin.

Jura: a system of mountain ranges, generally from 5,000 to 6,000 feet high, which cover parts of France, Switzerland, and Germany. They consist of a peculiar kind of limestone, called the Jura limestone, and are plentifully covered with fine pine forests. In the Swiss Jura are found many stalactitic grottoes, and caves abounding in bones of extinct animals. In several places large rivers, as the Orbe, Doubs, and Creuse, are lost and their courses concealed for some distance. The highest peaks are Crêt de la Neige, 5,656 feet, and Reculet de Toiry, 5,643 feet. Revised by M. W. HARRINGTON.

Jura: a department of France, on the frontier of Switzerland. Area, 1,928 sq. miles. The largest part is occupied by the Jura Mountains, which yield excellent timber and extensive pasturage for large herds of cattle and sheep. The lowlands and valleys have rich soil, well adapted to the cultivation of vines. Iron-mining is the principal industry of the department; wine, cheese, and timber are its main products. The inhabitants are thrifty and well educated. Pop. (1896) 266,143. Capital, Lons-le-Saulnier.

Jurassic Period: the division of geologic time following the Triassic period and preceding the Cretaceous. These periods together constitute the Mesozoic or middle era, and the Jurassic period thus stands midway in the great time scale characterized by fossils. The name is derived from the Jura Mountains, where the formations of the period are extensively developed. They also cover large areas in lowland districts of France, in Great Britain, in Germany, and in Russia. The two principal divisions are the Oölite, above, and the Lias, below. The beds have yielded fossils in great abundance, and the fauna of the period is exceptionally rich and characteristic. Among its more notable elements are the ammonites, which then culminated, the reptiles, which included a number of large and peculiar forms, and the birds, which were then first separated from the reptiles. For its flora, see PLANTS, FOSSIL.

Rocks of Jurassic age have been found in all continents, but they have not elsewhere been determined to constitute a system accurately corresponding to the European. In the U. S. they have been recognized in Colorado, Dakota, Montana, Wyoming, Utah, Nevada, California, and New Mexico, but only in Northern California has it been possible to determine the upper and lower limits of the beds representing the period. Especial difficulty has been found with the lower limit, and there are extensive formations not only in the far West, but on the Atlantic seaboard, whose questionable date has been expressed by the title Jura-Trias or equivalent terms. In the chronologic scale adopted by the U. S. Geological Survey in 1890, the Jurassic and Triassic periods of the European scale are replaced by a single one called the JURA-TRIAS PERIOD (*q. v.*). See also GEOLOGY, PALEONTOLOGY, and PTERODACTYL. G. K. GILBERT.

Jura-Trias Period: the division of geologic time following the Carboniferous period and preceding the Cretaceous. As indicated by the compound name, the period includes the Jurassic and Triassic periods of the European chronologic scale. It has been adopted for the maps of the U. S. Geological Survey on account of the difficulty of classifying the American rocks, which are not well supplied with fossils. On the eastern seaboard of the U. S. are a number of areas of red shale and sandstone constituting the Newark system. They occur in Massachusetts, Connecticut, New Jersey, Pennsylvania, Maryland, the Virginias, and North Carolina. Red rocks of more varied texture encircle the Black Hills of Dakota, flank various ranges of the Rocky Mountains in Montana, Wyoming, and Colorado, and are widely exposed in plateaus of Texas, Utah, New Mexico, and Arizona. Rock series which are not red and which include much calcareous matter occur in Western Nevada and in California. Among the more notable fossils are the tracks of gigantic reptiles which abound in some of the eastern beds, and the gigantic Atlantosaurus and Brontosaurus of the red beds of Colorado. From North Carolina have been obtained some of the oldest known mammalian remains. The New England and New Jersey beds afford an important building material called brownstone, and good building stone has also been obtained from the red beds of the West at many points. See GEOLOGY, PALEONTOLOGY, and NEWARK SYSTEM. G. K. GILBERT.

Jurien de la Gravière, zhoo'ri-ăn'de-laă-graă'vi-ăr', JEAN BAPTISTE EDMOND: admiral; son of Admiral Pierre Roch Jurien de la Gravière (1772–1849); b. at Brest, France, Nov. 19, 1812; entered the navy in 1828; was engaged in the Chinese war in command of the Bayonnaise; served in the Black Sea during the Crimean war; was made rear-admiral Dec. 1, 1855, and placed at the head of a squadron in the Adriatic. In Oct., 1861, he received the command of the squadron sent against Mexico in pursuance of the triple alliance between France, Great Britain, and Spain, and as imperial commissioner adjusted with the government of President Juarez the famous treaty of Soledad, which was repudiated by Napoleon III. He became vice-admiral in 1862, and returned to France, where he served as aide-de-camp to the emperor. From 1868 till 1870 he commanded the Mediterranean squadron; in 1870 took part in the defense of Paris; after the war became director of the maps and charts in the naval office; and in 1888 was chosen a member of the French Academy. He wrote numerous books, including the much-admired *Voyage en Chine* (1854; 3d ed. 1872); *Guerres Maritimes sous la République et sous l'Empire* (Paris, 1847; 8th ed. 1883); *Les Campagnes d'Alexandre* (1883–84); *L'Amiral Roussin* (1889). D. in Paris, Mar. 5, 1892. Revised by C. H. THURBER.

Jurieu, zhü'ri-ö', PIERRE: controversial writer; b. at Mer, Loir-et-Cher, France, Dec. 24, 1637; studied theology at Sedan; visited Holland and England, and succeeded his father as pastor of the Reformed church of his native city. In 1674 he was appointed Professor of Hebrew and Theology at the Academy of Sedan, but when this institution was broken up in 1681 by the Jesuits, and he was exposed to persecution for his *La Politique du Clergé de France* (1681), he sought refuge in Holland, and was elected pastor of the Walloon church in Rotterdam, where he died Jan. 11, 1713. In spite of his restless and irritable spirit, which drove him from one controversy into another, he was of great aid to the Protestant Church in France, and among his numerous writings there are many of great value, as, for instance, *Histoire Critique des Dogmes et des Cultes* (Amsterdam, 1704; Eng. trans., *A Critical History of the Doctrine and Worships . . . . of the Church*, 2 vols., London, 1705); and *Histoire du Calvinisme et celle du Papisme* (Rotterdam, 1682). Revised by S. M. JACKSON.

Jurisdiction [viâ O. Fr. from Lat. *ju'ris dic'tio*, administration of the law; *ju'ris*, genit. of *jus*, right, law + *dic'tio*, a telling, declaring, deriv. of *di'cere*, say, tell]: in law, the power possessed by a person or body of men to dispose of a cause or question judicially.

The jurisdiction of a court is exclusive when it is the only court by which the matter in question can be disposed of; and concurrent when it is one of two or more courts, either of which, indifferently, may entertain the cause. In this latter case the action may be begun in either one, and while

there pending, the other courts having concurrent jurisdiction will, in general, refuse to entertain another action for the subject-matter between the same parties. Thus an inferior court, e. g. a justice of the peace, frequently has concurrent jurisdiction with a superior court of minor causes, and an action may be begun in either. An instance of exclusive jurisdiction is that of a probate court in determining the existence and validity of a will. Jurisdiction is also original and appellate. It is original when a court entertains the cause in the first instance, appellate when it entertains a cause brought from another court.

Source and Extent of Jurisdiction.—The jurisdiction of a court may originate, as much of the jurisdiction of the courts of Great Britain has, from long usage, or it may be conferred, as it usually is in the U. S., by statute or constitutional provision.

Under the jurisprudence of the U. S. Government the judicial power is prescribed in the Constitution. It is, for most purposes, left to Congress to determine in what courts it shall be vested. It is, however, provided that there shall be a Supreme Court, and that it shall have original jurisdiction in two classes of cases—one in all cases affecting ambassadors, other public ministers, and consuls, and the other in which a State shall be a party. In all other cases the court shall have appellate jurisdiction, with such exceptions and under such regulations as Congress shall make. The effect of this provision is that Congress can not confer upon the Supreme Court original jurisdiction in any other cases than those that are expressly mentioned. Original jurisdiction in all other cases to which the judicial power of the U. S. extends must be exercised, as far as Federal tribunals are concerned, by some of the inferior courts referred to in the Constitution as within the power of Congress to establish. It can not be claimed that the Supreme Court of the U. S. can not exercise appellate jurisdiction in the two classes of cases in which its jurisdiction is original. In fact, there are two general grounds on which a case may be brought before a U. S. court, one being the nature of the case, and the other the presence of a particular party. The fact that the presence of a party makes a case one for original jurisdiction does not prevent the exercise of appellate jurisdiction where that depends on the nature of the case. For the particular jurisdiction of Federal courts, see COURTS.

The jurisdiction of a State court may or may not be prescribed in a State constitution. Where there is no constitutional direction, the whole matter is within the control of the State Legislature, which may in that case erect and abolish courts at will, and parcel out their jurisdiction according to its pleasure. The jurisdiction of the courts of Great Britain is now more largely statutory than formerly, having been modified to a considerable extent by the Judicature Acts of 1873 and subsequent years in England, and by similar acts in Ireland and Scotland. See COURTS.

Mode of Acquiring Jurisdiction.—Jurisdiction may be either of the subject-matter or of the person. In order to render the decision or action of a court legal or binding, the subject-matter before it must be such as it has authority to dispose of by law, and it must have been brought before it in the manner prescribed by law, except as the observance of this manner is waived by the parties. The powers of an existing court can not be extended by any consent of the parties to subjects over which the law gives it no control.

If parties should in the most solemn form agree that they would submit a question to a tribunal created by themselves, the most that their unaided act would amount to would be to appoint an arbitrator, and to give him authority to make an award. (See AWARD.) While these positions are true as to jurisdiction over the subject-matter of a cause, they can not be applied with the same breadth to jurisdiction over the person. It is frequently the case that general power to decide a question exists if the parties are properly before the court, and the law prescribes a particular mode of bringing them there. If that mode is not observed regularly the court has no jurisdiction. In such a case, if a party waives an observance of the prescribed mode, and voluntarily takes part in the action, the court may, upon the consent thus given, entertain the case. This view could not be taken of a case where the court could not, by the most strict adoption of regular forms of procedure, acquire jurisdiction. An illustration is found in the jurisdiction of a State court over a foreign consul. The U. S. Constitution for public reasons withdraws the consul as a defendant from the State courts. He can not, accordingly, be sued there by his consent. There is here no question of an adoption of regular forms. The State court has nothing to do with the case, and can no more acquire jurisdiction over the person of the consul by his consent than it could obtain the right to dispose of an admiralty cause in the same manner.

Presumption as to Jurisdiction.—A distinction has been taken as to the presumption of jurisdiction between an inferior and a superior court. It has been laid down as a rule that "nothing shall be intended to be out of the jurisdiction of a superior court except that which specially appears to be so; on the other hand, nothing shall be intended to be within that of the inferior court unless it be expressly so alleged." In determining to which particular class a court belongs, no definite line can be drawn for general guidance, but it is necessary to consider the statutes and usages of the particular jurisdiction in which the case arises. A court may have a limited jurisdiction, such as the circuit or district court of the U. S., and not be an inferior court within the meaning of this rule. Even as to the superior courts, the presumption of jurisdiction may be rebutted by proof to the contrary, unless, having jurisdiction under a certain state of facts, its record contains a recital of those facts, in which case the record, by a technical rule of law, is not to be contradicted by extrinsic evidence. Wherever the record expressly or by implication shows that the court proceeded without jurisdiction, there is no presumption in its favor, and its acts are plainly void. The rule also fails of application when the court proceeds in the exercise of some special statutory authority: for as to this, it is deemed to be an inferior rather than a superior court.

When the case is one of an inferior court, another set of rules prevails. Although it may appear on the record that the conditions precedent to the right to hear and determine the matter in hand existed, so that its decision is apparently correct, yet the facts may be disproved by extrinsic evidence. So, in any case where the record of an inferior court does not show upon its face the existence of the facts necessary to give jurisdiction, they are presumed not to have existed, though extrinsic evidence may be offered to the contrary, and the jurisdiction thus be upheld under these rules. If a court martial should assess a fine without giving the accused an opportunity to be heard, the decision will be wholly void; the court would in such a case have no jurisdiction over the person. The same rule would be applied to a magistrate having power by statute to issue a warrant or an attachment under special circumstances that were not complied with. Where a judge acts wholly without jurisdiction, his decision may not only be disregarded by other courts, but he may render himself liable to an action for damages at the suit of the party injured.

Want of Jurisdiction.—Where jurisdiction does not exist the act of passing judgment is wholly inoperative and void. Thus if a State court should pass upon a question which is reserved by the U. S. Constitution exclusively for the Federal tribunals, its judgment would be without effect. An instance would be the assumption of the functions of a court of admiralty. It is not necessary, where there is a total want of jurisdiction, to raise the question by an appeal from the decision. It may be shown to be of no avail in a wholly independent and collateral proceeding. Thus if a person were sentenced for a criminal offense by a court having no jurisdiction, he might be discharged on a writ of *habeas corpus*. This power to declare the judgment of a court a nullity is one of great delicacy, and is to be exercised with much caution; still in a clear case there is no hesitancy in exercising it, as otherwise great injustice might be done.

In the U. S. this question as to jurisdiction is frequently presented where an attempt is made to enforce in the courts of one State a judgment or decree of the courts of another State. The U. S. Constitution provides (Art. iv., § 1) that full faith and credit shall be given in each State to the public acts, records, and judicial proceedings of every other State, and Congress is empowered to prescribe the manner in which such acts and proceedings shall be proved and the effect thereof. Under this provision the court of the one State may inquire into the jurisdiction of the court of the other State, and refuse to recognize a judgment rendered without jurisdiction. The constitutional clause assumes that there is a record to which recognition can be given; and a professed judgment rendered without jurisdiction is in fact no judgment. There must be jurisdiction both of the subject-matter and of the person. Accordingly, if judgment was obtained against a defendant in one State without notice, it could not be enforced against him as a judg-

ment in the courts of another State, as the court acted without jurisdiction over his person. It would be immaterial though the courts of the State where the judgment was rendered deemed it valid. A judgment of this kind may sometimes, by force of statutory provisions providing notice by means of newspaper publication instead of that which is personal, have a local effect when it is wholly discarded in other States for want of true jurisdiction over the person. This question frequently arises in actions for total divorce. If one of the parties, having become domiciled in one State, obtains a divorce from the other in his absence and without personal notice, the judgment may be valid by the local law of the State where it is rendered, and yet not be recognized in another State, on the ground of want of jurisdiction. If, on the other hand, the absent party had appeared and submitted to the jurisdiction of the court, the judgment might have been valid in both States.

A like question may arise as between the courts of different nations. Thus the English courts will, as a general rule, recognize as conclusive a judgment rendered in the courts of one of the U. S., where the latter has full jurisdiction over the subject. Assuming, what is doubtful, that this rule would be applied there to an action in the U. S. for divorce from an English marriage, still, if an Englishman, dissatisfied with his marriage relations, should leave England, and while the wife still remained in England, acquire a domicile in one of the States and obtain a divorce valid by its laws, the English courts would not recognize its existence on account of the defect of jurisdiction. See Timothy Brown's *Commentaries on the Jurisdiction of Courts* (Chicago, 1891); Kerly *On Equitable Jurisdiction*, and the general treatises on the various branches of the law.

Revised by F. STURGES ALLEN.

Jurispru'dence [from Lat. *jurisprudentia*, science of law; *ju'ris*, genit. of *jus*, right, law + *prudentia*, foresight, knowledge, for **providentia*, deriv. of *pro-*, fore- + *vidēre*, see]: the word used by the Romans to signify the scientific knowledge of their own law. The imperial Roman law, in which the legal ideas and institutions of the entire civilized world had been blended and harmonized, was something more than a national system; it had gained a universal character; and the regard paid by the jurists of the empire to ethical ideas almost justified Ulpian's definition of *jurisprudentia* as "the knowledge of things divine and human; the science of that which is just and that which is unjust." *Dig.*, i., 1, 10. § 2.

Mediæval and Modern Schools of Jurisprudence.—From the close of the third century to the beginning of the thirteenth there was little activity in the field of law that deserves to be called scientific. The best work of this period was that of the ecclesiastics, who gave Europe, in the *canon law*, a common system of family law and testamentary succession. With the revival of the study of the imperial Roman law in the twelfth century, and its gradual "reception" in a great part of continental Europe (a movement which was practically completed in the sixteenth century), a new impulse was given to jurisprudence. "The threads of the single legal systems no longer run side by side without points of contact, but meet and unite into a web, of which the Roman and the canon law form the common woof." (Von Ihering, *Geist des römischen Rechts*, i., 10.) Even in those parts of Europe where the Justinian books were not received as law, e. g. in Northern France and in England, the study of the Roman jurisprudence had a strong influence on legal literature (cf. *Beaumanoir* and *Bracton*); but it was in the countries of the Roman law that legal science reached its highest development.

School of Natural Law.—In the Roman jurisprudence itself, however, were the germs of a new and somewhat antagonistic development. The Roman theories of "natural law" were eagerly taken up in the Middle Ages, and in the seventeenth and eighteenth centuries these theories, considerably modified in their development, became dominant in European jurisprudence. The writers of this school regarded natural law as something independent of all positive law, and cognizable by pure reason. They also considered it antecedent (at least in a philosophical sense) to all positive law, the latter being merely an imperfect expression of the law of nature. The most radical of the natural lawyers regarded the law of nature as law of the highest validity, overriding all contrary rules established by legislative authority. The school has by no means disappeared, but it is no longer dominant. In its time it rendered the world great service. It developed the purely modern science of international law. It gave a logical basis for the great revolutions which have transformed constitutional law. It helped to free Europe from the "foreign laws," civil and canon, by preparing the way for independent national systems. Some of the leading names of this school are those of Suarez, Gentilis, Grotius, Pufendorf, Thomasius, Wolf, and, in the political field, Locke and Rousseau.

The Positive School.—The reaction against the theories of natural law has produced two modern schools of jurisprudence—the positive school and the historical. The positivists base all law on the authority of the state (without always accurately distinguishing state and government). Natural law, in their view, is, as such, not law; it represents only a mass of more or less concordant opinion as to what ought to be law. Its rules are generally rules of morals. These may become rules of law, but only through their acceptance by the state. To the positivists all rules of law are the commands of the sovereign, and the regular and typical form of a legal rule is the statutory form. Law of usage and the law created by judicial interpretation are explained to be indirect or "oblique" commands of the sovereign. Judge-made law is law only because of the delegation of the law-finding power to the judiciary; custom is law only by virtue of judicial recognition and the tolerance of the legislature. A further essential criterion of law is the sanction which the state attaches to its rules, i. e. the ultimate interposition of force to execute its commands. To many writers of this school force is the essential basis of the legal order. They charge the natural lawyers with a confusion of law and morals, but in their anxiety to distinguish the two they not only make law independent of morals, but almost ignore the existence of any moral basis for law.

The positive school of jurisprudence is predominantly English. Hobbes furnished the philosophical basis for positive theories in his insistence upon the complete and exclusive sovereignty of the state, and in the distinction which he drew between natural laws and laws proper (*Leviathan*, ch. xv., last paragraph, and ch. xxvi.). Hobbes rather than Bentham should be regarded as the father of the school, although its ideas are most fully expressed and sharply formulated by Bentham and Austin.

The historical school also opposes the theories of natural law. To the historical jurist law is always in flux, in process of development; its truths are relative; and there is no such absolute legal truth as the natural lawyers assert; but the historical school fully recognizes the derivation of law from the moral sense of the community. The popular sense of right always shapes, or at least controls, legal development. (1) In the earliest period the instincts of the people find direct expression in their usages. Early custom is a spontaneous and unconscious product of the national life, as much so as language. With the progress of civilization and the increasing complexity of social relations comes an inevitable differentiation of social functions, and the development of law falls into the hands of a class, the lawyers; but the law is still national custom—*jus civile*, *Volksrecht*, *lex terræ*, common law. (2) As social conflicts become more acute, the state becomes more and more the arbiter. The authority of the political superior, the magistracy or the crown, is more freely interposed, and the old national custom is broadened by the introduction of more equitable rules. This is the period of the *jus honorarium*, *Amtsrecht*, equity. (3) In the development of national custom by juristic interpretation there is already a reflective element. Considerations of expediency or "policy" exert more and more influence, and reveal themselves in direct change of law by "fictions." This tendency is even more marked in the period of equity; but the most efficient agency of voluntary change is legislation. This agency exists and finds occasional employment in the periods of custom and equity, but with the maturity of the national civilization it becomes the chief factor of legal development. In all these periods, however, that of custom, that of equity, that of legislation, law remains, in its fundamental principles, an expression of the popular sense of justice. The bar and the bench, the prætor or chancellor, the legislators themselves, be they despots or elected representatives, can not free themselves if they would from the instincts of their nation and their time.

The main difference between the positive and the historical school is in their attitude toward customary law. To the positivist it is something abnormal, to be done away with; to the historical jurist (as to the Romans) it is a coordinate source of law, of greater importance in the earlier

periods, of lessening significance in modern times, but never destined wholly to disappear. As the German jurist Bruns has expressed it, "nations, like individuals, are governed in their actions in part by conscious purpose and resolution, in part by almost involuntary habit." Holtzendorff, *Rechtsencyclopädie*, 3d ed., p. 343.

The founder of the historical school was the great German jurist Savigny. Forerunners in the fields of public law and politics were Montesquieu and Burke. Germany still holds the first place in historical jurisprudence, but the fundamental ideas of the school have been independently formulated and thoroughly naturalized in the English-speaking world by Sir Henry Sumner Maine. The service which historical jurisprudence has rendered and is rendering to legal science is incalculable, but it may be questioned whether it has proved as effective an agency for legal progress and social reform as the school of natural law or that of positive law. The assertion that what ought to be law is already "natural" law greatly facilitates the recognition of new rules, and the positive theory that the normal method of legal development is by legislation encourages statutory innovations. The historical school has been charged with "quietism" and a tendency to fatalism. If legislation is merely the expression of slowly ripening popular instincts, it is sure to come when the instincts are sufficiently ripened. To hasten the process may be impossible; will certainly result in mistakes. Such was, in fact, the feeling of Savigny, who was a strong conservative in his political views; and the attitude of the historical jurists toward reformatory legislation has always been rather unsympathetic.

The Comparative School.—Historical jurisprudence does not represent the last word of European legal science, even in the nineteenth century. The historical method is being supplemented here, as in other sciences, by the method of comparison, and jurisprudence is coming to be regarded not as the science of Roman law merely, or of English law, or of any single national system, but as the science of human law. A new school of historical jurists has appeared who are studying and comparing the customs and laws of the most diverse peoples, ancient and modern, savage and civilized, and who are trying to formulate the laws of legal evolution. Much work has been already done in the general field of early law by Maine, Fustel de Coulanges, von Ihering, Kohler, Post, and others; and valuable researches have been made in early family law by Bachofen, Starcke, Dargun, McLennan, Morgan, Robertson Smith, Giraud-Teulon, and others. The work of this school can best be followed in the *Zeitschrift für vergleichende Rechtswissenschaft*. Little has yet been done in the comparative study of law in its intermediate development (in the period, for example, of equity), but such work will doubtless follow. Preliminary studies in the evolution of single systems, such as those of Puchta, von Ihering, Mommsen, Lenel, and Muirhead in Roman law; those of Brunner and Schröder in Teutonic law; and those of Holmes, Maitland, and Ames in English law, are preparing the way for scientific comparison.

Finally, active work is being carried on, especially in France, in the field of "comparative legislation." The Société de Législation comparée publishes annual collections of the most important laws passed in all civilized countries, and monthly bulletins containing special essays. Many monographs are appearing, largely by members of the society, upon special legal questions. It is in this field that the comparative method seems most likely to counteract the over-conservative tendencies of the historical school. The study and comparison of the most progressive legislation can not but exercise a stimulating influence upon reform in every country.

Subject-matter of Jurisprudence—Law, Rights, Duties, Legal Relations, Sanctions.—The field of jurisprudence is all human law. *Definitions of law* are countless. One of the most satisfactory, because most general, is that of the Swiss jurist Hartmann, which may be paraphrased: Law is the system of social order established and enforced by society. This definition includes early customary law as well as international law, to both of which positive jurisprudence is inclined to deny the character of law. But the definition seems also to include such rules of social conduct as are enforced by purely social penalties, or by the mere pressure of social opinion without any ultimate interposition of governmental authority; and such rules are not commonly regarded as law. Modern law may therefore be defined, with an approach to the positive theory, as *the system of social order established and enforced by the state and its governmental organs.* As a matter of fact, popular usage has almost ceased to be a source of law in the modern civilized world. At the most, it makes nothing more than local or class law (e. g. mercantile custom); and it is doubtful whether the essential criterion of customary law, viz., the belief that the custom is law (*opinio necessitatis*), exists even in these cases until the custom has received judicial recognition; but governmental usage, if such a term may be coined, is still an important source of law. International law (apart from treaties) rests wholly on this basis. Constitutional law, even in countries which possess written constitutions, is largely of this character. In the U. S. the custom of the executive departments has been recognized as "a sort of common law" (*U. S.* vs. *McDaniel*, 7 Peters 1, 14), i. e. as unwritten administrative law. Finally, the common law of England and the U. S., which rests upon the basis of judicial decisions, is the persistent custom of the judicial department of government. On the continent of Europe it is commonly maintained that judicial decisions do not make law. The Romans, however, recognized that, when the written law was ambiguous, "the authority of cases always similarly decided ought to have the force of statute" (*Dig.*, i., 3, 38); and in spite of the general reduction of all modern European law to statutory form (codes), judicial decisions interpreting doubtful rules and filling "open places" seem to be treated practically as law. A French writer speaks of "that occult legislation which is termed judicial practice."

A rule of law is regularly a declaration by some authorized organ of government that certain acts or a certain state of facts shall have certain legal results. To define a rule of law as "a command of the sovereign" is doubly erroneous. It is not always a command, and it does not always proceed from the sovereign. Within the limits of their constitutional powers many subordinate organs of government lay down rules of law. In the U. S. it is only the nation, acting through the forms of constitutional amendment, that is really sovereign; but the ordinances of a city council, acting within its competence, are just as truly law as an amendment to the Federal Constitution.

The law orders social relations either negatively, by prohibiting certain acts and thus creating duties of forbearance, or positively, by according certain limited powers or *rights.* The law may also command certain acts, and thus create duties of a positive sort. Right and duty are correlative conceptions. When the law imposes a duty it recognizes, inferentially at least, a corresponding right; if not an individual right, at least a right of the community or the government. The so-called personal rights, i. e. rights over one's own person, life, liberty, etc., are commonly defined in this negative way, by the legal prohibition of homicide, assault, false imprisonment, etc. Conversely, when the law bestows a right, corresponding duties are created; if not an individual duty, at least a duty of the community to respect the right. In ordering the relations between individuals, particularly property and family relations, the law attains its ends mainly by according private or civil rights.

Every right implies a subject or holder of the right, a "person of inherence," possibly a number of such persons. Where a complex of closely related rights is held by the entire people, or by a section of the people, or by a body of associated individuals, and where the rights and obligations of the whole body or association are practically separable from the rights and obligations of its members, it is always convenient and often necessary to regard the association, for legal purposes, as a single person. Thus we have the so-called artificial, moral, legal, or *juristic person.* Juristic personality is attributed to the state and to many smaller political units, such as cities and towns. These are termed *political corporations.* A fictitious personality may similarly be ascribed to voluntary associations formed for religious, charitable, educational, social, or commercial purposes; and in these cases we have *private corporations.* These latter exist only in the domain of property law. On the continent of Europe, property held and used for religious, charitable, or educational purposes is not put into the hands of trustees, who are then vested with corporate powers, as in the practice of the English law; but the same end is gained by idealizing the purpose for which the property is held, and constructing a fictitious person called the *foundation* (*pia causa*).

The "incidence" of a private right is regularly against the whole community, including the government, i. e. the duty corresponding to the right is a general duty of for-

bearance; but the immediate object over which the right is exercised may be a thing or a person, and we accordingly distinguish rights *in rem* (ownership, easements, liens, etc.) from rights *in personam*. In the latter case there exists a special duty of the person bound or obliged. This distinction, according to the better opinion, applies only to the law of property, which thus resolves itself into the law of things (immovable and movable) and the law of obligations (choses in action). Attempts to construct family law on the basis of rights *in rem* and *in personam* lead to many absurdities. In family law we have a system of legal relations with rights on both sides and duties on both sides.

In a wider sense, this latter statement is true in all domains of the law; rights and duties, in public law as well as in private, and in property law as well as in that of the family, may be regarded as component parts of legal relations. In the modern German theory, especially, law is regarded as a system not of rights nor of duties, but of *legal* or *jural relations*. In its simplest form a legal relation consists of a definite right belonging to one person and a corresponding duty attaching to another person, as in the case of money loaned. In its more complex forms, a legal relation includes a series of rights and duties subsisting between two or more persons, natural or juristic, as in the case of landlord and tenant, employer and servant, husband and wife, state and citizen. It is only in very primitive communities that the law can be satisfactorily construed as a system of rights; and the thought which Maine expressed in his famous saying, that the development of the law was from status to contract, is more fully and more correctly expressed by the German jurist von Ihering, who says that law develops from a system of one-sided and unlimited powers to a system of legal relations, in which limited rights and duties are found on both sides.

The customary classifications of law are really based on the nature of the relations with which each branch of the law deals. Relations between independent states are ordered by *international law*; relations between the state or government and the citizens by *constitutional* and *administrative law*; the former dealing rather with the organization of the state and the government, the latter with the relations which arise between the government and the citizens in the exercise of governmental powers. All these branches of the law we term *public*. *Private law* deals with relations between individuals. This is again divided (and again according to the nature of the relations with which it deals) into *property law*—i. e. law of real property, law of personal property, law of obligations—and *family law*—i. e. relations of husband and wife, parent and child, guardian and ward. Property law is again divisible into the law of ordinary property relations (*inter vivos*) and that which deals with relations resulting from death (relations *mortis causa*)—the law of inheritance or succession. Commercial law, or the *law merchant*, and *maritime law*, if treated as special branches of property law, are so treated again, not because any new types of right or duty appear in those parts of the law, but because they deal with relations peculiar to commerce.

From this point of view the law of *crimes* and of *torts* and that of *criminal* and *civil procedure* are not divisions of *substantive law*, but fall under the head of *remedial law*. These parts of the law do not deal with normal relations, but with the results attached to the disturbance of normal relations. We have here, in other words, the *sanctions* of the law. Where the disturbance of the legal order is of a willful and flagrant character the law makes it a crime or a misdemeanor (*delictum publicum*), and decrees punishment. The prosecution of the offender may be left to the person primarily wronged, but is usually undertaken by an agent of the government, and the action is brought in the name of the state (crown or people). Criminal law attaches its sanctions to every domain of substantive law, public and private. In the field of private law, however, the redress of wrongs and the enforcement of rights are usually left to the initiative of the wronged party (civil action).

To the domain of remedial law belong, finally, *international criminal law* and *international private law*, which some French writers group under the common title *droit international particulier*. The purpose of those branches of the law is to minimize, in administering justice, the evils necessarily connected with the existence of independent jurisdictions and with the resulting "conflicts of law."

Relation of Jurisprudence to other Social Sciences.—In the historical and comparative study of early law, anthropology, ethnology, and philology are of the greatest service; in the study of later legal development, political and economic history are indispensable aids. Public law becomes thoroughly intelligible only through the study of political history and political science. The relation between the law of property, real and personal, and the "science of wealth" is extremely close; some of the fundamental conceptions in this field of the law are really economic, and need revision in the light of recent and clearer economic thinking. But the science most closely related to law is social ethics. It is true that the domains of law and ethics are not precisely the same. Many rules of ethics can not be enforced at all, and many others can not advantageously be enforced by machinery so rude as that of government. On the other hand, law has to settle many questions where the solution is ethically indifferent, where it matters nothing what the rule is, so that there is a rule. But, after noting all those differences, it is still true that, in its fundamental principles, law is applied ethics; and it is also true that the most effective sanction of legal rules is afforded, not by the physical force of the state, but by the moral sentiment of the community.

LITERATURE.—All scientific treatises in law furnish material, at least, for jurisprudence; and treatises in modern Roman law are material of the greatest value. (See ROMAN LAW.) Next in importance stand treatises on the English common law. These of course, like works on Roman law, deal mainly with private relations. Scientific works on international law are necessarily comparative in treatment, and are therefore contributions to comparative jurisprudence. (See INTERNATIONAL LAW.) For comparative treatment of other branches of public law and for science of law in general, consult Thon, *Rechtsnorm und Subjektives Recht* (Weimar, 1878); Lorimer, *The Principles of Jurisprudence* (2d ed. London, 1880); Clark, *Practical Jurisprudence* (Cambridge, 1883); Lightwood, *Nature of Positive Law* (London, 1883); Fouillée, *L'Idée Moderne du Droit* (2d ed. Paris, 1883); Markby, *Elements of Law* (3d ed. Oxford, 1885); Goldschmidt, *Uebergriffe der historischen Schule* (Berlin, 1886); von Ihering, *Der Zweck im Recht* (2d ed. Leipzig, 1886); Courcelle-Seneuil, *Preparation à l'Étude du Droit* (Paris, 1887); Arndts, *Juristische Encyclopädie* (5th ed. (Grüber) Stuttgart, 1887); Beaussire, *Principes du Droit* (Paris, 1888); Hastie, *Outlines of Jurisprudence* (Edinburgh, 1888); de Vareilles-Sommières, *Principes Fondamentaux du Droit* (Paris, 1889); Burgess, *Political Science and Constitutional Law* (Boston, 1890); Ratkowsky, *Encyclopädie der Rechts- und Staatswissenschaften* (Vienna, 1890); von Ihering, *Der Kampf ums Recht* (10th ed. Vienna, 1891; French transl. by Meulenaere, *La Lutte pour le Droit*, Paris, 1890); Holland, *Elements of Jurisprudence* (5th ed. Oxford, 1891); Anzilotti, *La Scuola del Diritto Naturale* (Florence, 1892); Goodnow, *Comparative Administrative Law* (New York, 1893). In these works will be found abundant references to the older literature. MUNROE SMITH.

Jurisprudence, Medical: the science (called also *Forensic Medicine*) which treats of the application of medical and correlative knowledge to the purposes and principles of common law, especially in its juridical relations. It is not state medicine, as some writers have been pleased to insist, but only one branch of it, the other being what is variously termed hygiene, sanitation, or the science of public health. The former considers essentially the individual rights of the person as related to society or to other individuals, and these are to be determined and sustained by the courts, the judicial element of the law; the latter, including all matters that pertain to the public health and the physical welfare of society, is the concern of the legislative and executive branches of government, the one enacting, the other enforcing such laws as may be necessary to preserve the health of the people at large.

Although all the earlier nations recognized the public welfare as paramount to that of the individual, and sanitary and hygienic regulations had a most important place in both their legal and religious codes (these ancient edicts surviving and obtaining to this day among the Hindus, and, in a modified way, among the Hebrews), thus showing the recognition of the connection between medicine and law to have existed in early times, yet the personal rights of the individual were of lesser moment, and medical jurisprudence as a science did not exist. Even the most primitive people, however, could hardly exist as an organized community without recognizing to some extent the principles upon

which medical jurisprudence is based, and in their customs, codes, and institutes we may trace its rudiments. Herodotus tells us that the Egyptians had laws regulating marriage, determining penalties according to the gravity of wounds and physical injuries, etc. In Greece the writings of some of the most noted philosophers show that they had considered and believed in medico-legal regulations, and many years after in Rome the Justinian code insisted that the courts should form opinions and render decisions in these matters upon the authority of the most learned Hippocrates, rather than on the testimony and judgment of living medical witnesses; and the influence of Aristotle was felt in the ecclesiastical courts long after the Dark Ages. Rome, with its advancing civilization, recognized the importance of medico-legal inquiry, authorized state physicians and enacted laws wherein were considered individual rights, the care of pregnant women, proofs of legitimacy, etc. And though it is doubtful whether the Roman law ever authorized *post-mortem* examinations of the interior of the body, it is more than probable that such autopsies were sometimes made when death occurred under suspicious circumstances.

Then came the downfall of the empire and a check to the progress of all science. But the influence of Rome still persisted, and whatsoever there was of forensic medicine in those days was transmitted or derived from the usages of her courts. Nor could there be much further development till more knowledge than was then had could be gained of anatomy, physiology, pathology, chemistry, and kindred sciences, for these contain the fundamental truths upon which the structure of medical jurisprudence must rest.

It was not, then, until the early part of the sixteenth century that forensic medicine, as a science, had its beginning. The German penal code, adopted by the diet of Ratisbon in 1532, under the persuasion of Charles V., is rightly considered the natal event of the science, since it compelled the courts and magistrates to call physicians as witnesses in all cases of violent death, injuries, poisoning, infanticide, etc. It is well to remember, however, that as early as 1507 the necessity of medical evidence was recognized in a code established by the Bishop of Bamberg, and that another most important event was the publication in Germany in 1553 of the *Constitutio Criminalis Carolina*. As a natural sequence to the stimulation and dignity thus given to the infant science, there followed careful and studious investigations of medico-legal problems by the greatest physicians of the time, and eventually, as a result of these investigations, the shaking of the widespread belief in witchcraft, the overthrow of superstitions, and the general enlightenment of the people. Most important, in this connection, are the writings of Ambroise Paré on monsters, simulated diseases, and the art of drawing up medico-legal reports; the publication by Paulo Zacchia (1621–35) of his *Quæstiones Medico-legales*; the discovery of the circulation of the blood by Harvey in 1616; the researches of Bartholin on the period of gestation; and the labors of many other equally zealous workers. One of the results of Ambroise Paré's work was the creation of an interest in the subject in France, and the decree of Henry IV., about 1603, authorizing his chief surgeon to appoint skilled physicians and surgeons throughout the kingdom whose duty it should be to inquire into and report on medico-legal cases, especially on cases of accidental death.

During the eighteenth century the principal works that appeared on forensic medicine were Valentini's *Corpus Juris Medico-legale* in 1722 in France; Teichmeyer's *Institutiones Medico-legales* and Alberti's *Systema* in Germany; and especially Foderé's *Traité de Médecine Légale* in 1798. Germany had established chairs for teaching forensic medicine in her universities long before any other nation took a similar step, but by the beginning of the nineteenth century France had three professorships, and since then may be said to have kept the lead in developing this important science. The first systematic treatise in English was by Dr. Samuel Farr in 1788. Though others, like Harvey, had written special articles before this, the first English professorship of medical jurisprudence was established at the University of Edinburgh in 1803, and the first in the U. S. at Columbia College in 1804. Strangely enough, there was no similar chair in England till 1820. Since the beginning of the nineteenth century the science has made rapid strides to its present prominent position, and a vast amount of work has contributed to its development. Foremost among those who have been instrumental in bringing it to its high standard, both by their researches and their writings, must be mentioned Orfila and Tardieu, of France; Casper, of Germany; Guy, Christisson, and A. S. Taylor, of England; and Beck, Wharton, Stillé, Reese, and Wormley, in America. Of all these, Casper is probably the greatest. The treatises and text-books of each one of these are to be recommended to the student for the fund of information they contain; but it must be remembered that as our knowledge of those sciences on which medicine is founded is constantly growing broader and more exact, so must there be corresponding and accompanying changes in this science, which likewise has its foundation and existence in them.

Elements of Medical Jurisprudence.—The essential purpose of the aid and testimony of forensic medicine is to help the court and the law in securing exact justice to and for all by showing the facts of the case and the inferences to be drawn therefrom in aid of scientific medical investigation. It is not concerned with the questions of evidence or procedure which may arise in the trial, nor is its proper purpose to win a case for one side or the other. Medico-legal evidence may be of two kinds: first, that from medical men whose connection with or relation to the case is the normal one of physician or surgeon; and second, that of specialists or experts in certain branches, whose testimony is meant to strengthen or make clear the facts or hypotheses presented by one side or the other, or by the court itself. The following quotation from Taylor is appropriate concerning physicians called upon to give the first kind of evidence: "The duties of a medical jurist are distinct from those of a physician or surgeon; the latter looks only to the treatment of disease or accident and the saving of life; but the object of the former, in a large proportion of cases, is, whether in reference to the living or dead, to aid the law in fixing on the perpetrator of a crime, or to rescue an innocent person from a falsely imputed crime. Thus he may be required to determine whether, in a particular case, the cause of death is natural or violent; and for this purpose it will be necessary for him to make an entirely new application of his professional knowledge. He has now the difficult task of making a selection from other parts of the medical sciences which bear upon the legal proof and development of crime." As a certain learned judge once remarked, "A medical man, when he sees a dead body, should notice everything," this embodying a principle which should be observed by every physician in relation to any case in reference to which he may by any possibility become a forensic witness. A medical expert called as a witness in a case, however, may express his opinion either as to definite facts or certain hypothetical circumstances, and may not testify as to his opinion of the merits of the case; he may use memoranda only as aids to the memory, and not as part of his evidence, and may not quote from the published works of others.

Personal Identity.—Since forensic medicine considers essentially the personal rights of the individual, it must embrace not only all medico-legal questions concerning the relation of the individual to the community or society at large, but also those that arise in respect to the physical integrity of the person. Consequently it becomes necessary in almost every case that the identity of the person should be established beyond the peradventure of a doubt, though often it is so evident as not to be questioned. So many and so varied are the characteristics by which men are distinguished, and so slight the chances of exact coincidence, that one might suppose that it would be scarcely ever difficult to determine or prove this identity. Numerous instances, however, have served to show that such difficulties do arise, and are sometimes well-nigh insurmountable, especially where long periods of time have elapsed, after wasting or disfiguring disease or accident, etc. To prove identity, recourse is had to all those physical and mental characteristics which distinguish one person from another, such as sex, race, stature, age, complexion, color of eyes, voice and accent, habits and mannerisms, scars, congenital markings, deformities, etc. Scars are often peculiarly valuable as a means of identification, for Devergie states that every wound which involves the thickness of the true skin leaves a cicatrice which is indelible. Unfortunately, the difficulty is often increased by the lack of recorded evidence regarding the above data, and by the fact that testimony from memory may be very untrustworthy, even though given in good faith. The uncertainty of *post-mortem* identification usually increases in proportion to the time that has elapsed since death, while the circumstance of death frequently makes the establishing of exact identity the more necessary. This is well illustrated by noted cases involving the payment of large life-insurance policies, inheritance of title and estate,

etc. An anthropometric system based upon a systematic classification of individuals into groups according to careful measurements of certain portions of the body, together with a record of the physical characteristics and peculiarities taken with the measurements, has been in use for several years in France for the identification of criminals and suspects. Though this system of record has been applied to many thousands of persons, it is said that thus far there has never been a failure to identify any one so registered.

Marriage.—There is probably no other subject in which the union of legal and biological elements is so prominent, nor in relation to which so many medico-legal questions may arise, as in the case of marriage. Being a contract with a physical purpose, marriage can only be entered into by those who are legally competent to fulfill a contract of this kind—viz., those of sufficient age, of sound mind, and physically able to consummate the marriage, and a marriage contracted by a party lacking in these requisites is void or voidable. The age at which propagation is possible varies somewhat with the climate, though probably not so much as was formerly supposed. It is proverbially greater in northern than in southern countries. For Great Britain and the U. S. it may be put down at about fifteen for the male and fourteen for the female, though instances are recorded where the age of one or both parents was less than the above. Insanity, in that it renders a person legally incapable of making a contract, is of course a bar to marriage as long as it persists. Impotency is a valid impediment to a marriage, because it prevents the consummation of the latter. It also renders the contract voidable, though not necessarily void, provided the incapacity existed before or at the time of the marriage and was unknown to the complaining party. It must be due to a physical cause; where this is not apparent a three years' cohabitation is required to prove that it is not irremediable, provided this can not be established in the meantime. Proceedings to annul the bond must begin as soon as possible after the discovery of incapacity, and suit to declare a marriage invalid for this cause can not be instituted after the death of one of the parties or by a third party. A personal examination can not be made against the wish of the afflicted party, nor can he or she be compelled to undergo medical or surgical treatment; such action, however, may strengthen the complainant's case and influence the decree. Sterility in either the husband or wife does not constitute sufficient ground for a divorce, nor does inability to conceive, provided there is capacity for natural intercourse.

Pregnancy.—There are several circumstances in relation to this condition that require careful attention from the medical jurist. As to the age at which it may occur, the general and safest rule is to consider a woman capable of procreation from the beginning to the cessation of menstruation, say from fourteen to fifty years of age. As exceptions to this, alleged cases are recorded where conception has occurred as early as the tenth and as late as the sixty-third or seventieth (?) year. Cases have occurred where women have conceived before the menstrual function was established, and in some rare instances where this was entirely wanting through life it has proved to be no bar to the induction of the maternal state. The average duration of pregnancy is from thirty-eight to forty weeks, though many cases require a less or greater period than the above for the completion of gestation. Two circumstances serve to increase the difficulty of determining the exact period: the fact that conception is not always synchronous with intercourse, it being possible for the former to take place seven or possibly even more days after the latter; and that it is customary to count the time from the cessation of the last menstrual discharge, when it is possible that the fruitful intercourse may have taken place just before the next monthly period. Making full allowance for the discrepancies that would arise from these causes, it is evident that there is no exact period of gestation for all women, and the average must be taken as above. A child delivered at the end of the seventh month of pregnancy is viable and should survive with proper care and favorable circumstances; but it will be extremely rare that such a child will be as mature and fully developed as one carried the full time. A child born at the end of eight months, however, may be fully matured to all appearances and as large as the average one at nine months. A fœtus may be born alive as early as the end of the fifth month, and be capable of living a short time, but it usually dies very soon, and few born before the end of the seventh month live through their minority. As to the longest possible period of gestation, both the Roman and French law fix upon 300 days as the extreme limit, and this is probably correct for almost every case. Still we can not say that it is impossible that this time should be exceeded, and in English law there is no fixed limit. The signs of pregnancy are of moment to the medical jurist, because much may be at stake upon his determining whether a woman is or is not in that condition. The early signs are cessation of the menses, nausea and vomiting, especially in the early morning, swelling of the breast and darkening of the areola about the nipples, enlargement of the abdomen, and changes in the neck and body of the uterus. Any one of these by itself might be a symptom of some other cause than pregnancy, but existing together they are strongly corroborative as indicating a gravid womb. Later on in the course of gestation the evidence becomes more reliable, and after the fourth month, sometimes earlier, there may be distinguished rhythmical contractions of the uterus, the uterine souffle or bruit, the murmur of the blood current in the dilated vessels of the womb, quickening and movements of the fœtus, the presence of a floating uterine tumor by ballottement, and, most important of all, the fœtal heart sounds, these being the only signs which may not be feigned or accidentally due to other causes. Great care must be exercised in expressing an opinion in any case, and unless the examiner is certain in his own mind as to his conclusion, one or more future examinations should be made to prevent the possibility of error. It may not be out of place to state the signs of parturition, for attempts may be made either to conceal or to feign the advent of maternity. Briefly they are tumefaction and possible laceration of the external genitals, a relaxed vagina, an enlarged but empty womb, breast distended with milk or colostrum, flabby abdominal walls, and, especially, the characteristic lochial discharge. These symptoms are, however, quite transient and may so far disappear within a week or two as to seriously embarrass the medical examiner and prevent him from giving an authoritative opinion.

Legitimacy.—From some one of those points relating to the married state certain questions may arise concerning legitimacy, paternity, inheritance, etc. All children born in wedlock are presumed to be legitimate, and to prove illegitimacy it is necessary to prove beyond reasonable doubt that the husband could not have been the father, or that the alleged mother could not have borne a child at the time stated. Consequently the medical evidence may concern the actual period of gestation, e. g. whether it was such as to make it impossible that the husband should be the father; the physical competency of the husband, or the incapacity or sterility of the wife.

Insanity.—This subject involves questions concerning the safety and personal liberty of individuals, the motive for strange acts and awful crimes, the perpetration of fraud and evasion of contracts, and the protection and welfare of society at large. As there is a thorough discussion of this condition in all its phases in another part of this work, it is here only necessary to make the following notes. Though of necessity no exact definition of insanity can ever be given, it may be considered as "a condition of the mind in which a false action or conception of judgment, a defective power of the will, or an uncontrollable violence of the emotions and instincts, have separately or conjointly been produced by disease." Four forms of insanity are legally recognized: mania, monomania, dementia, and idiocy. Though there is a growing and proper tendency to refer all cases of this kind to experts and specialists in mental diseases, any physician may be called upon in court to pass upon the mental soundness of an individual, to determine the form and degree of insanity, when present, to detect and expose those feigning it, and to give an opinion whether one afflicted may be safely allowed to go unrestrained. The legal grounds that justify restraint are that the patient is dangerous to himself or others, and that he is incapable of taking care of and properly managing his business and property; and the physician may be asked for a certificate that the degree of mental unsoundness justifies and requires the custody of the patient in an asylum for safety and proper treatment. Such a certificate may be signed only by a legally qualified physician and must be separate from that of any other person and based upon a separate visit and personal examination of the patient. To commit one to an asylum the laws of Great Britain and of many of the U. S. require that, except in cases of emergency, there shall be at least two such medical certificates, and these must be accompanied by a formal appli-

cation signed by a near relative or friend of the insane one. The physician is required to specify the facts upon which he bases his opinion and to state whether they are derived from his own observation or outside information. Moreover, the certificate refers only to the condition of the patient at the time of the examination and must be employed as a means of restraint to the person within a few days thereafter. A medical man is not compelled to sign such a certificate, but if he undertakes it the examination must be "with reasonable care and ordinary skill." Restraint does not necessarily mean personal confinement. The question of insanity also arises when a person whose life is insured commits suicide. The fact of suicide does not prove insanity, but if insanity be otherwise proved the policy must be paid. See INSANITY.

Personal Injuries.—Heretofore the discussion has been concerning medico-legal questions in which there is a distinct relation between the party involved and the civil or social rights of the community. No less important are those which arise from the physical injuries of individuals, whether these be accidental or with intent, trivial or fatal, self-inflicted, or at the hands of another.

Abortion.—Where the injury is directed against the life of the unborn it constitutes abortion, but here, as elsewhere in criminal law, the essence of crime is determined by the intent; and likewise attempts, whether successful or not, to produce criminal abortion by any means whatsoever are subject to legal punishment. To be consistent the general law now considers that the crime may be committed at any time during pregnancy, though formerly in some States indictments could only be brought where the attempt was made after quickening. Inasmuch as abortion or miscarriage may and often does occur accidentally and through no wicked designing, it is necessary in all judicial cases that the intent should be clearly proved. Where attempts have been made, the means employed will be found to be either mechanical or the use of medicinal or chemical substances to produce expulsive uterine efforts or bring about the death of the fœtus. It is to be noted that, though the latter are rarely directly successful, the health and even the life of the pregnant woman is jeopardized by either method, and that the end desired is often brought about indirectly by the disturbance of or shock to her system. The signs of abortion are practically the same as those of parturition and recent normal delivery. The only cases in which the induction of abortion by the physician would be justifiable are those in which further continuation of pregnancy would endanger the life of the mother, though it may be permissible under certain circumstances to bring on premature expulsion after the child is certainly viable in order to save the life of the child as well as lessen the risk to the parent; but all such procedure should only be after a careful consideration of the case with other physicians and with a conscientious belief in its necessity.

Infanticide.—This crime, the murder of a new-born child, is in the eye of the law not distinct from homicide, and is subject to the same penalty; but practically the public at large look upon it far more leniently, as is shown by the fact that while child murders are far more numerous, convictions are rare, and capital punishment is almost never inflicted. The burden of proof is on the prosecution, and many things often render it extremely difficult to furnish such proof. The child may have died from natural or violent causes; the number of deaths from the former of these is very great, and many from the latter class are purely accidental. It is only where there is willful design that there is crime; but neglect properly to guard the child from mischief, hunger, or cold may be as much a felony as the actual use of direct force or fatal agents. Again, the child must have been entirely delivered from the mother and have a separate existence of its own. Should it be proved that the mother did make way with her offspring immediately after its birth the question might arise as to whether she was mentally responsible at the time. One might think that proof of respiration having occurred, as shown by the size, position, weight, condition, and specific gravity of the lungs, would be sufficient evidence of independent life; but an infant may have breathed before fully born, and, on the other hand, may have lived apart from its parent for some considerable time without having used its lungs either partially or entirely. However, if respiration has been well established it would usually be excellent corroborative evidence of living birth. So, also, the presence of food in the stomach almost certainly establishes the same fact. Great care must be used in determining the means or agent of death, and all wounds or other injuries must be noted, but the possibility of the accidental occurrence of these last must not be forgotten. The presence of foreign bodies in the windpipe, gullet, or stomach would be good proof of living birth. It is well to remember that the proportion of deaths from natural causes is considerably greater among illegitimate infants, especially those of primiparous women, than among others, and that in these cases means may be adopted to conceal the birth which may give rise to the suspicion or appearance of child-murder. Each case must be decided for itself on all the circumstances adduced as evidence, and not solely on the medical testimony offered.

Rape.—This crime is peculiar in that the moral injury is, in most cases, far greater than any possible physical damage to the body alone. It consists in the carnal knowledge (sexual intercourse) of a female child or woman forcibly and against her will. In Great Britain and most of the U. S. the laws fix the age of consent, the acquiescence of a girl under that age in no wise altering the degree of the crime; and the penalty is everywhere most severe, being imprisonment for life or even death in some of the States. Being of so serious a nature, the evidence in every case must be most carefully examined and analyzed, lest an innocent person be convicted; for not only are false accusations made willfully and maliciously for the purpose of extortion or revenge, but often in good faith through mistakes as to symptoms, identity, etc. The following points are to be noted: The force employed to overcome the victim may be of any form, either express or implied, physical, mental, or moral; and that she was unconscious or in deep sleep does not alter the case. Idiots and insane persons are in the same category as girls under the age of consent, though it is questionable whether intercourse with an insane person at her solicitation is rape. The law requires that a woman should resist the assault to the utmost of her strength and throughout the act, but it must not be forgotten that she may lose consciousness or else be rendered powerless and even unable to speak through terror and horror of her situation, though failure to cry out would in itself be suspicious even if there was some show of active resistance. Lastly, it is known that certain anæsthetics and narcotics sometimes give rise to erotic sensations in those under their influence, and unjust accusations may be made against professional men after their use, though there may be no ground whatever for the charge.

Wounds.—In the discussion of personal injuries it remains to speak of such as are caused by wounds or by poisons, and attention may be called to certain important essentials pertaining to the investigation of cases involving the one or the other. To quote a prominent authority, "In a medico-legal sense a wound implies a breach of continuity in the structures of the body, whether external or internal, suddenly occasioned by mechanical violence." Questions will naturally arise in any case as to whether the wounding was "imminently dangerous to life," or such as to cause "grievous bodily harm"; with what intent, if any, was it inflicted; whether by the victim himself or by another; what were the attendant circumstances; what the weapon or agent; what the character and appearance of the wounds; when and upon what part of the body were they inflicted, etc. If death ensues other points must be determined as far as possible: viz., was death immediate after the wounding; did one or more of the wounds cause death directly, and if so was it from hæmorrhage, injury to vital organs, or shock; if death was not immediate, was it caused by any intercurrent disease or natural cause; by bad treatment; by imprudence or neglect; by an unhealthy condition of the victim, or by any other unavoidable cause or abnormal condition not directly blamable upon the wounding itself? In addition to the above, a proper medical examination should determine the situation, extent, length, breadth, depth, and direction of the wound or wounds; the condition not only of the surrounding parts, but also of all the organs of the body and of the victim in general; the nature of the weapon; the position of the body; the condition of the dress; the character of hair, blood, and other substances upon suspected weapons or persons; whether poison has been administered or not; whether the wounds were inflicted before or after death; in fine, according to the quotation already given, "a medical man, when he sees a dead body, should notice everything," and the advice is equally applicable to all cases which, though not immediately fatal, may become the subject of judicial inquiry or investigation. While it may be possible to state that a given substance is blood and that of a mammal, as distin-

guished from the blood of any other animal, it is at present impossible to state positively from any chemical or microscopical examination that the substance is human blood. We can only say that it is consistent with human blood, and there may be no moral doubt of the fact. Moreover, the statement of a person that a suspected stain is blood of a certain animal may be proved to be false, and the rest of his evidence thereby weakened.

Poisons.—In some respects there is no branch of the subject so interesting as the one concerning poisons. The insidiousness of administration, the utter helplessness of the victim to guard himself against the poisoner, the diversity of symptoms, and the wonderful accuracy of the science in tracing and determining the exact nature of the substance employed, all combine to render the study of toxicology exceptionally fascinating. According to Wormley, "a poison is any substance which, when taken into the body and either being absorbed or by its direct chemical action upon the parts with which it comes in contact, or when applied externally and entering the circulation, is capable of producing deleterious effects." Practically poisons may be classified as irritants, those primarily affecting the parts with which they are in contact; narcotics, those acting principally upon the brain and spinal cord, and narcotico-irritants. Their action, either for good or evil, may be modified by personal idiosyncrasies, habit, disease, and the condition of the stomach. In any medico-legal case the evidence is to be derived from the symptoms of the victim, from post-mortem appearances in case of death, and from chemical analyses of suspected food or medicine, the contents of the stomach, vomited matters and excreta, especially the urine, and of the soft organs of the body and the blood. Poisoning will naturally be suspected when acute symptoms suddenly appear in a person in good health, or soon after a certain kind of food or medicine has been taken, or when several partake of the same food and suffer from similar symptoms. Should such suspicion arise, notes should be made, especially by medical men, of every detail, word, or action that may have a bearing on the case, and all suspected matters, together with substances vomited and excreted, and all tissues or organs taken from the body, should be separately sealed and labeled as soon as possible in absolutely clean glass vessels and transmitted with due care to the one who is to make the analysis. Likewise, all results and products of the analysis should be preserved, together with careful notes and details of the methods employed. In case of death it is important to know how long it occurred after the ingestion or application of the poison, and the condition of all the organs at the earliest post-mortem examination. The question as to what quantity of a substance is necessary to make it a poison may be a matter of inquiry, but if a person give any substance, believing it to be a poison and intending to commit murder, he is guilty of felony. So if he prepare a poison for a certain party and it is taken accidentally by another, if death results, he is guilty of murder.

It is fitting to note that there have been isolated a number of alkaloidal products of decomposition, the so-called ptomaines, which closely resemble or are even identical in their reactions and effects with some of the well-known vegetable alkaloids. Consequently it is possible, unless extreme care is employed, that in medico-legal investigations of organs or parts of the body that have undergone putrefaction, some one of these ptomaines might give the reactions and be mistaken for a poison suspected to have been criminally administered. Substances closely resembling atropine, digitaline, morphia, strychnia, conium, etc., have been thus isolated; and a case is noted where a man was prosecuted in Italy for murder by strychnia poisoning, but the alkaloid found in the cadaver was afterward shown to be a ptomaine. Among the common people also, symptoms caused by tyrotoxicon, a poisonous product of the decomposition of milk or cheese, may give rise to unjust charges of criminal poisoning, but any proper investigation and chemical analysis should readily disprove this. The work of Selmi and Brieger in Europe in regard to cadaveric alkaloids, and of Vaughan in the U. S. with the poisonous products of decomposing food stuffs, is worthy of especial mention; while Wormley's *Toxicology and Micro-chemistry of Poisons* is a classical and standard work.

Malpractice.—The law requires that a medical man should provide in his practice the ordinary skill of his profession, since his patients have no means of proving beforehand his possession of the skill: and also that he attend the cases under his charge with all due care and watchfulness. Consequently the faults for which a physician may be justly fined or subject to damages are those dependent on lack of professional skill or negligence; errors of judgment or difference of opinion with other physicians are not good grounds for suit, but it should be remembered that juries are often unjust in such cases, and that a medical man's best protection in a doubtful case is either consultation with a brother practitioner of undoubted ability or an indemnity bond against prosecution, given by the patient or his legal representatives. For instance, some fractures so closely resemble dislocations that it may require a dissection to distinguish them, and even the best surgeons might be led astray in the treatment.

In conclusion, there are other subjects pertaining to forensic medicine, but of minor importance, such as difference of sexes, Cæsarean section, simulated diseases and injuries, deaths by heat, cold, etc., which can not be discussed here at length. For a fuller and more comprehensive study of the matters touched upon in the above, together with authoritative decisions regarding the various legal points in question, the reader is referred to the digests and textbooks. SENECA EGBERT.

Juruá, zhoo-roo-aá: a southern affluent of the Upper Amazon; rising, presumably in Peru, between 8° and 9° S. lat.; crossing a small portion of Northwestern Bolivia, at first E., and then in a curve to N. N. E., through the Brazilian state of Amazonas, to its junction with the Amazon near lat. 2° 30′ S., and lon. 65° 50′ W. The total length along the main curves probably is not less than 1,000 miles. Steamboats occasionally ascend to the Urubú rapids, 564 miles; above that point as far as Chandless's exploration was carried, the channel is only slightly obstructed. The width in the lower course averages one quarter of a mile (2,650 feet at the mouth). The only tributary of importance is the Tráhuacá, which enters on the eastern side, 650 miles from the Amazon. Flowing through almost perfectly level land, the Juruá is excessively crooked, and the channel changes frequently. It is bordered everywhere by matted forests, inhabited only by a few Indians and by rubber-gatherers who frequent the river during a part of the year. See Chandless, in *Journal Roy. Geog. Soc.*, xxxix., (1869), p. 296. HERBERT H. SMITH.

Jury, Trial by: See TRIAL.

Jus gen'tium [Lat., law of peoples, i. e. the law common to all peoples]: a law not to be confounded with the more modern phrase, *jus inter gentes*, or "the law of nations," "international law." By the first phrase Gaius understood those rules and usages of justice which all nations use alike, as opposed to *jus civile*, the law of Rome itself, so far as it was peculiar. The *jus gentium* contained many rules of an international code, such as the sanctity of ambassadors, but covered quite a different ground from that of the international science.

Jusserand, zhü'se-rāñ', JEAN JULES: scholar; b. at Lyons, France, in 1855. After obtaining the degree of *docteur ès lettres*, he entered the diplomatic service, but subsequently gave himself entirely to authorship. He has mainly devoted himself to the study of matters concerning England and English literature. We have from him *Le Théâtre en Angleterre depuis le Conquête jusqu'aux prédécesseurs immédiats de Shakspeare* (1878; 2d ed. 1881); *Les Anglais au moyen âge: la vie nomade et les routes d'Angleterre au XIV^e^ siècle* (1884; crowned by the French Academy; Eng. trans. by Lucy T. Smith—*English Wayfaring Life in the Middle Ages*, 1889); *Le Roman Anglais* (1886); *Le Roman au temps de Shakspeare* (1887); *A French Ambassador* (*le Comte de Comminges*) *at the Court of Charles II.* (1890); *L'Épopée mystique de William Langland* (1893). A. R. MARSH.

Jussieu, zhü'si-ü, de: the name of a celebrated family of French botanists and physicians, the most noteworthy of whom were the following: (1) ANTOINE DE JUSSIEU, M. D., b. at Lyons, July 6, 1686; d. in Paris, Apr. 22, 1758.—(2) BERNARD, b. at Lyons, Aug. 17, 1699; d. Nov. 6, 1777.—(3) JOSEPH, b. 1704; d. Apr. 11, 1779.—(4) ANTOINE LAURENT, one of the fathers of botanical science, b. at Lyons, Apr. 12, 1748; studied medicine in Paris, where he was an academician and botanical professor. Following his uncle Bernard, who had made the sketch, he was the first to introduce the natural system into botany, disposing all known genera in defined natural orders. His *magnum opus* is the *Genera plantarum* (1789), and he was the author of many botanical papers of great value. D. in Paris, Sept. 17, 1836.—(5) His

son, Adrien, b. in Paris, Dec. 23, 1797, succeeded his father in 1826 as professor at the museum; became professor of organography in 1845, and was for many years a brilliant lecturer, an able scientific writer, and one of the first botanists of his time. D. in Paris, June 29, 1853.

Jussieu, Laurent Pierre, de: writer and moralist; nephew of Antoine Laurent; b. in the department of Isère, France, Feb. 7, 1792; was a member of the Chamber of Deputies 1839–42; and wrote many educational and popular works designed for the diffusion of useful knowledge among the masses. One of these, *Simon de Nantua, ou le marchand forain* (1818), passed through more than thirty editions, and was translated into eight or ten languages. He received the Montyon prize for the similar work, *Œuvres posthumes de Simon de Nantua* (1829). We may mention further *Antoine et Maurice* (1821), a book crowned by the Society for the Amelioration of Prisons in France; *Petits livres du père Lami* (6 vols., 1830–42); *Fables et Contes en vers* (1844); *Cloud Grangambe* (1854). He contributed much to several journals for popular instruction. D. at Passy, Feb. 23, 1866.

Revised by A. R. Marsh.

Juste, zhüst, Théodore: historian; b. at Brussels, Belgium, Jan. 11, 1818; was secretary of the Belgian board of education, and a prolific writer on Belgian and French history. Among his works are *Histoire élémentaire de la Belgique* (1838); *Histoire de la révolution Belge de 1790* (1846; new ed. 1858); *Le soulèvement de la Hollande en 1813, et la fondation du royaume des Pays-Bas* (1870); *Guillaume le Taciturne* (1873); *Léopold I. et Léopold II. rois de Belges* (1878); *Les fondateurs de la monarchie Belge* (27 vols., 1865–81); *La révolution de juillet 1830* (1883). D. in Aug., 1888.

Revised by C. K. Adams.

Justice: considered as a question of morality, exact conformity to the laws of God and of man; considered as an attribute of a man in his intercourse with his fellow men, of the law in relation to those who are under it, of the state toward its subjects or citizens as far as their political rights are concerned, or of the judge in the interpretation of the law, it is the rendering to each one his due, the requital of desert; considered with reference to the administration of the law by the judge in deciding legal controversies, it is the rendering to each party to a controversy the exact rights which are his due according to the law and the evidence.

It is needless to say that the conception in any age or among any people of what constitutes justice varies with the development of ethical ideas in the age or among the people in question. Greek philosophy, after Socrates began to teach, occupied itself much with discussions touching justice. One of Plato's leading definitions of it is that a person should "do his own things"—i. e. mind his own business—and he would determine what a man's "own things" are by state authority. Aristotle makes a distinction between political and natural justice. The Stoics carried out the thoughts on ethics of the older philosophers in one direction beyond their predecessors; in their hands the ethical system of classical antiquity bore its best fruits, and their thinking has affected the forms of thought or morals ever since. They conceived of justice, after a definition of the Platonic school, as that which assigns to each his due or worth. Cicero follows them in calling justice an affection of mind, *suum cuique tribuens* (*De Fin.*, v., § 23, 65); i. e. which assigns to each person his own. The doctrine of a law of nature, or a *jus naturale*, having principles which may oppose the laws of the state, was borrowed by the Roman lawyers from the Stoics, and produced in their hands important results; in theory, for instance, slavery became contrary to natural right, although the institution in the empire could not be shaken.

While the laws of all ages and of all peoples are theoretically and practically made in order to enable every man to demand and receive his due from his fellow men, in short to enable him to live in the full enjoyment of all those rights which are his according to the degree of enlightenment of those by whom the laws are made, they do not always attain this object. The imperfections of human language, the mistaken notions of those who make the laws, the necessity of expressing the laws in general terms, all conspire to bring about those cases in which the law, as it must be administered by the judge, works injustice between the parties, and in which the only remedy for the injustice is to change the law. There are many cases where equity steps in to modify the decision where a strict adherence to the rules and forms of the common law would do injustice between the parties, but equity itself is governed by certain rules, and can act only according to established rules and principles, and can not relieve against the express provisions of statute law.

In the case of penal justice or punishment for crime there are other elements besides merely meting out to the offender his due according to the law of righteousness. One of its main objects is the protection of society by preventing the repetition or increase of crime, and there are those who maintain that the only proper end of penal law is the reform of the offender and the protection of society, and that the state has no right to inflict penalties merely by way of punishment.

These subjects are more fully treated in the articles Equity, Jurisprudence, Anthropology (criminal), Interpretation, International Law, Law, Roman Law, and in such general works on the philosophy of morals and of law as Vattel's *Law of Nations*; Burlamaqui's *Principles of Natural and Politic Law*; Hobbes's *Elements of Law, Natural and Politic*; Kant's *Philosophy of Law* (Eng. trans.); Pulszky's *The Theory of Law and Civil Society* (London, 1888); Spencer's *Synthetic Philosophy*; Lightwood's *Nature of Positive Law*; Tallack's *Penological and Preventive Principles* (London, 1889); Ellis's *The Criminal*; as well as in other works referred to under the articles mentioned above.

F. Sturges Allen.

Justice of the Peace: a subordinate magistrate appointed or chosen to exercise certain judicial and administrative functions of a subordinate character within the limits of a county, borough, or town.

Origin, Method of Appointment, etc.—The justice of the peace has taken the place of the public officials called Conservators (*q. v.*) of the peace, whose powers were chiefly executive. The conservators derived their authority, some by prescription, some by virtue of the tenure of their lands, but the larger number were elected by the freeholders of the county. At the beginning of the reign of Edward III. (1327) it was ordained by Parliament that such officers should be appointed by the king or under the king's commission, and in 1361, by statute, as Blackstone states, "they acquired the more honorable appellation of justices." They are now appointed by the lord chancellor by virtue of the king's special commission under the great seal. It is the practice to declare that no judicial business shall be done without the presence of at least one of certain justices who are specified in the commission, and who are said to be of the *quorum*, a term derived from the first word of the clause by which this special privilege was formerly conferred. As all of the justices are now usually included in the *quorum* clause, it is no longer necessary, as it was formerly, to specify in a warrant that the justice who issued it is of the *quorum*.

There are certain property qualifications required at present in England in order that a person may be appointed a justice. Thus (by 18 Geo. II., c. 20) he must have in possession, for his own use and benefit, an estate in lands of the clear yearly value of £100 above all incumbrances, or he must be entitled to the reversion or remainder of an estate of the yearly rental value of £300, or (by 6 and 7 Vict., c. 73, § 33) must have occupied for two years a dwelling-house of the yearly rental value of £100. As a general rule, the justices serve gratuitously, but in the cities and larger towns there are certain justices appointed, called stipendiary magistrates, who receive a fixed salary. They must be barristers of a specified number of years' standing, and alone may do acts required to be done by two of any other justices. In the U. S. the institution of justices of the peace has been adopted from England. They are county or town officers, and are in some States elected by the people, in others appointed by the executive. Their terms of office are usually of short duration, rarely continuing longer than three or four years, and as a rule their mode of compensation is defined by law.

In England there are four courts composed of justices of the peace—the petty, special, quarter, and general sessions. The general sessions is a court of record, and may be divided into two branches for the dispatch of business. By statute it must be held four times a year if occasion shall require. When held at the regular period, it is called the quarter sessions; otherwise, the general sessions. The petty sessions and special sessions are courts of inferior importance. In this country similar tribunals sometimes receive corresponding names, as the courts of special sessions in New York State. In some States, however, they are termed simply justices' courts.

General Powers.—In the U. S. the rules of law governing their appointment, tenure of office, powers, and responsibilities are generally defined by statute with great fullness, and the extent of their authority made to depend entirely upon statutory provisions, so that it will only be practicable to state the general powers which they possess both in England and in the U. S., so far as these are substantially similar. These powers are either *administrative* or *judicial.*

Important administrative functions are those which justices exercise as keepers of the peace. Thus, they may arrest without a warrant any person committing a felony or a breach of the peace in their presence, and commit him to prison. They may issue warrants for the arrest of alleged criminal offenders against whom a charge has been made supported by an affidavit, or search-warrants authorizing a search to be made upon a person's premises for goods which he is accused by complaint under oath of having stolen or embezzled, when there appears reasonable ground for suspicion that they are there concealed. A justice may also bind over to keep the peace any person who engages in an affray in his presence or makes threatening demonstrations of violence against others, or who is brought before him by any other peace-officer, as a constable or a sheriff, after being arrested for a breach of the peace, or who is charged with having threatened to commit a criminal offense against the person or property of another by a complainant who maintains his charge by a sworn affidavit, and who upon examination under oath satisfies the justice that there is reasonable ground to apprehend the commission of the offense by the person complained of. In determining whether such reasonable ground exists the justice acts judicially, and in like manner many of his administrative functions are incidental to the exercise of judicial prerogatives; as, for example, the issuing of subpœnas for witnesses, binding over witnesses to testify, examining persons accused of crime and committing or discharging them, taking recognizances, committing persons for contempt of court, admitting to bail, etc. As a general rule, justices have power to take affidavits and acknowledgments of deeds. In some States they have, besides, a right to celebrate marriages.

In the exercise of judicial functions justices of the peace have either a civil or a criminal jurisdiction. In criminal cases they have power to try offenders charged with offenses of a minor grade, without the aid of a jury, by what is known as a summary proceeding. Such offenses are drunkenness, idleness, vagrancy, profane swearing, mendicancy, keeping disorderly houses, gaming, and other similar practices. Such proceedings must, however, be conducted according to the course of the common law in trials by jury. The defendant must be duly summoned, and must have an opportunity to make his defense. This form of proceeding was introduced into the English law by various acts of Parliament, and was generally adopted in the U. S. as a part of the common law. At present, in the U. S., the nature and extent of the power to try and convict by summary process are usually defined by statute, and such legislation is not in contravention of the common provision in State constitutions that no person shall be deprived of life, liberty, or property except by the judgment of his peers or of the law of the land, where it does not provide for trial without a jury except in regard to offenses of the same grade or class as those to which this mode of proceeding was formerly applicable. Justices also have power to make a preliminary examination of all persons arrested upon a criminal charge, and if there is reasonable ground to believe that the offense alleged has been perpetrated, and that the person accused is guilty, he may be committed to prison, or, in a proper case, admitted to bail. If the offense charged be of a minor grade, it may also be tried before justices in a special criminal court with a jury, but if it be a grave and serious crime, the prisoner will be committed for trial before a higher court.

In many of the States justices' courts have received by special legislation jurisdiction in civil cases. The causes declared cognizable in such courts are those which involve claims to property of but little value or demands for small amounts of damages.

Liability.—A justice of the peace is not liable to a civil action for any injury to another committed in the exercise of his judicial functions if he had jurisdiction of the proceeding or cause of action in connection with which the injury occurs, and acted honestly and in good faith. As he, however, is a magistrate of special jurisdiction, his privilege in this respect is not so extensive as that of judges of superior courts of record. (See JUDICIARY.) If a justice has no jurisdiction of a particular case, and has the means of ascertaining his want of jurisdiction, he will be responsible to any person who suffers damage from his unwarrantable exercise of judicial power; but where the pleadings and allegations of the parties apparently give jurisdiction, the justice will be protected in an honest and faithful exercise of the power to which he believes himself entitled, even though he be chargeable with mistake or error; but even if he has jurisdiction, he will be liable to an action if he acts maliciously, corruptly, or with willful intent to commit wrong. For any neglect of duty or malfeasance in the performance of ministerial duties he is not protected by his judicial privilege, and is liable in damages for any injury which others may sustain by reason of such neglect. See Stephen's *History of the Criminal Law of England*; Stone's *Justices' Manual* (London, Kennett's ed.).

Revised by F. STURGES ALLEN.

Justification [from Lat. *justifica'tio*, deriv. of *justifica're*, justify (whence Eng. *justify*); *jus'tus*, righteous, just + *fac-*, root of *fa'cere*, make. Theologically, a transl. of Gr. δικαίωσις, deriv. of δικαιόειν, justify, deriv. of δίκαιος, just, righteous]: strictly, a making righteous, but in the peculiar usage of Paul, in the epistle to the Romans, justification signifies the act of God's declaring men free from guilt and acceptable to him. As a theological term, justification came into prominence at the Protestant Reformation, and is thus defined in the first Protestant confession, the Augsburg: "Men can not be justified (obtain forgiveness of sins and righteousness) before God by their own powers, merits, or works, but are justified freely for Christ's sake through faith. . . . This faith doth God impute for righteousness before him." Calvin wrote: "We simply explain justification to be an acceptance by which God receives us into his favor and esteems us as righteous persons; and we say that it consists in the remission of sins and the imputation of the righteousness of Christ." The Westminster Confession defines it as "accounting and accepting their persons as righteous, not for anything wrought in them or done by them, but for Christ's sake alone." The Arminians did not depart from these definitions, Limborch, for example, writing: "In the forensic sense it denotes declaration of righteousness, or absolution from fault and treatment as if righteous." New-school Calvinists in the U. S. have generally accepted these definitions, denying only the element of imputation.

New Testament Doctrine.—This is expressed solely in the epistles of Paul, particularly in that to the Romans, other portions of the New Testament comprehending their teaching under the term "forgiveness of sins." This apostle begins the argument of his great epistle by exhibiting the universality of sin, among Jews as well as Greeks, and by thus emphasizing the guilt and condemnation and hopeless condition of all men without exception; but men desire righteousness before God, and must have it, if they are to escape remediless ruin. They could have secured this by a life of perfect obedience to the law of God considered as a body of definite precepts; but they have not done this. They have broken the law, are therefore guilty, and have nothing to urge for themselves. Works, therefore, that is, single acts of obedience constituting in their sum total a spotless life, accomplish nothing for the justification of man, that is, do not enable God to declare man righteous (Rom. iii. 19, 20). So God provides a righteousness of his own. He provides the sacrifice of Calvary which enables him to forgive sin without impairment of his justice; and then he declares the man who believes in Jesus righteous on account of that faith. The points emphasized by the apostle are, then, (1) justification is from God; (2) is upon, or in consequence of faith; (3) is free, or gracious, i. e. without merit, and (4) is granted to every believer. It is followed by freedom from the law and from the bondage of sin, by adoption into the family of God's dear children, and by obedience to the law and progressive sanctification.

History.—Before the Reformation there can not be said to have been any doctrine of justification in the Church. The earliest fathers undoubtedly understood in a practical way the method of salvation, but they had not thought it out in all its applications and relations. Hence while isolated expressions will be found in their writings which seem perfectly satisfactory, the same writer may upon the same page fall into forms of expression which if pressed would involve the entire denial of the doctrine; and this, though in less measure, is true even of Augustine. The ecclesias-

tical system, which was already largely developed, also came in to disturb. The guilt of original sin is removed by baptism, but the real justification begins when the sinner is made a righteous man by the operation of grace in working within him a good will. The new disposition and power which is thus produced is the experience of justification, which, empirically viewed, is a continuous process never completed in this world. The systemization and perfection of the penitential discipline of the Church in the Middle Ages intensified these elements introduced by Augustine. After baptism no forgiveness was admitted without satisfaction, and the idea that merit attached to good works, and that merit was the foundation of the gift of the divine favor, grew more and more dominant; and so it was that Luther was not perfectly clear at first. He confounded justification with sanctification, and conceived of it as constantly increasing; but he soon came clearly out, and taught that upon faith in Christ we are freely forgiven of our sins for his sake; but this simple statement did not completely satisfy him. He had been too long trained in the Catholic system to let the idea of merit easily fall. His mind demanded some ground of merit for this gift which, so far as the sinner was concerned, was undeserved. This he found in the righteousness of Christ which he taught was imputed to the believer. Calvin retained the same phraseology; but it is quite evident in his works that imputation denoted nothing more than forgiveness, and that the righteousness of Christ had in mind was his atoning sacrifice. Subsequent writers distinguished between Christ's active obedience by which he fulfilled the law, which was the righteousness imputed to the believer, and his passive obedience, which was the suffering of death. The Roman Catholic theologians at the Council of Trent made a sincere attempt to understand the Protestant position and do it justice, but the points of view occupied by the two parties were too diverse to admit of agreement. Not only the previous development of the Catholic system, but their conceptions of the meaning of righteousness prevented the fathers in Trent from admitting the possibility of a declaration of righteousness where there was confessedly no actual righteousness. Consequently they taught that justification was strictly the making of a man just, and further define it as "the sanctification and renewal of the inward man through the voluntary reception of the grace and of the gifts, whereby man of unjust becomes just, and of an enemy a friend." Hence actual righteousness was required as the condition of justification, or justification was by works rather than apart from works.

Criticism.—The fundamental thoughts of the Reformers have remained the accepted doctrine of every branch of the Protestant communion, but the progress of knowledge has already led to important modifications of the theory of the subject, and will doubtless lead to still others. The false positions held at the Reformation upon the constitution of the human mind and the nature of the will vitiated the whole formulation of the doctrine. Luther and Calvin were both determinists, Luther of the strictest type. None of the scholastic Calvinistic divines knew what voluntary action was, or could give an intelligible definition of faith in philosophic terms. Faith was said to have no holy character, though it is fundamentally a volition, and we now know that all character and all holiness consist in the activity of the will. The Roman Catholics were nearer the truth than the Protestants at this point. Then the explanation given of imputation under the lead of the remaining leaven of the Roman doctrine of merit and at the prompting of certain legal fictions was untenable. The Augsburg Confession taught rightly that faith was imputed to the sinner for righteousness (Rom. iv. 9), but the Westminster denied this. It was early assumed that the righteousness of Christ is imputed to the believer, but Paul nowhere uses this language. When he says that Abraham's faith was imputed to him for righteousness, it was immediately assumed that it was imputed because it was *not* righteousness; but this is unwarranted by the text. These points need still to be cleared up, and when it is seen that saving faith is holy, that man has no merit of any kind upon which to base a claim for justification, whether native or imputed, that there can be no imputation of the active obedience of Christ to the believer, and that after forgiveness of past sins, the "declaration" of justification is the declaration of that which is, viz.: holy character consisting in the fundamental and all-embracing holy choice, great progress will have been made.

FRANK HUGH FOSTER.

Jus'tin I., JUSTINUS: an Emperor of Constantinople; by birth a Gothic shepherd of Tauresium in Mœsia; b. 450 A. D.; went to Constantinople to seek his fortune; enlisted in the imperial guard; acquired fame for valor, and at last became commander of the guard; by craft and skillful management induced the army to salute him as emperor after the death of Anastasius (518 A. D.). The emperor could not read or write, but under the advice of the quæstor Proclus his reign was on the whole a just one, and advantageous to the empire. D. in 527, and was succeeded by his nephew, Justinian, who had for some time been associated with him in the government.

Justin II., FLAVIUS ANICIUS JUSTINUS: Emperor of the East; succeeded Justinian I., his uncle, in 565. In his reign occurred the dismissal and death of the exarch Narses and the occupation of nearly all of Italy by the Lombards. In the North the Avars gained great advantages, and in the East a bloody war went on with the Persians. The emperor died in 578, and was succeeded by Tiberius III.

Justin, JUSTINUS: the author of a compendium of Roman history, extracted from a vast work by Pompeius Trogus, who lived in the time of Augustus. (See TROGUS.) It seems rather to be a collection of extracts than an abridgment, and in it much important information has been preserved from oblivion. Especially in regard to the early wars with the Parthians it is almost the only source of information. Nothing is certainly known of Justin, who is called in one manuscript M. Junianus Justinus, but he probably lived not later than the first part of the third century A. D. The first edition of *Justini Historiarum Philippicarum Libri XLIV.* was printed at Venice in 1470 by Jenson; best Venetian edition 1522 (Aldus); most complete by Frotscher (3 vols., Leipzig, 1827–30). See also edition by F. Ruehl (Leipzig, 1886). An English version by Arthur Goldinge was printed in 1564, and at least seven other translations have since appeared. Revised by M. WARREN.

Justin'ian the Great (FLAVIUS ANICIUS JUSTINIANUS): Roman emperor at Constantinople; b. of Gothic peasant ancestry at Tauresium in Mœsia, probably in 483 A. D.; went in youth to Constantinople, where his uncle, afterward the Emperor Justin I., was in high favor; was educated by the latter, to whom Justinian was a faithful and useful servant after the uncle's elevation to the purple. In 520 he was appointed commander of the Asiatic armies, and in 521 consul, and soon after married Theodora, an actress and courtesan, to whom he was always tenderly attached. He succeeded to the imperial throne in 527. Justinian's celebrated reign seems to have derived little of its splendor from the ruler himself, whose great talent lay in the selection of able lieutenants. His generals, Belisarius, Narses, and Germanus, carried the terrors of the Roman arms into Africa, where the Vandal kingdom was overthrown; into Italy, where, after long years of warfare, the Goths and Lombards were conquered; into Persia, where, after a twenty years' struggle, Persia obtained a nominal triumph, but Constantinople gained the real victory. Huns, Avars, Arabs, Gepidæ were repelled, often by setting tribe against tribe, oftener by the direct expenditure of gold. Constantinople and the whole empire was adorned with splendid buildings, of which the present mosque of Santa Sophia is the most famous. Silk-culture was introduced, and manufactures, agriculture, commerce, notwithstanding the fearful burdens of incessant wars, appeared to prosper. The greatest monument to Justinian's fame is the *Corpus Juris Civilis*, the work of Tribonian and his assistants, but one which Justinian planned, and in which he took a profound interest. Justinian is accused of vanity and avarice, and his treatment of Belisarius shows that he was capable of meanness and ingratitude; but his private life was correct. He was continually involved in theological discussions, in the course of which he condemned several heretical writings, and anathematized their authors, but in his later years he himself lapsed into heresy. He died Nov. 14, 565, leaving no legitimate offspring.

Justinian II.: surnamed RHINOTMETUS; Roman emperor at Constantinople; b. 669; succeeded Constantine IV., his father, in 685, and was one of the worst of the Eastern emperors. Notwithstanding some splendid successes in Syria, Sicily, and among the Slavi, he abandoned the fruits of his victories; in 695 his nose was cut off, and he was banished to the Crimea, whence in 705 he returned and took fearful vengeance upon all adversaries. His reign is a record of shameful excesses. During the insurrection of Philippicus Bardanes the emperor was killed, Dec., 711 A. D.

Justin Martyr, Flavius Justinus: Christian apologist; b. at Flavia Neapolis, the ancient *Shechem*, the modern *Nablous*, in Samaria, about 105 A. D.; studied philosophy in the schools of Asia Minor, Greece, and Egypt. None, however, of the different systems satisfied him, and about 132 he turned away altogether from pagan philosophy and embraced Christianity, of which he became an able and zealous defender. Of his personal life nothing is known with certainty, but it seems probable that he resided at Rome during the latter part of his life, and suffered martyrdom there. His martyrdom has generally been assigned to 165, but modern writers incline to an earlier date. Of his writings, the *Liber contra omnes hæreses* is lost; the genuineness of the *Oratio ad Græcos* and *Epistola ad Diognetum* is contested; but his *Apologia prima* and *secunda* and his *Dialogus cum Tryphone Judæo* are among the most important productions which the Christian literature from the second century contains. The best edition is that by Otto (Jena, 1842; 3d ed. 1876). There are translations in vol. i. of *The Ante-Nicene Fathers* (New York).

Jutahy, zhoo-tăă-ee': a southern affluent of the upper Amazon, entering about 100 miles above the Juruá. Like that river, it runs through forest-clad plains, and is very crooked; its general course is almost precisely parallel to that of the Juruá. It is formed by the junction of two unexplored rivers, which meet at a distance of 450 miles from the Amazon. H. H. S.

Jute [from Bengali *jūt* < Sanskr. *jūṭa*, matted hair]: a vegetable fiber, obtained from two species of plants (*Corchorus capsularis* and *Corchorus olitorius*) belonging to the natural order *Tiliaceæ*. They are raised in India, principally in the central and eastern parts of the Bengal Presidency. The product of both species is so similar that no distinction is made between them commercially or otherwise. See India.

The soil and climate in Bengal are peculiarly well adapted for the cultivation of the plants yielding this fiber, and similar conditions have not been found elsewhere in the world. For about twenty years (1870–90) continuous attempts were made to raise them in Louisiana, Mississippi, and Texas, but finally abandoned after much money and labor had been lost. Similar attempts in Egypt and Algeria have also proved unsuccessful. A very similar plant, called China jute, has been raised for ages in China, but the fibers, instead of being free from each other, or readily separating, cross each other web-like and do not separate: hence it can not be worked with the same machinery, and has no commercial value except for domestic purposes in China.

There are four distinct kinds of jute produced in India. They are, speaking generally, named after the districts around which they are raised, namely: Serajgunge, Naraingunge (or Dacca), Daisee, and Dowrah. Until about 1880–85 the best Serajgunge was far superior to the others, the fiber being 10 to 15 feet long, clean, bright light-colored, and strong, but since then so much care has been taken in the cultivation of Naraingunge that it now commands higher prices than even Serajgunge. It has all the characteristics of the latter, and in addition a beautiful golden tint, more uniformity of strength, and is longer. Daisee is generally of a very dark-gray color, approaching almost to black, and more towy than either of the former. Dowrah is grown on the low marsh-lands near Calcutta. It is coarse, dark-colored and strong, with long, very hard root (or butt) ends.

For a long period Calcutta was the only shipping-port, but the production of Naraingunge has increased so very rapidly that now (1894) most of this quality is shipped from Chittagong, a town on the river Karnaphuli.

The plants are cultivated not only for the fiber, which is the inner bark, but also for the leaves, which are largely used by the natives as a pot-herb. The stalks are also used by them for fences, and the root or butt-end for the manufacture of paper.

Sowing begins in March and extends through April, the ground having previously been well prepared. If the weather is propitious—a hot, moist atmosphere with abundant rain is the most favorable for the growth of jute—it is ready for cutting in July, and this should be finished by September. (The season, or crop-year, dates from Aug. 1, to July 31 next, both inclusive, and all Indian statistics are kept accordingly.) The stalks are cut down close to the ground, and the best quality is obtained by retting while the plant is in flower; frequently, however, it is allowed to run to seed before cutting, the result being a coarser fiber with many long, hard, barky runners in it, materially reducing the value of the fiber. After cutting, the fiber is separated from the stalk by macerating. The stalks are laid in water and allowed to remain there until the fiber separates readily from both stalks and outside bark or skin. After stripping, the fiber is washed of its impurities by being repeatedly beaten on the surface of the water, then wrung out and hung on lines to dry in the sun. When sufficiently dried it is put up in loose bundles and shipped to Calcutta for sale. The various qualities are there carefully selected, the butts or cuttings are cut off from the better qualities, and after being graded both jute and cuttings are put up in bales of 400 lb. each, ready for export and domestic use. Great care should be taken when baling that the jute is not too moist; if it is, it will heat, and the inside of the bale will become heart-damaged or dry-rotted. This is the most serious fault that can be attributed to the fiber.

As a proof of the enormous growth of the jute industry in India, it is only necessary to mention that, though very small parcels were exported to Great Britain near the end of the eighteenth century, it was not until 1829 that the Indian Government kept any statistics of exports. In that year 496 maunds (of 82⅔ lb. each), or 366 cwt., were exported; in 1840 the export had increased to 937 tons, or 5,247 bales of 400 lb. each, the weight now universally adopted in baling all jute. All this went to Great Britain. Since then the figures mentioned below, giving the importations into all Europe (principally the United Kingdom), show to what large proportions the trade has grown:

1850.....	122,897 bales.	1880.....	1,309,560 bales.
1860.....	303,357 "	1890.....	2,624,845 "
1870.....	844,996 "	1893.....	2,326,810 "

These figures include cuttings (or butts). The importations into the U. S. have been as follows:

YEAR.	Jute.	Cuttings.
1840....	None.	None.
1850	7,327 bales.	None.
1860	15,406 "	Not known.
1870	62,850 "	55,207 bales.
1880....	56,606 "	292,889 "
1890	134,744 "	476,420 "
1893....	152,509 "	340,626 "

In the last-mentioned year the importations of cuttings fell off, owing to small production and consequent high prices, which caused the paper-manufacturers to draw on reserve stocks and use other raw material. There are also imported into San Francisco 30,000 to 35,000 bales of jute yearly.

The principal articles manufactured from this fiber are burlaps, or hessians, for the baling of wool, hops, etc.; and bags for coffee, sugar, rice, grain, flour, linseed, etc.; yarns for the backs of common wool and other cheap carpets; pure jute carpets, oilcloth-foundations, rugs, and napier matting, rope, window-sash cord, wrapping-twine and wool twine; mail-bags also are made from it. The finest qualities are mixed with silk goods, and also made into window-curtains, tapestries and table-covers. The fiber takes dye readily, but holds some colors much better than others.

Up to about 1870 the whole cotton crop in the U. S. was covered with coarse gunny-cloth imported from Calcutta (hand-made there and in the interior before the building of modern steam-factories); since that time, however, the States have manufactured their own cloth or bagging, first from low grade, jute "rejections," and the best or bagging quality of butts or "cuttings," but now (1894) with improved machinery from all cuttings. From 250,000 to 300,000 bales are required yearly for this purpose. The average annual consumption of jute in the U. S. for 1890–92 was 136,248 bales; the annual average for the six years previous, 90,690 bales, an increase of about 50 per cent. The common quality imported into the U. S., and also the bagging stripped from bales of cotton, is made into Manilla wrapping-paper.
John Lund.

Jutiapa, hoo-tēē-aa'păă: a southern department of Guatemala; bounded N. by Jalapa and Chiquimula, S. E. by Salvador, and W. by Santa Rosa; southward it has a short coast on the Pacific. Area, 1,563 sq. miles. The surface is broken, nowhere high, and the climate, especially of the valleys, is hot. Lake Guija lies on the Salvador boundary. The principal industries are cattle-raising, and, to a smaller extent, coffee and sugar planting. Pop. (1889) 48,461. Jutiapa, the capital, has 2,000 inhabitants. H. H. S.

Jut'land [i. e. land of the Jutes; Dan. *Jylland*]: a peninsula between the North Sea, the Skagerack, and the Cattegat, extending S. to the Eider, and embracing both North Jutland and South Jutland (Schleswig). In a more limited sense it means only North Jutland, and as such is the largest province of the kingdom of Denmark. (See DENMARK.) North Jutland lies between 57° 45′ and 55° 16′ N. lat., and between 8° 5′ and 10° 50′ E. of Greenwich. Its area is 25,240 sq. miles. It is traversed by a ridge of low hills, to the W. of which the country is heath, lined with a range of sandbanks along the coast. The eastern part is beautiful and fertile, hilly, rich in forests of beech and oak, indented by numerous fjords, dotted with small but thriving towns, and cultivated like a garden. Wheat, rye, oats, and barley form the most common crops. Much butter and cheese is made and exported. In many localities the rearing of cattle is the principal occupation, and great numbers of live cattle are exported to the London market; also lambs, poultry, and fruit. Pop. (1890) 942,361. The Jutes formed a large part of those swarms which under the name of the Northmen devastated the coast of Germany and France and conquered England, and they retain in their characters something shrewd, daring, and indomitable, which distinguishes them from the islanders, who are gentler and livelier, but weaker—characteristics which also appear in their dialect. Revised by RASMUS B. ANDERSON.

Juvena'lis, DECIMUS JUNIUS: the last of the Roman satirists and the most eminent poet of Trajan's reign. Of his life we know little, although no less than eleven different *vitæ* varying in details are given in MSS., and an inscription, found at Aquinum, his birthplace, records the fact that a Junius Juvenalis, tribune of the first Dalmatian cohort, duumvir quinquennalis and flamen Divi Vespasiani, dedicated there an altar to Ceres. This Juvenal is commonly identified with the poet. In one of the *vitæ* his father is called Junius Juvenalis and his mother Septumuleia. He was born probably about 56 A. D., and died about 140. He studied rhetoric and practiced declamation until middle age, settling in Rome, where he was on terms of intimate friendship with Martial, who, however, as late as 98, only knows of him as rhetor, not yet as satirist. Accordingly he appears not to have published any satires before the reign of Trajan, and the latest event to which distinct allusion is made in his works is of the year 127. The tradition of his banishment to Egypt (or Britain), under the guise of a military command, is hardly worthy of confidence. His sixteen satires, in heroic hexameter verse, are divided into five books. They are full of stern indignation against the abuses, vices, and follies of Roman life, which are described in the most glowing colors, often with great realism, occasionally with great coarseness. The pictures, however, are unrelieved by the kindliness and humor which characterize Horace. The style is too rhetorical, and we miss the lightness of touch and ease of the earlier poet. Ribbeck has assailed the genuineness of satires 12–16 and 10, but his arguments have not met with general acceptance. Among editions we name Otto Jahn's, with the scholia (Berlin, 1851), revised and abridged by F. Buecheler (3d ed. Berlin, 1894), and Weidner's, with German notes (Leipzig, 1889). The best in English is by J. E. B. Mayor, containing thirteen satires, with a learned commentary, in 2 vols. (London, 1888–89). C. H. Pearson and H. A. Strong (2d ed. Oxford, 1892) contains thirteen satires with introduction and notes. The edition of J. D. Lewis (London, 1882) is accompanied by a literal English prose translation. See also J. Dürr, *Das Leben Juvenals* (Vienna, 1888); O. Ribbeck, *Der echte und der unechte Juvenal* (Berlin, 1865). M. WARREN.

Juvenile Offenders: a term specifically applied in criminology to criminals not arrived at the age of legal maturity, and especially to those considerably under that age.

It is now recognized by students of sociology and criminology that many young criminals if subjected to the proper sort of training and teaching may be permanently reformed, and that many children who, through criminal instincts or vicious surroundings, are likely to become criminals may be kept free from crime by being brought under influences which will tend to develop their better instincts. The endeavor to accomplish these objects has led to the creation of many public reformatories and many private and voluntary institutions, meeting the wants of special classes. The subject of the reformation of criminals in public institutions is treated under REFORMATORIES (*q. v.*).

The general aim and methods of private institutions may be illustrated by that of the Children's Aid Society of New York city, incorporated in 1853. Its object is to save the vagrant children of the street from becoming even juvenile criminals. By inexpensive night-lodgings for little street venders and for girls without homes, by encouraging small savings, by establishing industrial schools where sewing as well as the rudiments of knowledge is taught, and where Sunday services for religious training are held, and chiefly by deporting houseless and worse than homeless children from the miserable haunts of poverty and vice in the city to good homes in the country, an inestimable amount of good is done, and an effective preventive agency against crime secured. The multiplication of these voluntary preventive agencies in many portions of the U. S. has perceptibly reduced the amount of juvenile crime, and the effect would also soon be made manifest in the decrease of adult criminals, were it not for the large importation from Europe of this class. Several of the great religious sects, particularly the Roman Catholic, have turned their attention and practical energies in this direction. The largest portion of the most exposed and vicious children in the cities of the U. S. has been of foreign parentage, and by birth connected with the Roman Catholic faith. The very vigorous establishment of reformatories, industrial schools, and orphanages by the Roman Catholic clergy has made itself apparent in most beneficial results in some of the cities. Voluntary religious movements, like the ragged schools instituted by John Pounds in England; like the industrial and Christianizing scheme of Dr. Chalmers, introduced into the most abandoned parts of the city of Glasgow, Scotland, in 1820, and into the lowest wynds of Edinburgh in 1845; like those of the Methodist women and Rev. Mr. Pease in the Five Points of New York, and of their successful imitators in Philadelphia and Boston, have produced marvelous results.

Juv'encus, C. VETTIUS AQUILINUS: one of the earliest Christian poets; a native of Spain of noble descent, and a presbyter in the Church. About the year 330 he composed in epic measure a *Life of Christ*, following the Gospels, and particularly Matthew. In phraseology he is largely influenced by Vergil. See the editions by C. Marold (Leipzig, 1886) and J. Huemer (Vienna, 1891) and *A Study of Juvencus*, by J. T. Hatfield (Bonn, 1890). M. WARREN.

Juven'tas [Lat. abstract subs. *youth*, deriv. of *ju'venis*, young < Indo.-Eur. *juven-*, whence as deriv. Lat. *juven'cus*, Eng. *young*]: in Roman mythology, originally the goddess of young manhood, who from an early period had enjoyed a shrine in the cella of Minerva in the Capitoline temple, and to whom offerings were made on the day of assuming the toga of manhood. From the time of the second Punic war Juventas became identified with the Greek Hebe, the goddess of youth in general. It was to this conception of the goddess that a temple was vowed by Livius Salinator in 207 B. C., and begun by him in the valley of the Circus Maximus three years later. G. L. HENDRICKSON.

Jynx (in Gr. Ἴυγξ): in Greek mythology, the name of the bird which Aphrodite gave Jason as a symbol of passionate and restless love, by which he won the love of Medea. According to one version of the myth, Jynx was the daughter of Peitho or of Echo and Pan, and was transformed into a bird because she undertook, by means of magic, to make Zeus fall in love with herself and with Io. According to another, she was a daughter of Pierus, and when she and her sisters presumed to enter into a musical contest with the Muses, she was changed into a bird. It is the *jynx torquilla*, or wryneck, which can twist its head and neck completely around and then untwist it with startling rapidity. Owing to this peculiarity magic power was ascribed to the bird. In sorcery it was bound to a wheel which was made to revolve rapidly in one direction only, the while incantations were spoken. See Jahn in the *Verhandlungen der Sächsischen Gesellschaft der Wissenschaften* (1854, p. 257 ff.); Theocritus, *Idyl.* 2; Pindar, *Pyth.* (4, 213 ff.).

Revised by J. R. S. STERRETT.

K

: the eleventh letter of the English alphabet.

Form.—The form is that of the Roman alphabet K. It was received from the Greek as Κ, where the earliest retrograde form 𐌊 is essentially that of the early Phœnician 𐤊 or 𐤉, in which form the supposed resemblance to an open hand gave it its name (*kaph*, hand) and probably its place in the alphabetic series. The letter was but little used in the Roman alphabet, its place being supplied by C. It was used only in a few words before *a* and in abbreviations like K = *Kalendæ*, *Kæso*, which were reminiscences of earlier orthography. In Old English *k* is sparingly used, but in some MSS., as, e. g., in the Rushworth Gospel, it is more frequently written for *c*.

Name.—The English name *ka* (phonetically *kē*) represents the M. Eng. and O. Fr. *ka* from Lat. *ka*. The peculiarity of the vowel-sound in the Latin name, in contrast with, e. g., *be*, *ce*, *de*, *pe*, *te*, *qu*, may be connected with the fact that *k* appeared in use only before *a*. The Greek name *kappa* is a Greek adaptation of the Semitic name *kaph*, hand.

Sound.—Its sound is a voiceless guttural explosive, characterized by a closure between the back or body of the tongue and the roof of the mouth near the boundary between the hard and soft palate. Before the vowels *a* (*aa*), *o*, *u* (*oo*), the closure is toward the back or soft palate, as in *kaiser*, *Koran*, *koodoo*, like *cart*, *code*, *cool*, while before the vowels *æ* (*ă*), *e* (*ay*), *i* (*ee*, *ĭ*), it is toward the hard palate, as in *kaleidoscope*, *Katy*, *keel*, *kill*. The sound is also expressed in English by *ck*, as in *duck*; *c* before *a*, *o*, *u*, or consonants, as in *cat*, *cot*, *cut*, *act*, or finally as in *music*; *ch*, as in *chasm*, *choler*, *anchor*, *epoch*; *q*, as in *queen*; *qu*, as in *liquor*, *coquet*, *antique*; *cu*, as in *biscuit*; *gh*, as in *hough*. It has become silent initially before *n* since about 1700, though retained in spelling, as in *knife*, *knot*, *know*, but notice its retention in *acknowledge*, derivative of *aknowe*, with prefix *on-*, *a-*.

Source.—Initially it is widely used in loan-words from other than Latin-Roman sources, as *kadi*, *kafir*, *kaiser*, *kangaroo*, *Kantian*, *karat*, *kirmess*, *khan*, *khedive*, *knout*, *kreutzer*, especially in words derived or formed directly from the Greek to emphasize such derivation; thus *Kyrie eleison*, *kaleidoscope*, *kilogram*, *kilometer*, *kinematics*, *kerosene*. In words of Teutonic origin it appears commonly only before *e* and *i*, as it serves here the purpose of denoting unmistakably the hard sound, which is not the case with *c*; thus *kiln* < O. Eng. *cyln*, *kin* < O. Eng. *cynn*, *kind* < O. Eng. *gecynde*, *key* < O. Eng. *cæg*, *king* < O. Eng. *cyning*, *ken* < O. Eng. *cennan*. The retention of the hard sound is often due to Scandinavian influence or origin; thus *kirk*, the Northern English form of *church* <O. Eng. *cyric*; *keg*, cf. Icel. *kaggi*; *kill*, cf. Icel. *kolla*; *keel*, cf. Dan. *kjöl*. In *kerchief* < M. Eng. *kyrchefe*, *courchef*, from O. Fr. *covrechef*, the *k*, contrary to usual rule, appears in a Romance word. Before *n* it represents generally an Old English *c*, as in *knight* < O. Eng. *cniht*, *knife* < O. Eng. *cnīf*, *knot* < O. Eng. *cnotta*, *knee* < O. Eng. *cnēow*, *know* <O. Eng. *cnāwan*. Finally and medially *ck* is generally used instead of *k*, as in *back*, *check*, *crack*, as *c* alone would be insufficient in the derivatives *checking*, etc., but *k* appears as representative of O. Eng. *c* in, e. g., *work* < O. Eng. *weorc*, *seek* <O. Eng. *sēcan*, *wreak* < O. Eng. *wrecan*.

Value as Symbol.—K = karat; in chemistry = potassium (*kalium*); in mathematics denotes a constant coefficient; K. B. = Knight of the Bath; K. C. B. = Knight Commander of the Bath; K. G. = Knight of the Garter; K. G. F. = Knight of the Golden Fleece. BENJ. IDE WHEELER.

Ka: according to the Egyptian conception, a genius, double, spirit; a something that continued to reside in the tomb (see MASTABA) as long as the mummy remained intact, and together with a *cha*, the perishable body, a *ba*, or soul, and a *chu*, or intelligence, constituted man. The funereal offerings for which the tomb-texts pray, and for which the deceased often made lasting provision, were intended for the sustenance of the *ka*. It is an independent spiritual existence which insures to man "protection, life, continuance, purity, health, and joy" so long as it remains present. It is the constant companion of each individual, human or divine, growing as he grows, and never leaving him. Pictorially the *ka* is represented by the extended arms bent at a right angle upward from the elbows. After death the offices of the *ka* continue. The body must be preserved so that the *ka* may return to it at will, or at least an image of the dead must be within reach in a hidden recess in the tomb. These ideas are inextricably connected with the Egyptian conception of the future, and explain the philosophy of the form and construction of the tombs as "eternal dwellings" for the dead. See Erman, *Aegypten*, p. 413 ff., and Edwards, *Fellahs*, *Pharaohs*, *and Explorers*, pp. 113 ff., 186 ff. CHARLES R. GILLETT.

Kaaba [= Arab. *al-Ka'bah*, the Square House, deriv. of *ka'b*, cube]: the most sacred shrine of Islam, toward which, when praying, Mussulmans must turn their faces; "the point to which are directed and where are united all human prayers." It is an almost cubical structure, about 40 feet each way, standing in the center of the vast seven-minareted mosque of Mecca, which has been built around it. The Arabs believed that the Kaaba was the direct gift of God to their ancestors; in sign that they were his chosen prople, and that it was the favorite praying-place of Abraham and Ishmael. Gradually 360 idols, images of inferior deities, were collected in it, so it became the pagan pantheon of Arabia. All these idols the prophet Mohammed destroyed (Jan. 12, 630) after his triumphal return to Mecca. He did not injure the black stone which, still preserved in the Kaaba, receives the utmost veneration from the Mussulmans. This stone, of irregular oval shape and about 7 inches in diameter, is probably of meteoric origin. Innumerable legends attach to it. It is thought to have been white or crimson when it came down from heaven, but to have become black in the presence of human sin and suffering. None but Mussulmans are allowed to approach the Kaaba, or even to enter Mecca and Medina, though several travelers, as Burckhardt, have succeeded in doing so in disguise. EDWIN A. GROSVENOR.

Kaalund, HANS VILHELM: poet; b. in Copenhagen, Denmark, June 23, 1818. After studying art he attracted attention by his poem of welcome to Thorwaldsen (1838), and devoted himself from that time to literature. His first independent work, *Kong Halfdan den Stærke* (1840), was written in the style of Oehlenschläger, but in *Fabler og blandede Digte* (Fables and Miscellaneous Poems, 1844) he found his proper field as the interpreter of nature. *Fabler for Börn* (Fables for Children, 1845), with illustrations by Th. Lundbye, is still a popular nursery-book in Denmark. *Et Foraar* (A Spring, 1858), partly new poems, partly his older *Fables*, and *En Eftervaar* (An Autumn, 1877), are companion pieces. His only drama, *Fulvia* (1875), was a success at the Royal theater. A posthumous collection of his poems appeared in 1885. D. Apr. 27, 1885. D. K. DODGE.

Kaama: same as HARTEBEEST (*q. v.*).

Kaarta: a country of the Western Sudan; between the upper Senegal river and the Sahara, centering in lat. 15° N., lon. 10° W., but with ill-defined boundaries. Area estimated at 21,000 sq. miles. It is a fertile plain, formerly scattered over with villages, and covered with fields of millet, maize, rice, cotton, tobacco, indigo, and pulse. In 1859 Gen. Faidherbe estimated the population at 300,000, mostly Bambaras and Soninkis. It belonged formerly to the Soninkis, but was conquered by the Bambaras, and in 1855 was conquered and ravaged by the Sultan of Segu. It is now within the French sphere of influence, but is jealously guarded from visits by travelers. The capital is Nioro, approximate lat. 15° 30' N., lon. 9° 45' W. MARK W. HARRINGTON.

Kaba, or **Kabah**: site of an important ruined city of Yucatan; 12 miles S. W. of Ticul. Its ruins have been investigated by Stephens, Charnay, and others. These ruins are not mentioned in history, but their character shows that the city must have been a very important one. The ruins consist of great pyramids, immense terraces surmounted by buildings,

triumphal arches, and fine palaces. See CENTRAL AMERICAN ANTIQUITIES; see also Stephens, *Incidents of Travel in Yucatan* (2 vols., 1848); Charnay, *Ancient Cities of the New World* (1887). M. W. H.

Kababish: a body of Arab pastoral tribes W. of the Nile, between Nubia and Kordofan. A part are purely nomadic, and remain permanently in the desert, and a part are permanently settled near the Nile. The most of them settle near the Nile in the dry season, but return to the desert in the wet. They devote themselves to the rearing of sheep and camels. They are of fine appearance physically, but their morals are said to be lax, and polyandry to be practiced. They number about 60,000. See Prout, *General Remarks on the Province of Kordofan* (1877). M. W. H.

Kabbalah: See CABBALA.

Kabul: city of Afghanistan. See CABUL.

Kabyles [Arabic *Qabaïl*, the tribes]: a group of Berber tribes occupying North Algeria, from not far E. of Algiers to Cape Bugaroni. So much of this region as is in the province of Algiers is called Great Kabylia; that in the province of Constantine is Little Kabylia. There are about 1,400 villages, comprising 450,000 to 500,000 individuals. The villages are combined into about 120 tribes, each ruled by its elective *amin*, and several tribes unite into a protective confederation. The tribe is the political unit; its amin is chief in war and judge in times of peace, but he divides his power with the general assembly of the tribe. The country is mountainous, and the villages are placed with reference to ease of defense. The language of the people is Berber, but this and the blood are much mixed, and traces of Carthaginian, Greek, Roman, Vandal, Arab, Negro, and various modern European races can be detected in them. The Kabyles are Mohammedans, and education among them, which is very limited, is essentially Arabic. They are especially devoted to agriculture, but are skillful with tools; are industrious and emigrate in considerable numbers to the large cities and ports as laborers and porters. They are essentially mountaineers, have always resisted encroachments on their liberty, and are largely independent of the French.

MARK W. HARRINGTON.

Kach, Katch, or Cutch: name of a feudatory state of Bombay, Western India. See CUTCH.

Kadapa: See CUDDAPAH.

Ka'desh, or Ka'desh-barnea [*Kadesh* is from Heb. *Kedesh*, liter., sanctuary]: a place of special interest in biblical geography. It was the third station of the Israelites in their march from Sinai to Canaan, and its original name appears to have been Rithmah (Num. xxxiii. 18). Thence the spies went out, and here the people murmured and were turned back to wander in the desert for nearly thirty-eight years. After seventeen encampments in the penal wandering, they returned to Kadesh (Num. xx. 14, 22), and set out from there for Jericho. In 1838 Dr. Robinson identified Kadesh with *'Ain el-Weibeh* (or *'Ayn el-Waybeh*), lon. 35° 30', about 10 miles N. of Mt. Hor. In 1842 the Rev. John Rowlands, an English clergyman, proposed another identification, which in 1881 was confirmed and established by the Rev. H. Clay Trumbull, of Philadelphia. The present name of the place is *'Ayn Qadees*, in about lon. 34° 30', and about 60 miles nearly W. of *'Ain el-Weibeh*. See Trumbull's *Kadesh-Barnea* (New York, 1884).

Kadi: See CADI.

Kadiak, kăăd-yăk' (sometimes wrongly spelled **Kodiak**): an island of Alaska; E. of the peninsula of Alaska and in the line of the prolongation of Kenai peninsula; about 100 miles long by 60 broad; area about 5,000 sq. miles. Its coast is very irregular, being much cut up by bays and fiords, and it has many smaller islands about it, the largest being Afognak to the N., separated from it only by a narrow winding strait. The island is rocky and has an extensive low forest growth. There is little soil fit for cultivation except the alluvial lands near the mouths of streams, and the summers are too cool for successful agriculture (lat. 56° to 58°). The aborigines are apparently the Kadiaks or Kaniagmuts, a people like the Aleuts, but among the inhabitants are the latter and some representatives of continental tribes. They are devoted to hunting and fishing. The island was discovered in 1741 by Bering; taken possession of by a company of Russian merchants in 1768; acquired by another company, the Russian-American, in 1799; and became a part of the U. S. by the cession of 1867. Pop. about 2,000. The chief town is St. Paul, near the northeast angle of the island, lat. 57° 47'. MARK W. HARRINGTON.

Kaempfer, kemp'fer, ENGELBERT: physician and historian; b. at Lemgo, Westphalia, in 1651. While a youth he traveled in Northern Europe, and in 1682 entered the Swedish diplomatic service. As secretary of legation he passed through Russia and Tartary on his way to Ispahan; later he joined the Dutch East India Company as surgeon, sailing from Ormuz to Batavia, and thence to Japan by way of Siam. He reached Nagasaki in 1690 and remained there, confined to the island of Deshima, for over two years. The yearly visits of the merchants to Yedo afforded him opportunities of seeing the country and collecting materials for his marvelously accurate *History of Japan and Siam*, which first appeared in an English translation from his own MS. (2 vols., London, 1727–28); next in Latin (1728); then in Dutch, and in French (1729)—all from the English. In 1777 an improved and modernized German edition appeared. The work now commands a high price; an abstract is given in the *Transactions of the Asiatic Society of Japan*, vol. ii. D. at Lemgo, Nov. 2, 1716. J. M. DIXON.

Kaf'fa, or Kafa: the most southern projection of the Abyssinian highlands; an extensive table-land rising about 5,000 feet above the sea. Coffee is indigenous here, and is said to have received its name from this country. It is largely cultivated. The *ensete*, a plant resembling the banana, furnishes the chief article of food. Cereals are not cultivated, and "grain-eater" is used as an expression of contempt. The inhabitants belong to the black Galla race, speak a language classified under the Hamitic group, and profess to be Christians. Bonga, situated in 7° 12' 30" N. lat., 36° 41' E. lon., on the Gojeb, is the principal town, but is a poor place, comprising about 6,500 inhabitants. Kaffa is tributary to Shoa, whose king is now the ruler of Abyssinia.

Revised by C. C. ADAMS.

Kaffa, or Feodo'sia: town in the government of Taurida, Russia; beautifully situated on the eastern coast of the Crimean peninsula (see map of Russia, ref. 10–D). It has a good fortified harbor, and was, while in the possession of Genoa, a commercial port of consequence, but lost its importance under Turkish dominion. It is rising again, and is much visited as a watering-place. Pop. 12,406.

Kaffirs: See KAFFRARIA.

Kaffraria [land of the Kaffirs]: the large part of South Africa inhabited by the branch of the Bantu family known as the Kaffir tribes. It extends from the Portuguese possessions, centering at Delagoa Bay, westward, embracing the southern coast regions, the Orange Free State, and the eastern part of Cape Colony. The natives of Basutoland and Bechuanaland are kindred, though their common language differs widely from the Zulu and Xosa (Kaffir proper) tongues. In a more restricted sense, the name Kaffraria applies to that part of the coast, thus designated on the maps, lying between the western border of Natal and the Great Kei river. Since 1884 it has been a part of Cape Colony. The name Kaffraria has now no official significance.

With the exception of the Yellow people (including the Hottentots and Bushmen of Southwest Africa), all the aborigines of South Africa as far N. as the northern boundary of Matabeleland and Mashonaland are Kaffirs or tribes allied to the Kaffirs, but mixed with more northern tribes of the Bantu family. The Arabic name Kâfir (unbeliever) was applied to the natives by the Mohammedan Indian traders on the southeast coast, and the word was continued in use by Portuguese explorers, and then by Dutch and British settlers. The Kaffirs were never a united tribe, but have a considerable number of tribal organizations, the most important of which are the Ama-Zulus or Zulus, the Ama-Xosa, and the Ama-Tembu (numbering all told about 500,000 people, and living near the coast), and the Matabele offshoot of the Zulus farther N. A peculiarity of some Kaffir languages is the clicks which have been borrowed from the Hottentots, and which foreigners find extremely difficult to combine with other sounds.

Kaffraria is among the most healthful, temperate, and fertile regions of Africa, with sub-tropical conditions prevailing on the southeast coast and in the more northern districts. Most of the cereals grow in the S.; there are considerable areas of fine timber, and immense regions adapted for grazing. There are various modes of native government. The patriarchal form exists among some tribes, like the Mashonas, where there is no general govern-

ment, but each head of a family is equal to his neighbor. There is the limited chieftainship among the Basuto and Bechuana, the chief being subject to the guidance of his head-men. The war-like tribes, like the Zulus and the Ama-Xosa, lived under a despotic or one-man form of government until they came under British control.

These tribes are physically among the finest of the African races. The Zulus were not an important tribe until their great leader Chaka arose early in the nineteenth century, conquered all the tribes around him, consolidated them with his own, and founded one of the most powerful native empires in Africa. The Zulu nation was the predominating native element in South Africa until it was disrupted by the war with Great Britain (1879), when two-thirds of Zululand was appropriated by the conquerors and is now a protectorate administered by the governor of Natal. The Zulus are no longer an important factor in South African affairs, the territory left to the nation being parceled out among the chiefs, while a part of it has been annexed as a province to the South African Republic, and the larger part of the people live in the British protectorate.

The Matabele are Zulus who emigrated N. of the present limits of the South African Republic about 1830, and have lived partly by cattle-raising, but chiefly by raids on other tribes for women and cattle. Their stock is now greatly mixed with the tribes upon whom they made war, chiefly the Mashonas. In 1893 they provoked a war with the British South Africa Company, and their decisive defeat destroyed their power to terrorize any longer the tribes around Matabeleland. The Ama-Xosa, Ama-Pondo, and other coast branches of the Kaffir family have come fully under British influence and are progressing in civilization. Some of the Kaffirs are excellent tillers of the soil, though they are more distinctively herders than agriculturists. See Gresswell's *Our South African Empire* and *Geography of South Africa*; Mackenzie's *Austral Africa*; Theal's *South African History and Geography*; and Silver's *Handbook to South Africa*. C. C. Adams.

Kafiristan' [from Pers. *kāfir*, infidel, unbeliever + *stan*, place, country]: a name of variable signification. Sometimes it is applied to the territory of all the infidel tribes on both slopes of the Hindu Kush, sometimes to those only of the south slope, and at other times to the country of the Siaposh, who occupy the higher valleys on the southern slope from N. of Cabul to Kashgar. In all its meanings it forms a part of modern Afghanistan, though the tribes included are generally independent. With the last meaning it covers a space of about 5,000 sq. miles. It is a rough, cold, and infertile region, isolated, without commerce or industry, and devoted mostly to the raising of sheep and goats. The people number about 200,000. The chief interest in them lies in the tradition (which is not aboriginal, however) that they are descendants, of fairly pure blood, of Greeks who came with Alexander. The basis for this tradition seems to lie in the fact that they are more like Europeans than their neighbors; fair complexions are not rare among them, and blue eyes are occasionally seen. Their language is allied to the Sanskrit. See McNair, *A Visit to Kafiristan* (*Proc.* Royal Geog. Soc., 1884). Mark W. Harrington.

Kaga: a province of Central Japan; lying along the west coast just S. of the promontory of Noto. Its daimios, whose family name was Mayeda, were among the wealthiest in the empire, and are marquises under the new *régime*. The principal town is Kanazawa (*q. v.*), 10 miles S. of which the main river, the Tetorigawa, 50 miles in length, enters the sea, its bed here being a mile in breadth. Kaga is isolated from the rest of the empire by high mountain ranges, and depends mostly on sea communication, its best port being Nanao (pop. 8,000). It has manufactures of silk, cotton, bronzes, cutlery, fans, but is especially noted for the celebrated Kutani or Kaga ware (dating from 1650 A. D.), which has a smooth white finish, and is ornamented in red and gold, probably the most generally attractive to foreigners of all Japanese porcelains. The chief seat of its manufacture is at Terai, 17 miles S. of Kanazawa, and close to the valleys of Kutani (literally, "nine valleys") and Nabetani, whence the clay is brought; there are also potteries in Kanazawa. J. M. Dixon.

Kago'shima, or **Kago'sima**: a city in the extreme south of Japan, on the island of Kiushiu, and formerly castle-town of the powerful daimio of Satsuma (see map of Japan, ref. 8–A). It is situated at the head of a long, narrow inlet, and fronts the picturesque island of Sakurajima. During the troubles attending the opening of Japan the daimio of Satsuma was directly involved with foreign powers, owing to the murder of Richardson in 1862 on the Tokaido by swordsmen in his train. This act led to the bombardment of Kagoshima by a British fleet, Aug. 15, 1863, in which the palace of the daimio and many other buildings were destroyed. Kagoshima was also the focus of the Satsuma rebellion under Saigo in 1876–77. The manufacture of pottery, introduced by Korean artisans at the close of the seventeenth century, is carried on in the neighborhood, which is noted for the celebrated crackled Satsuma ware. Pop. of Kagoshima, 45,097. J. M. Dixon.

Kagu: the *Rhynochetos jubatus*; a bird of New Caledonia related to the cranes and rails, but on account of its peculiarities made the type of a distinct family, *Rhynochetidæ*. It has, like the night-herons, moderately long legs, and a long stout beak, runs like a rail, frequents rocky ravines, is nocturnal in its habits, and feeds on worms, snails, and slugs. It is dark gray, paler beneath, with dark cross-markings on tail and wings. It has a pendent crest and scarlet feet and bill. F. A. L.

Ka'hau, or **Blanda**: the native name for *Semnopithecus larvatus*, a large, odd-looking monkey peculiar to Borneo, better known as the proboscis monkey from its long, pendent nose, which in old animals reaches a length of 3 or 4

The kahau, or long-nosed monkey.

inches. The face is cinnamon brown, the body reddish with conspicuous markings of white. It associates in small troops, is usually found over or near the water, and is very shy. F. A. L.

Kahoka: city; capital of Clark co., Mo. (for location of county, see map of Missouri, ref. 1–H); on the Mississippi river, and the Keokuk and West. Railroad; 20 miles W. of Keokuk, Ia. It is in a well-watered agricultural and grazing region; contains 8 churches, 2 graded schools, college, 3 banks, 2 weekly newspapers, and electric-light plant; and has 2 grain elevators, canning-factory, and other industrial establishments. Pop. (1880) 704; (1890) 1,425; (1893) estimated, 1,900. Editor of "Gazette-Herald."

Kai'eteur: a celebrated waterfall in British Guiana; on the Potaro river, a tributary of the Essequibo. It is 822 feet in height. The river is here nearly 400 feet wide, and 15 feet deep. The waterfall was discovered in 1870.

Kailas': a sacred mount of the Hindus; the Mt. Meru of Sanskrit literature; culminating peak of the Gangri Mountains in Tibet, in lat. 31° 5′ N. and lon. 81° E., not far from the sources of the four great rivers, the Sutlej, Indus, Ganges, and Brahmaputra. Altitude, 14,000 feet.

Kai-Ping: the coal region in Chih-li, Northern China; 75 miles N. E. of Tientsin, near the banks of the Lan-ho. It is connected by rail with the city of Hokow on the Pei-tang river, and with Tientsin viâ Taku.

Kairwan', or **Kairowan**: town of Tunis, Northern Africa. It has several magnificent mosques and other monuments of a splendor of bygone days. It is on a sandy plain, has no manufactures and no trade. Pop. 15,000. It is connected by rail with Susa, the nearest port.

Kaisarie, or **Kaisariyeh** [*Kaisariyeh* is from Lat. *Cæsarea*, the ancient name, a common Lat. place-name]: the ancient Cæsarea-Mazaca; the capital city of Cappadocia in Asia Minor (see map of Turkey, ref. 5–G). It lies in the plain not far from the foot-hills of Mt. Argæus, and is still a city of considerable importance. When Tiberius incorporated Cappadocia into the Roman empire the name of the city was changed from Mazaca to Cæsarea, a name which has clung to it. It became the chief Roman mint in Asia, and hence coins of Cæsarea are very common. J. R. S. Sterrett.

Kaiser, Friedrich: dramatist; b. at Biberach, Würtemberg, Germany, Apr. 3, 1814. Son of an Austrian officer, he was early in life taken to Vienna, where he was educated and passed his entire life in more or less needy circumstances. D. Nov. 7, 1874. Kaiser was for many years employed as dramatist by one of the local theaters of Vienna, and wrote a great number of farces and comedies, most of which, owing to their exquisite humor and clever plots, are still played on German stages. Julius Goebel.

Kaiserswerth, kī'zer-vărt: town of Rhenish Prussia, on the Rhine; 10 miles below Düsseldorf (see map of German Empire, ref. 4–C). It is noted for the school of evangelical deaconesses founded there in 1835 (see Fliedner), and now has branches in most Protestant countries. Pop. 2,400.

Kaiser Wilhelm's Land, Germ. pron. kī'zer *vil'*helms-laant': the German part of New Guinea, the northern part of the eastern end, declared a German protectorate in 1884. With Long, Dampier, and some other small islands, it has an area of about 72,000 sq. miles. It is under the control of the German New Guinea Company, with an imperial commissioner as chief executive. Tobacco is successfully grown, and horses, cattle, and goats flourish. In 1891 the imports amounted to $82,000. Pop. about 110,000. M. W. H.

Kakapo: a native and popular name for the owl-parrot (*Strigops habroptilus*) of New Zealand. See Owl-parrot.

Kakké: a disease rife in Japan during the summer and autumn months, akin to the beri-beri of the Malay Peninsula. It shows itself in loss of motive power, and in swelling of the legs; when it reaches higher the results are fatal. It especially affects young and otherwise vigorous persons in barracks, schools, and prisons. The disease, confined to a few localities about the middle of the nineteenth century, is now a national scourge, and special hospitals are open for its treatment from May till October. No specific remedy has yet been discovered, and change of residence to the hills is the best cure. J. M. Dixon.

Kakodyl: See Cacodyl.

Kakyen, **Kakhyen**, or **Kachin**: a people of Northwestern Indo-China, N. of Burma, between Assam and Yunnan, and also in Northern Burma. They form a western branch of the Singpo family, and are themselves divided into numerous tribes and clans. They are generally independent, are turbulent and war-like, and yet are good agriculturists and skillful smiths. M. W. H.

Kalafat': town of Roumania, in Little Wallachia, in a plain on the left bank of the Danube, nearly opposite to Widin (see map of Turkey, ref. 3–C). Partly by its natural position, and partly by its artificial fortifications, it commands entirely the approach to the Danube here, and was the scene of very severe contests between the Russians and the Turks in 1829, 1854, and 1877. Pop. about 2,500.

Kalahari (kăa-laa-haa'rĕe) **Desert**: a large territory of Southern Africa, of undefined boundaries, but mostly extending between lon. 20° and 26° E., and between lat. 21° and 26° S. The region has more the character of a steppe than a desert. It has a small amount of rainfall, sufficient at times to start a vigorous growth of grass, and water is found by digging in the usually dry beds of the rivers. The South African plateau slopes on all sides toward this waste, hence the remarkable salt pans in the Ngami basin to the N., where the water from large tropical rivers is evaporated or lost in the sand. The pure sand wastes are found chiefly in the western part. Bushmen wander over portions of the steppe, wherever they can find giraffes, antelopes, and the reptiles on which they live. Revised by C. C. Adams.

Kalakaua, kăa-laa-kaa'ŏo-ăa, David: King of the Hawaiian islands; b. at Honolulu, Nov. 16, 1836, of royal descent; was educated at the royal school of Honolulu; visited California in 1860; married in 1863 Princess Kapiolani. On the death of King Lunalilio, Kalakaua was elected his successor to the throne Feb. 12, 1874, instead of the dowager Queen Emma, whose partisans instigated a riot that was speedily put down by U. S. and British ships of war in the harbor. In 1881 he made a tour of the world, in which he met most of the potentates of Europe and learned extravagance. He arranged on his return for a formal coronation, which occurred Feb. 12, 1883, with much pomp. He built a beautiful palace at a cost of $350,000, spent $75,000 in celebrating his fiftieth birthday, and $60,000 on the funeral of a relative. As a consequence, his little nation was nearly forced into bankruptcy. In 1887 Queen Kapiolani and Princess Liliuokalani went to England to arrange for a loan. A rebellion broke out in their absence, and the king was obliged to grant a new constitution limiting his own powers and establishing ministerial responsibility. He died at San Francisco, Jan. 20, 1891, when on the point of returning to Honolulu from the U. S. King Kalakaua possessed many of the best qualities of a king. C. H. Thurber.

Kalamazoo': city (settled in 1829); capital of Kalamazoo co., Mich. (for location of county, see map of Michigan, ref. 8–H); on the Kalamazoo river, and the Chi., Kal. and Sag., the Gr. Rapids and Ind., the Lake Shore and Mich. S., and the Mich. Cent. railways; 40 miles E. of Lake Michigan, 49 miles S. of Grand Rapids. The river affords excellent water-power for the manufacturing industries of the city, which are carried on by thirty-nine incorporated companies, using $4,000,000 capital, employing more than 5,000 persons, paying annually $1,500,000 in wages, and receiving more than $6,000,000 annually for products. There are 27 churches, 10 public schools, 2 public parks, art gallery, a widely known driving park, public library with 17,800 volumes, and 5 other libraries with 12,907 volumes, Holly system of water-works, gas and electric-light plants, 10 hotels, 4 national banks with combined capital of $475,000 and surplus of $350,000, 2 savings-banks with capital of $100,000 and surplus of $46,000, and 2 daily, 1 semi-weekly, 2 weekly, and 3 monthly periodicals. Kalamazoo College (Baptist, organized in 1855) and the Michigan Female Seminary (Presbyterian, organized in 1866) are located here. The city is also the seat of one of the State asylums for the insane, which accommodates about 1,000 patients. Pop. (1880) 11,937; (1890) 17,853; (1894) 21,053. Editor of "Telegraph."

Kalamazoo College: an institution of Kalamazoo, Mich., incorporated as a college in 1855. It had previously been an academy, chartered in 1833. Its founders were Baptists, and a majority of its board of trustees are of the same body of Christians; but other denominations have always been represented in its board of trustees, and generally in its faculty. It admits both sexes to an equal share in its instruction and to the same courses of study. The buildings are finely situated. The college faculty consists of six men and five women. Classical, Latin-scientific, and scientific courses are offered. The number of students in the collegiate department is 55; in the preparatory and musical departments, 176. The endowment is $200,000.

Kalamazoo River: a stream which rises in Hillsdale co., Mich., flows generally W. N. W. to Kalamazoo, and thence N. W. to Lake Michigan. It is 200 miles long, 350 feet wide at its mouth, and is navigable 40 miles for boats.

Kalapoo'ian Indians: a linguistic stock of North American Indians which formerly occupied the valley of the Willamette river, Oregon, above the falls at Oregon City, and extended well up to the head-waters of that stream. The tribes appear not to have reached the Columbia river, being cut off by the tribes of the Chinookan family. All the accounts of early visitors to this territory agree in ascribing a large population to this region, but the tribes appear to have suffered severe loss from disease about the years 1824–25, when the Klikatat overran and took possession of much of their country. The Kalapooian tribes, according to Hale, were more regular and quiet than the wandering tribes of the interior, and more cleanly, honest, and moral than the quarrelsome nations of the coast. Fish, and wapatto and other roots formed the larger part of their subsistence. Of the form of government and tribal connections very little is known. Doubtless there were formerly many divisions of this family, and a still larger number of bands or tribes. The Kalapooians numbered in 1890 about 171, distributed among the following tribes: Atfalati, 28; Chepenapho or Mary's River Indians, 28; Calapooya, 22; Lakmiut, 29; Santiam, 27; Yamil, 30; Yonkalla, 7.

Authorities.—Hale, in *United States Exploring Expedition* (vol. vi., Philadelphia, 1846); Alexander Ross, *Adven-*

tures (London, 1849); *Overland Monthly* (vol. vii., Oct., 1871); *Harper's Magazine* (Oct., 1872). See also J. W. Powell, in *Seventh Annual Report Bureau of Ethnology.* See INDIANS OF NORTH AMERICA. F. W. HODGE.

Kalbeck, MAX: writer; b. Jan. 4, 1850, at Breslau, Germany, where he studied philology and philosophy. In 1872 he went to Munich in order to devote himself especially to the study of music. Since 1880 he has lived in Vienna. He has published *Aus Natur und Leben* (1870); *Wintergrün* (1872); *Joh. Chr. Günther* (1879); *Nächte* (1878); *Zur Dämmerzeit* (1881); and several operas. JULIUS GOEBEL.

Kalchoids: See *Bronze-brass alloys* under BRONZE.

Kale [probably of Celtic origin; cf. Gael., Ir. *cal*]: a variety of *Brassica oleracea*, the species of cruciferous plant to which the cabbage, cauliflower, etc., belong. There are many varieties, some of them very attractive in color and in the curly and crinkled character of the foliage. Kale is grown in kitchen-gardens for its leaves, which are boiled as pot-herbs. The plant is often called borecole. In the U. S. kale is largely grown about Norfolk, Va., whence it is shipped to Northern markets in winter. Upward of 3,000 acres in the U. S. are devoted to kale-growing for market. In Great Britain the sea-kale (*Crambe maritima*), a plant allied to the above, is commonly raised in gardens. It is unpalatable until after blanching, when it is highly prized as food. Revised by L. H. BAILEY.

Kalei'doscope [liter., beautiful form-viewer; Gr. *καλός*, beautiful + *εἶδος*, appearance, form + *σκοπεῖν*, look at, view]: an instrument invented in 1817 by Brewster. It consists of a tube containing two or more longitudinal stripes of glass mirror, whose reflecting surfaces are inclined to each other at an even-numbered aliquot part of four right angles—that is, at 60°, 45°, 36°, etc., which are respectively one-sixth, one-eighth, and one-tenth of a circle. At one end of the tube is an eyepiece; at the other, two plain glasses, the outer one ground. Between these glasses are bits of bright-colored glass, diaphanous beads, and the like. The reflection of these objects is multiplied by the mirrors, and constitutes a symmetrical image often of great beauty. It is of considerable use in the arts as an aid in devising new patterns for calico-printers and other decorative purposes.

Kalevala, kă-lā-vaa'lă: the national poem of Finland. The name, however, was the invention of ELIAS LÖNNROT (*q. v.*), to whom is due the present form of the work. It signifies the "home of Kalevas," or heroes; though originally "Kaleva" was a mythical gigantic personage, whose sons, not in the physical, but in the poetical sense, were all heroes. (See Comparetti, *op. cit.*, p. 127, *seq.*) The material out of which the *Kalevala* was made by Lönnrot was the body of Finnish popular song, known either by the generic name for all poetry, *laulu*, or by the more characteristic designation for traditional and unartificial compositions, *runo* (plu. *runot*). This popular verse includes not only poems of an heroic or legendary character, but also magic formulas, marriage songs, and other songs for special occasions. The cultivation of such poetry was, until a very recent time, universal in Finland. The popular singer, *laulaja*, or rune-maker, *runoja*, preserved and handed down from generation to generation poetic material derived from a remote past, long anterior to the conversion of the Finns to Christianity. This material was therefore essentially pagan, reflecting the conceptions of the original Ugro-Finnic race about life and nature. The central thought is always that the bond of connection between man and the rest of the universe is magic, by means of which the assistance is obtained of the deities that preside over every smallest portion of the visible world. Hence the magician who commands the powers of nature by means of his art is the true Finnish hero, and the *Kalevala* may be said to be devoted to the fortunes of a series of such heroes. The chief of these are Väinämöinen, the eternal singer; his envious rival, the Lapp Jonkahainen; the marvelous smith, Ilmarinen; the fair youth, deceiver of women, Lemminkäinen; the brothers Kalervo and Untamo, the personification of sleep, and the former's ever-unlucky son, Kullervo. Women, moreover, of magical qualities are not lacking to give the interest of intrigue to the adventures of the heroes. Such women are the fair Aino; Louhi, mistress of dark Pohjola, who will give her beautiful daughter in marriage to him who will make for her the mysterious *Sampo*; the lovely Kyllikki, of Saari.

Although Lönnrot has the glory of having thrown together into one work the runes devoted to these heroes and heroines, he was by no means the first to be attracted by them. As early as the sixteenth century M. Agricola (d. 1557) remarked upon them; and in the eighteenth century several scholars, chief among them H. G. Porthan (d. 1804), began the collection and publication of isolated examples of them. The mythological investigations of Porthan's pupils, Ganander and Lencquist, greatly increased the interest in Finnish popular poetry; and the work of the German scholar F. Rühs, *Finland und seine Bewohner* (1809), enlarged this interest. A little later the German H. R. von Schröter, in his *Finnische Runen, finnisch und deutsch* (1819), and Z. Topelius, in his *Suomen Kansan vanhoja runoja ynnä myös nykyisempiä lauluja* (Old Runes and Modern Songs of the Finnish People, 1822–31), gave more extensive examples of this popular song. In 1820 Reinhold von Bekker, in his weekly journal of Åbo (*Tarun Viikko Sanomat*), took the important step of writing the runes about Väinämöinen into a larger whole. But the merit of carrying out this suggestion belongs to Lönnrot. The ambition and patriotism of this distinguished scholar were alike fired by the examples of his forerunners, to collect and preserve from oblivion the whole mass of songs of the Finnish race.

For this purpose he spent many years wandering from cottage to cottage throughout Finland and the Finnish parts of Lapland and Russia. He would visit the peasant or fisherman and sit in the evenings at their hearths, and have the men, women, and children sing all the songs and recite all the stories they knew, all of which he faithfully recorded. The first result of his travels was a collection of poems published under the name of *Kantele* (1829–31), from the name of the national instrument to which they are sung—*kantele* being a species of harp with five strings. After having gathered a considerable body of such songs, he began to compose and arrange them into a systematic whole; and so successful was he in this that in 1835 he was able to submit to the Society of Finnish Literature at Helsingfors, which immediately printed it, his first version of *Kalevala*, containing 12,078 verses divided into thirty-two cantos. Conscious of the many gaps in the story, Lönnrot both himself made new journeys and also encouraged others to assist him. Among his assistants may be mentioned M. A. Castrén, A. Ahlquist, and D. E. D. Europæus. Europæus, particularly, succeeded in finding a large number of new songs in his extended travels in 1845–48 in Karelia, Ingermanland, and among the Finns in Russia. Lönnrot having in the meantime published his collection of lyric ballads *Kanteletar* (1840), his volume of about 7,000 Finnish proverbs (1842), and a collection of riddles (1844), again turned his attention to *Kalevala*, dovetailing into it all the fresh materials found. Thus he was able to publish in 1849 the second and ultimate edition of *Kalevala*, which contains 22,805 verses, divided into fifty runes, or cantos. In this epic Lönnrot has published the songs as they were actually sung by the peasants, but selecting with great freedom the best for his purposes of the many variations at hand. Only occasionally was he obliged to add a line to complete the connection; and yet it must be said that the total effect produced by his redaction is very far from that of the songs themselves as they were found in the mouths of the popular singers. The *Kalevala*, as he left it, is a continuous epic, similar in appearance to the other great epics of the world—the *Iliad*, the *Mahâbhârata*, the *Shah-nameh*, the *Nibelungenlied*—and as such it was at first welcomed by the scholars of Europe. Jacob Grimm wrote an enthusiastic essay about it, taking this ground. (*Kleinere Schriften*, ii., p. 75, *seq.*). Max Müller said of it that it "possesses merits not dissimilar from those of the *Iliad*, and will claim its place as the fifth national epic of the world." The Finns went even further, and their poet, Runeberg, expressed their general opinion when he declared that it is perhaps superior to the *Iliad* and the *Odyssey* "in the sublimity and simplicity of its descriptions of nature." Translations of it into other European languages began at once to be made. Castrén rendered the first edition into Swedish (1835–36), and the second was translated into the same tongue by Collan (1864–68). Anton Schiefner made a line-for-line translation in the original meter into German (1852); and Léouzon le Duc rendered the work into French prose (1868). There is a version in Hungarian by Ferd. Barna (1871); one in Russian by E. Granström (1880); and in English, besides the *Selections from the Kalevala*, by J. Porter (New York, 1868), a complete translation in the original meter by J. M. Crawford (2 vols., New York, 1888). An Italian version has been

undertaken by D. Ciampoli, who has already printed two specimens (*Kanto* 8 and 50, Catania, 1890). Longfellow showed his admiration by adopting the meter and, in the main, the manner of the *Kalevala* for his own *Hiawatha*.

In spite of this outburst of enthusiasm, however, and in spite of the great beauties of the poem, it must be admitted that later studies have largely modified the first judgments upon the *Kalevala*. A closer examination of the materials used by Lönnrot, and of his manner of treating them, has made it clear that he hardly succeeded in producing a great national epic like the *Iliad*. No scholar was ever more open and highminded than he, as is shown by the fact that at his death he left the entire mass of his collections to the Society of Finnish Literature at Helsingfors, to be used by investigators as they might see fit. His work, therefore, has nothing of the suspicion attaching to it that will ever be connected with Macpherson's *Ossian*, whose originals were carefully and shamelessly destroyed. At the same time, these very collections show us that Lönnrot seemed to obtain success mainly because he was imbued with the philological theories of a certain time. These were the theories of Wolf in regard to the composition of the Homeric poems—theories that had been extended by Lachmann to the *Nibelungen*, and to popular epics in general. (See Epic Poetry.) Lönnrot imagined himself to be in the position of the Homeric ἀοιδός, or diaskeuast, into whose hands a great body of isolated epic songs had come, to be by him combined and arranged as he might see fit. To be sure, he seemed to be borne out in this notion by the fact that the Finnish popular singers whom he heard did allow themselves considerable freedom in varying and rearranging their material; but these poets were far from going so far as he did. Their variations took place within very definite cycles of songs, dealing with quite distinct matters; and when Lönnrot combined these matters into one whole, interweaving also magic formulas, incantations, marriage songs, etc., he did what no popular singer had ever thought of doing. Even so, he did not succeed in giving real unity to his work; and the great difference between the *Kalevala* and the *Iliad* is that the former has no single theme running through it, and therefore can not be called an organic whole. In popular song, the story of Väinämöinen and the making and theft of the magic *Sampo* had nothing to do with the story of Lemminkäinen or with that of Kullervo, much less with those of Aino, Kyllikki, and Mary, the mother of Christ. This original diversity, in spite of all Lönnrot's efforts, still appears in the *Kalevala*. As has well been said, no one can answer the question, "What is the subject of the poem?" The theory that it is the longstanding rivalry between the Finns and Lapps, though often advanced, and though it was very likely in Lönnrot's own mind, is too slight to bear serious examination, and has now been abandoned by the best scholars.

The first to undertake an examination of the materials composing the *Kalevala* was von Tettau, in his book *Ueber die epischen Dichtungen der finnischen Völker, besonders die Kalevala* (1873), which, though containing much just and valuable criticism, was based upon altogether inadequate documents. After Lönnrot's death (1884), however, scholars felt greater freedom in dealing critically with his work, and, as has been said, had through his own highmindedness greater opportunities for doing so. The new opinions that had gradually been forming themselves received authoritative expression in the remarkable work of Julius Krohn, *Suomalaisen Kirjallisunden historia. Ensimm. Osa, Kalevala* (History of Finnish Literature, pt. i., *The Kalevala*, 1885. Cf. for portions of this in German and Swedish, *Zeitschr. f. Völkerpsychologie*, xviii. (1888), p. 59, *seq.*; *Zeitschr. f. Volkskunde*, i., 117, *seq.*, and 209, *seq.*; *Finsk Tidskrift*, xxi. (1886), 99, *seq.*, 177, *seq.*, 241, *seq.* A translation of the whole work into Swedish—*Finska litteraturens historia*—appeared in 1891; a German translation is in preparation). The same scholar also incited the Society of Finnish Literature to undertake the task of printing the mass of documents necessary for the scientific study of the *Kalevala*. These began to appear in 1888 with the title *Kalevalan Toisinnot* (Variants of the Kalevala), *etc.*, Helsingfors, edited by Krohn. Since his death (1888), his labors have been taken up by a band of Finnish scholars, chief among whom are his son, Kaarle Krohn, A. Borenius, R. Hertzberg, O. Donner, A. Genetz, and Palmén.

The best edition of the *Kalevala* is by F. W. Rothsten (3d ed. Helsingfors, 1887). See also A. Ahlquist, *Kalevalan textin tutkimusta ja tarkastusta* (Helsingfors, 1886); *id.*, *Elias Lönnrot biografiskt uttkast* (*ibid.*, 1884); K. Krohn, *Histoire du traditionnisme en Finlande* (in *Tradition*, vol. iv., 1890); Palmén, *L'œuvre demi-séculaire de la Société de Littérature finlandaise et le mouvement national en Finlande de 1831 à 1881* (Helsingfors, 1882); J. Krohn and A. Borenius, *Kalevalan esityöt* (First Attempts at the Kalevala, Helsingfors, 1891, *seq.*); Comparetti, *Il Kalevala o la poesia tradizionale dei Finni* (Rome, 1891, the basis of the present article). R. B. Anderson and A. R. Marsh.

Kalevipoeg, kä'lā vē-poog (The Son of Kalev): the national poem of the Esthonians. The material of which the poem is made consists of popular songs, which Kreutzwald, imitating the success of Lönnrot's Kalevala (*q. v.*), threw into the form of a continuous epic (1857–59). The poem consists of twenty cantos, and is far less interesting than the *Kalevala*. Its chief importance, indeed, may be said to consist in the light it throws upon difficult questions concerning the latter; and even here its value is greatly diminished by the fact that Kreutzwald destroyed his manuscript materials after writing the poem. It is therefore very difficult to determine what portions of the work repose upon genuine popular tradition and what upon Kreutzwald's own fancy. The text with German translation has been published by Karl Reinthal (*Kalewipoeg, eine estnische Sage, verdeutscht von K. R.*, Dorpat, 1859–61). See Schiefner and Wiedemann, in *Bullet. de l'Acad. de St.-Pétersbourg* (ii., 1860, p. 273, *seq.*); Schiefner, in *Mélanges Russes* (iv., p. 126, *seq.*); Schott, in *Abhandl. d. Akad. d. Wissensch. zu Berlin* (1862); Blumberg, *Quellen und Realien des Kalewipoeg* (in *Verhandl. d. gel. est. Gesellsch.*, Dorpat, v., 1869, p. 16, *seq.*); Hurt, *Vana Kannel, etc.* (Ancient Lyre, a Complete Collection of Ancient Esthonian Songs, Dorpat, 1886). A. R. Marsh.

Kal'gan, called in Chinese *Chang-kia-kow*: a walled city of Chih-li, China, 125 miles N. W. of Peking; at the foot of the Great Wall, on the Mongolian frontier, and on the regular caravan route from Peking to Urga and Kiachta (see map of China, ref. 3–J). Population variously estimated from 70,000 to 100,000, including several missionaries and Russian merchants. Kalgan has little trade of its own, but has a large transit trade, being the terminus of transportation from the north as well as the south. M. W. H.

Kalguev', or **Kolguev**: an island in the Arctic Ocean, belonging to the government of Archangel, Russia; in lat. 69° N., and 75 miles N. E. of Kanim peninsula. Area, 1,350 sq. miles. It is inhabited only by a few Samoyed families, but visited each summer by a great number of fowlers on account of the multitude of eider-ducks, swans, and geese which breed here, whose feathers and eggs are very valuable.

Kalidasa [Sanskr. *kālidāsa-*, servant of *Kālī*; *Kālī-*, name of the goddess Durgā + *dāsa-*, slave]: the greatest poet of the second or classical epoch of Sanskrit literature. The age in which he lived can not be determined with certainty. He is placed by Georg Huth, *Die Zeit des Kālidāsa* (Berlin, 1892), in the sixth century of our era. Three dramas—*Sakuntalā*, *Vikramorvaçī*, and *Mālavikā and Agnimitra*—and three poems—*Meghadūta*, *Raghuvança*, and *Kumāra-sambhava*—are extant, which are ascribed to him with certainty or the greatest probability. The best, and by far the most celebrated, of his works is his drama *Sakuntalā*, translated into English by Sir William Jones (Calcutta, 1789); by Monier-Williams (Hertford, 1855, etc., and New York, 1885). The drama *Vikramorvaçī* was done into English prose by E. B. Cowell (Hertford, 1851). The *Meghadūta* was translated into English verse by H. H. Wilson (2d ed., London, 1843). For the plays, see H. H. Wilson's *Hindu Theatre* (2 vols., 3d ed., London, 1871); text of *Sakuntalā* by R. Pischel (London, 1877); of *Meghadūta* by A. F. Stenzler (Breslau, 1874). C. R. Lanman.

Kalikat: See Calicut.

Kalisch, kaa'lish, David: journalist and playwright; b. of Jewish parentage at Breslau, Germany, Feb. 23, 1820: entered a business career, but afterward turned to literary pursuits, going in 1844 to Paris, where he became correspondent for several German papers. In 1846 he returned to Germany, lived at Leipzig, and finally went to Berlin, where he founded, in 1848, the famous humorous weekly *Kladderadatsch*, which became an eminent factor in the political life of Germany. He also wrote a number of witty farces, which are still played with success on German stages. Among these farces may be mentioned *Hunderttausend Thaler, Berlin bei Nacht, Doctor Peschke, Ein gebildeter Hausknecht, Einer*

von unsre Leut', *Berlin wird Weltstadt*, etc. The songs from these farces and from *Kladderadatsch* have been collected under the title *Berliner Leierkasten*. D. in Berlin, Aug. 21, 1872. JULIUS GOEBEL.

Kalisch, MARCUS, Ph. D.: religious writer; b. of Jewish parentage at Treptow, Prussia, May 16, 1825; studied in Berlin; in 1849 went to England and began the preparation of his critical but rationalistic commentary on the Old Testament, of which the volumes on Exodus (London, 1855), Genesis (1858), and Leviticus (1867–72, 2 vols.), only appeared. His other publications are a Hebrew grammar (1863); *Leben und Kunst* (poems, 1868); studies on *Balaam* (1877), and on *Jonah* (1878); *Path and Goal, a Discussion of the Elements of Civilization and the Conditions of Happiness*, a treatise on religious systems (1880). D. at Rowsley, England, Aug. 23, 1885.

Kalisz, kaa'lish: city of Russia, in the government of Kalisz, on the Prosna; 135 miles W. of Warsaw (see map of Russia, ref. 8–A). It is one of the oldest Polish cities, situated in a fertile and well-cultivated region, has a castle, a teachers' institute, a gymnasium, theater, and public park, is the seat of a Roman Catholic bishop, and carries on an extensive trade. Its antiquity is proved by the great quantity of coins and other ancient relics which have been found here. Augustus the Strong gained here, Oct. 29, 1706, a decisive victory over the Swedish general Mardefeld. Pop. 20,280.

Kali-yuga: in Hindu mythology, the fourth or present age of the world. It commenced in 3102 B. C., and will endure for 432,000 years.

Kalkas'ka: village (founded in 1873); capital of Kalkaska co., Mich. (for location of county, see map of Michigan, ref. 4–I); on the Gr. Rapids and Ind. Railroad; 137 miles N. of Grand Rapids. It is in an agricultural and lumbering region, and has 4 Protestant churches, a graded public school, sawmills, planing-mills, and wood-working factories, and 2 weekly newspapers. Pop. (1880) 496; (1890) 1,161; (1894) 1,247. MANAGER OF "KALKASKIAN."

Kalm, kaalm, PETER: botanist; b. in East Bothnia, Sweden, in 1715; was educated at Åbo and Upsala; traveled extensively in Europe; was sent by the Swedish Government, at the instance of his friend Linnæus, to North America, where he traveled 1748–51; returned to Åbo, where he was botanical professor, and published (1753–61; in English 1772) an account of his American travels. He also published a large number of works on natural science and other subjects. D. Nov. 16, 1779.

Kal'mar, or **Calmar**: an old, interesting, and well-built town of Sweden; on an island in Kalmar Sound, and connected with its suburbs on the mainland by a long stone bridge (see map of Norway and Sweden, ref. 13–F). It has a good harbor, considerable trade, and manufactures. In its old castle, now decayed, the treaty was signed in 1397 by which Queen Margaret of Denmark united the three Scandinavian kingdoms, Sweden, Norway, and Denmark, under one crown. Louis XVIII. and Charles X. of France lived here during their exile. Pop. (1891) 11,772.

Kal'mia [named in honor of Peter Kalm]: a genus of shrubs of the family *Ericaceæ*, evergreens and natives of North America. The U. S. has five species, of which the mountain laurel, spoon-wood, or calico-bush (*K. latifolia*) is the best known. It is a large, handsome shrub, with beautiful flowers, highly ornamental in cultivation. The leaves of *K. angustifolia* are supposed to be very poisonous to sheep. They have been employed in medicine.

Kalmucks: See CALMUCKS.

Kalousek, kaa'lō-sek, JOSEF, Ph. D.: historian; b. at Vamberk, Bohemia, Apr. 2, 1838; studied at the University of Prague; became docent in 1871, and is now regular Professor of History. His main work is *České státní právo* (Bohemian Constitutional Law, Prague, 1871 and 1892), being a history of the Bohemian constitution. He also wrote a defense of St. Wenceslas, a history of Charles IV. (*Karel IV., otec vlasti*, 1878), a history of the chalice in pre-Hussite times (1881), and a number of historical and literary essays. In 1874 he published a map of *Bohemia in the Fourteenth Century*, and 1874–77 edited the *Památky archæologické a místopisné*. J. J. KRÁL.

Kalpa: in Hindu mythology, a day and a night of Brahmā, or 4,320,000,000 mortal years. See BRAHMA.

Kal'pi (variously written also *Kalpee*, *Calpi*, *Culpee*): a city of India; in Bundelcund, on the right bank of the Jumna; in lat. 26° 7′ N., lon. 79° 28′ E. It is 46 miles S. W. of Cawnpore (see map of N. India, ref. 6–F). Paper and refined sugar of superior quality are made here. Kalpi was conquered by the British in 1803. In May, 1858, it was captured by Gen. Rose from the mutinous Sepoys, who had made Kalpi one of their headquarters. The navigation of the Jumna river is commanded by the fort of this city. Pop. (1881) 14,306.

Kalu'ga: government of European Russia, bounded by Smolensk, Moscow, and Tula. Area, 11,942 sq. miles. The ground is low, surface flat, soil stony and not fertile. The country is largely covered with forests. Rye and oats are the common crops; flax and hemp are extensively cultivated; distilling and manufactures of linen are the chief industries. Pop. (1886) 1,199,882.

Kaluga: town of European Russia, the capital of the government of Kaluga; on the Oka; 76 miles by rail N. W. of Tula (see map of Russia, ref. 7–E). It has very important manufactures of sailcloth and leather, and an extensive trade in corn. Pop. (1886) 40,252.

Kama, kaa'mää: a river of European Russia, which rises in the government of Viatka, and flows through Perme, Orenbourg, and Kasan, where, after a course of 1,100 miles, it joins the Volga. It is navigable 40 miles from its source, and forms a very important line of traffic.

Kamaku'ra: a village in Japan, on the seacoast; 12 miles E. of Yokohama; once a famous city, and the seat of the early shoguns, or military governors of the empire (see map of Japan, ref. 6–E). It was founded by the shogun Yoritomo, representative of the Minamoto family, who died in 1199 A. D., a notable general and the organizer of military feudalism. When the Ashikaga shoguns established themselves at Kioto, in 1338, Kamakura remained the capital of the north, known as Kuanto; but in the middle of the fifteenth century it began to dwindle in importance. The temple of Hachiman, the Japanese god of war, in Kamakura, still retains its popularity, and contains some valuable relics of mediæval times. Not far off is situated the gigantic bronze statue of Daibutsu, probably over eight centuries old. It is 49 ft. 7 in. high; the thumbs are 3 feet in circumference, the eyes 4 feet in length, and of pure gold. About 3 miles from Kamakura lies the famous island of Enoshima, with a cavern where the goddess Benten is worshiped. J. M. DIXON.

Kamba'lu. Kamba'luc, or **Camba'luc** (in Mongol. *Khanbaligk*, city of the khan or emperor): the capital of China, and the residence of the Mongol emperors from 1234 to 1368, when the Yuen or Mongol dynasty was superseded by a purely native one called Ming. It was rectangular in shape, and corresponded in part with that portion of the present city of Peking which is known as the "Tartar City." (See PEKING.) Kambalu was visited and described by Marco Polo and other Europeans in the thirteenth century. Here Friar John of Montecorvino established a flourishing mission, and was created Archbishop of Khan-baligk with patriarchal authority by Pope Clement V. in the year 1314. See CATHAY. R. L.

Kamchat'ka: a large peninsula of Southeastern Siberia, 850 miles long, and at its greatest width 250 miles broad; extending between the Sea of Kamchatka and the Sea of Okhotsk, and terminating in a long, narrow tongue forming Cape Lopatka. It is traversed from N. to S. by a range of volcanic mountains whose craters mostly are extinct, though Klinchevskaia, 16,152 feet high, was seen in full activity in 1854. The soil is generally stony, though there are fertile valleys, especially that along the river Kamchatka. But even here the land is unfit for agriculture on account of the severity of the climate. The winter lasts nine months, and frost is not rare in the summer; there are forests of birch and pine trees. The inhabitants, from 5,000 to 6,000, are Kamchadales, Koryaks, and Lamuts, who live by hunting and fishing. Bears, sables, foxes, otters, beavers, seals, and salmon abound. The only domestic animal is the dog, a peculiar species, large and strongly built. Russians made their first settlements in the country in the sixteenth century, and in 1855 it was incorporated with the Maritime Provinces. The principal town is Petropaulovski, on the east coast, in lat. 53° N., built on the shores of one of the finest natural harbors in the world. Karl von Ditmar, geologist, spent five years (1851–55) studying Kamchatka, and part i. of his work was published (1892) by the Academy of Sciences, St. Petersburg. Revised by C. C. ADAMS.

Kamee'la, or **Kama'la** [from Hind. *kamīla*, kameela]: a drug consisting of a red-brown powder from the capsules of *Rottlera tinctoria*, a small euphorbiaceous tree of India, China, and Australia. It is used in medicine for killing the tapeworm, which it usually accomplishes with great promptitude. It is a smart cathartic, and is used for skin diseases. In India it is extensively used as a dyestuff, making a deep-red color.

Kame'hame'ha: the name of several kings of the Hawaiian (or Sandwich) islands.—Kamehameha I., the conqueror and first king of the entire group, succeeded in 1781 to the head-chiefship of a part of the island of Hawaii. With the advantage of some foreign-built vessels and the aid of firearms in the hands of a few Europeans, he soon conquered the other chiefs of that island, and one after another the other islands fell under his sway, so that in 1811 he was the acknowledged sovereign of the group. As a ruler he was vigilant and strict, placing authority only in trustworthy hands, and keeping near his person and under control those conquered and rival high chiefs from whom he had the most to fear. His friends and favorite warriors were liberally rewarded, and his enemies, if spared, closely watched. He valued the superior knowledge and skill of white men, and kept several employed as mechanics, etc. He died on May 8, 1819, a few months before Christian missionaries sailed from Boston for his country. By his queen of highest rank, Keopuolani, he left two sons and one daughter.—Kamehameha II. (Liholiho), his eldest son, did not inherit the best qualities of his father. He was intemperate and given to pleasure; but by abolishing idolatry and the more oppressive taboos he prepared the way for the missionaries, who were treated with consideration when they landed in 1820. The king afterward professed the Christian faith, attended public worship, and recommended the new religion to his people. Fearing that he might not be able to retain control of his kingdom, he desired to secure the friendship and protection of the King of Great Britain. In Nov., 1823, he sailed for England with his favorite queen (Kamamalu), a few chiefs, and servants. They were well received, but died soon after their arrival in London, July, 1824. Their remains and their suite were returned to their island-home in a British frigate.—Kamehameha III. (Kavikeaouli), called Kamehameha the Good; brother of Liholiho; b. in 1814; ascended the throne in 1833, the kingdom having been governed by a regency since 1823. He was educated by the American missionaries. Correcting the careless habits of his youth, he became a wise and benevolent ruler. In 1840 he gave his people a written constitution and a simple code of laws, and in 1852 revised the constitution, introducing very liberal provisions. The independence of his government was acknowledged by the U. S. in 1842, and by Belgium, Great Britain, and France in 1844. With the concurrence of the chiefs he gave in 1848 lands in fee simple to the common people, so that nearly all heads of families were landholders. Treaties were made with the U. S. and with several European countries, and great progress was made in education, civilization, agriculture, and commerce. The king adopted as his heir and successor his youngest nephew, Alexander Liholiho. In the winter of 1843 Lord George Paulet forced him to cede the islands to Great Britain, but Admiral Thomas, commander-in-chief of the squadron, restored the flag and sovereignty July 31, 1843. In 1846 a new code, establishing a more systematic government, with courts of various grades, was promulgated. The more responsible offices were filled by foreigners. He died Dec. 15, 1854, at the age of forty years, childless, and his adopted nephew succeeded him.—Kamehameha IV. (Alexander Liholiho): b. Feb. 9, 1834; succeeded his uncle in Dec., 1854. In 1849–50 he and his elder brother, Lot Kamehameha, had visited the U. S., Great Britain, and France. June 2, 1856, he married Emma, adopted daughter of Dr. T. C. B. Rooke. He took an active interest in the introduction and progress of the Reformed Catholic Mission. The Queen's Hospital in Honolulu was established in 1860 by the aid of subscriptions solicited by him in person, and he kept up a deep interest in it to the end of his life. D. Nov. 30, 1863.—Kamehameha V. (Lot Kamehameha): b. Dec. 11, 1830; succeeded his younger brother Nov. 30, 1863. He had been Minister of the Interior and commander-in-chief of the forces. On coming to the throne he declined to take the oath to the constitution of 1852, considering it not binding upon him to do so, and that the constitution was too democratic for the good of his people. In 1864 he called a convention of the nobles and delegates of the people to make a new constitution, but disagreeing with the third estate, and believing the opposition to be factious and unreasonable, he dissolved the convention, granted a constitution of a less democratic character than the old, and took the oath to support it. Although this was apparently satisfactory to the mass of the people, it alienated the more democratic and progressive part of the foreign population. His energy and his disposition to engage in trade and speculation, for which he had not been trained, did not increase his estate, and in the latter part of his life he had the reputation of being avaricious and grasping. Partly out of regard for the memory of his brother, and also from a real interest in good morals and education, he gave liberal aid to the Reformed Catholic Mission and its schools. He was never married, and left no heir to the throne. On his deathbed he requested his kinswoman, Mrs. Bernice Pauahi Bishop, to become his successor, but she declined, and he expired soon after, without making any appointment according to law. D. Dec. 11, 1872. See Hawaii-Nei. Revised by F. M. Colby.

Kameke, kaa'me-ke, Georg Arnold Carl, von: Prussian general; b. June 14, 1817; entered the military service in 1834; in 1850 was made a captain in the staff; and from 1856–58 was military *attaché* to the Prussian ambassador at Vienna. He was then created a lieutenant-colonel, and appointed chief of the engineering department of the ministry of war. In 1861 he received the command of a regiment of infantry, in 1863 became chief of staff of the Eighth Army-corps, and in 1865 major-general and chief of staff of the Second Army-corps. In this position he took part in the war of 1866 against Austria, and received the decoration *pour le mérite*. In 1867 he was made inspector-general of the engineering corps and the fortresses, and in 1868 lieutenant-general. In the war of 1870–71 with France he first commanded the Fourteenth Infantry division, occasioned the battle of Saarbrücken (Aug. 6, 1870), and took part in the battles of Aug. 14, 16, and 18. On the surrender of Metz he was ordered to take Thionville, and lay siege to Mezières and Longwy, and then to Paris to superintend the works during the siege. Minister of war 1873–83. D. Oct. 12, 1893.

Kamen'etz Podolsk': town; in the government of Podolia, Russia; on the Smotritza, near the Austrian frontier; 40 miles N. E. of Czernowitz (see map of Russia, ref. 9–B). It is beautifully situated, fortified, has a Roman Catholic cathedral, an Armenian church, and several Greek Orthodox churches and monasteries. Pop. 36,630.

Kamenz: See Camenz.

Kamerun: a German protectorate in Guinea. See Cameroons.

Kames: See Drift.

Kames, Henry Home, Lord: philosopher and jurist; b. at Kames, Berwickshire, in 1696; was educated at Edinburgh, and passed advocate in 1724; became a judge of the court of session, with the title of Lord Kames, 1752, and in 1763 became a lord of justiciary. He published several legal works, chiefly volumes of decisions and the like, but his fame mainly rests upon the *Principles of Morality and Natural Religion* (1751), and especially on the *Elements of Criticism* (1762), a work which once had a wide influence. D. in Edinburgh, Dec. 27, 1782.

Kaministiqui'a: a river of Thunder Bay district, Ontario; one of the largest tributaries of Lake Superior, coming in from the N. W. at Fort William, Thunder Bay. This is a very picturesque stream, and about 25 miles from Fort William are the beautiful falls of Kakkabeka. The river formerly afforded the northern canoe route to Rainy Lake and the Northwest, and the Northern Pacific Railway now passes up its valley. M. W. H.

Kam'loops: a town of British Columbia; on the Canadian Pacific Railway; at junction of Clearwater and Thompson rivers. It is the supply-point for a large district to the S. Pop. about 2,000.

Kampen, kaam'pen, Nikolaas Godfried, van: historian; b. at Haarlem, Holland, May 15, 1776; was apprenticed in a bookstore, but devoted himself with great zeal to the study of languages and history; became professor at the University of Leyden 1816. Author of *Geschiedenis van de fransche heerschappij in Europa* (Leyden, 1815–23); *Geschiedenis der Nederlanders buiten Europa* (Haarlem, 1831–33), and other works. D. at Amsterdam, Mar. 14, 1839. See the *Biography* by S. R. van Campen (London, 1887).

Kämpfer, Engelbrecht: See Kaempfer, Engelbert.

Kampootcha: See Cambodia.

Kamp'ti, or **Kamti**: a city of the Central Provinces, British India; 8 miles N. E. of the city of Nagpur (see map of N. India, ref. 8–E). It was established in 1821, and has gradually grown up around a British cantonment. It is one of the most important civil and military centers of the Central Provinces, has an important trade, 5 mosques, and 70 Brahmanic temples. The foreign quarter has schools and churches, with a population of about 2,500. Total population, 56,930. M. W. H.

Kamptu'licon [from Gr. *καμπτός*, bent, flexible, deriv. of *κάμπτειν*, bend + *οὖλος*, thick, close-matted]: a sort of floor-covering composed of gutta-percha and caoutchouc (or linseed oil), mixed with naphtha and powdered cork, and rolled into sheets, which are calendered, dried, and painted or printed in imitation of floor-cloths. It is expensive, but warm, noiseless, and waterproof. It is not durable.

Kamptz, kaampts, Karl Albert Christoph Heinrich, von: statesman; b. at Schwerin, Mecklenburg, Sept. 16, 1769; studied jurisprudence at Göttingen, and held from 1790 to 1830 different judicial positions in Mecklenburg and Prussia. From 1830–42 he was Prussian Minister of Justice, and contributed very much, both by his writings and by his practical measures, to harmonize the different legislation of the several divisions of the Prussian state; but his bearing toward the liberal movements of his time was arbitrary and odious. The students burned his *Codex der Gendarmerie* at Wartburg in 1815. D. at Berlin, Nov. 3, 1849.

Kampveer: See Campveer.

Kamrup', or **Camroop'**: a district of the Brahmaputra valley division, Assam, British India; between the Himalayas and the Khasia hills; the remnant of the ancient Kamrup kingdom mentioned in the *Mahâbhârata*. Area, 3,631 sq. miles. Pop. 650,000. It falls into three distinct zones—1, that of the Himalayan foot-hills, occupied by the dense forests and impenetrable morasses of the Terai; 2, that of the center, traversed by the Brahmaputra, and devoted to rice-culture; 3, that of the south, on the Khasia hills, and devoted especially to the cultivation of tea. The capital is Gowhatty, on the Brahmaputra river. M. W. H.

Kanaga'wa: town and prefecture of Japan; situated on the west shore of Yedo Bay (see map of Japan, ref. 6–E). The town lies along the Tokaido, the main highway between the two capitals, and is 16 miles from Tokio. Formerly of importance as a halting-place and as a port, it was the first port opened (1859) to foreign trade. Yokohama, 2 miles across what was then a bay, but is now closed in, actually became the port, although Kanagawa nominally remains so. Near Kanagawa is the spot where Urashima, the Japanese Rip Van Winkle, is said to have been buried. Pop. of town, 10,600; of prefecture, 873,914. J. M. Dixon.

Kanakas, kăă-naa'kas [Hawaiian, *Kanaka*, indigenous, autochthone]: name applied, usually in contempt, to the natives of Polynesia, more especially to those of the Sandwich islands.

Kan'ara, or **Can'ara**: a narrow strip of territory in British India: between the Arabian Sea and the Western Ghats, or from 12° 11′ to 15° 30′ N. It varies in breadth from 6 to 60 miles. It is divided into two parts administratively. North Kanara is in the Bombay presidency; area, 3,911 sq. miles; pop. about 430,000. South Kanara is in Madras; area, 3,902 sq. miles; pop. 965,000. The surface is much the same in both districts. It is low and sandy near the coast, but becomes rugged and mountainous in the interior. The coast is irregular, with many small harbors. The port of Honavar is the capital of North and Mangalur of South Kanara. The principal production is rice, and on the mountains are very fine forests of teak. Among the other productions are pepper, betel, and sugar-cane. The population is mostly Dravidian, who speak the Kanara language in the north and center, the Tuluva in the south. In religion they are Brahmans, Mohammedans, Jains, Christians, and Jews. The Christians are in part descendants of the old Portuguese colonists, in part recent converts.
Mark W. Harrington.

Kánaris, kaa'năă-ris, Constantine: naval hero; b. in the island of Ipsara, Greece, in 1790, and commanded a small merchant vessel when the war of independence broke out. His exploits soon made his name known to the whole civilized world. On June 19, 1822, he burned a Turkish squadron in the canal of Chios; on Nov. 22 another in the harbor of Tenedos; on Aug. 17, 1824, a third at Cape Trogilion. In 1825 he conceived the bold idea of burning the Egyptian fleet which lay at anchor in the harbor of Alexandria, ready to convey the troops of Mehemet Ali to Peloponnesus. The attempt failed, however. On Aug. 5 the fire-ships were actually launched, but at the same moment the wind turned and drove them away from the Egyptian vessels. Kánaris wished to make a new attempt the following day, but for some unknown reason the plan was not executed. In 1826 he commanded the frigate Hellas, and in 1827 a whole squadron, with which he drove the Turkish flag out of the Greek waters. Under King Otho and King George he was constantly a member of the Greek Diet, and held the office of Minister of War several times, though generally only for a short time. In 1851 King Otho attempted to buy off his opposition by a pension and the title of admiral, but failed. In 1865 he was appointed inspector-general of the Greek navy. D. at Athens, Sept. 14, 1877.

Kanawha Court-house: See Charleston.

Kanawha River: See Great Kanawha River.

Kanazawa, kăă-năă-zaa'wăă: the name of several towns of Japan, of which the most important is the chief town of Kaga, on the west coast, just S. of the promontory of Noto; formerly the castle-town of Mayeda, one of the wealthiest and most powerful daimios of the empire; now capital of Ishikawa prefecture (see map of Japan, ref. 6–C). The castle is a military headquarters. The public gardens are particularly fine; near them are the potteries where the highly prized red and gold porcelain known as Kaga-ware is made, Kanazawa possesses one of the five higher middle schools, and several foreign missions have stations in the city. The harbor is 5 miles off. Pop. 97,653. J. M. Dixon.

Kandahar: See Candahar.

Kandy, or **Candy**: town of Ceylon; situated nearly in the center of the island; on an elevation 1,713 feet above the sea (see map of S. India, ref. 8–F). It has many Christian churches, Buddhist temples, and Mohammedan mosques. Close by is a beautiful artificial lake. Pop. (1891) 20,252.

Kane: borough (1886); McKean co., Pa. (for location, see map of Pennsylvania, ref. 2–D); on the Brad., Bord. and Kinzua, the Penn. and Erie, and the Pitts. and W. railways; 95 miles E. S. E. of Erie, and 2,100 feet above tide. It is in an oil, lumber, and natural gas region, and is a popular summer resort. It has 3 planing-mills, 2 glassworks, and has butter-dish, wooden-bowl, and other factories, and extensive industries in the neighborhood. It has a good water-supply and sewerage, 2 banks, 9 churches, 3 large public-school buildings, a parochial school, 1 daily, 1 weekly, and 1 semi-monthly periodical. Pop. (1890) 2,944; (1897) estimated, 6,000.
Editor of "Republican."

Kane, Elisha Kent, M. D.: explorer and scientist; b. in Philadelphia, Feb. 3, 1820; was the son of Judge J. K. Kane, of that city. He was educated at the University of Virginia; took his medical degree in 1842; entered the navy; was physician to the Chinese embassy; traveled in Asia, the Levant, and Western Africa; served in the Mexican war, in which he was severely wounded; sailed in 1850, under de Haven, in the first Grinnell expedition in search of Sir John Franklin; commanded the second Grinnell expedition (1853–55), and reported erroneously that he had discovered an open polar sea. For this expedition he received several gold medals and other distinctions. (See Polar Research.) His health, always delicate, was impaired by the sufferings of this expedition. He published a narrative of his first polar expedition (1853), and of his second (2 vols., 1856). D. at Havana, Feb. 16, 1857. A volume of his personal letters was published by his wife, Margaret Fox. See his *Life* by Dr. W. Elder (1858). Revised by C. C. Adams.

Kane, Sir Robert, M. D., LL. D., F. R. S.: chemist; b. in Dublin in 1810: Professor of Chemistry in Apothecaries' Hall; founder and (1832–34) editor of the Dublin *Journal of Medical Science*; was 1834–47 Professor of Natural History to the Royal Dublin Society; for a time was president of Queen's College, Cork; resigned this position in 1873; was knighted in 1846. He belonged to numerous learned societies, was the recipient of many honors, and was author of the *Elements of Chemistry* (1842) and the *Industrial Resources of Ireland* (1845). D. Feb. 16, 1890.

Kangaroo' [from native Australian name, *kanguroo*]: a name given to numerous species of marsupial or pouched animals belonging to the family Macropodidæ (*q. v.*), but

more especially to the large species of the genus *Macropus*. They are found in Australia chiefly; also in Tasmania, New Guinea, and a few of the adjacent islands. The kangaroo was first made known by Capt. Cook, who on landing at

Kangaroo.

New South Wales was astonished at the sight of what was at first regarded as a new and very peculiar species of greyhound. The kangaroo is characterized by a remarkable disproportion between the anterior and posterior extremities, and particularly by the presence in the region of the abdomen of a curious pouch, within which are the mammæ. The male is without this development. The head is small and resembles that of the deer, having the same mild and placid expression, as well as delicate shape. The hind feet are provided with four toes, the middle one being much larger than the others, of great strength, and provided with a hoof-like claw. An examination of these stout and extremely long hind limbs show how well adapted they are to aid the creature in its wonderful leaps. The tail, which is also very stout and strong, serves as a sort of third hind leg when the animal is at rest, but, contrary to the popular idea, is of use only as a balancing pole when the kangaroo leaps. The fore legs are very short, and are provided with bent claws with which they hold food when eating. Kangaroos have no canine teeth; their incisors are six in the upper jaw, and but two in the lower. The molars are ten in number in each jaw, and are separated from the incisors by a long space. They are exclusively herbivorous in diet, associating in small herds under the guidance of older males. They vary in size greatly, some species being about the dimensions of a rat, while others are known to measure 8 feet from the nose to the tip of the tail, and to weigh over 200 pounds. The young are produced in a very imperfect state, being in the largest species not more than 2 inches long at birth. The new-born are conveyed by the mouth to the pouch, where they attach themselves to the teats, which they do not leave until able to walk. These animals are easily tamed, and are harmless and timid, though when brought to bay in the wild state they fight with great power, using their tail and hind feet. The flesh of the kangaroo is esteemed a delicacy in regions which they inhabit. See also MARSUPIALIA. Revised by F. A. LUCAS.

Kangaroo-rat: a name given to the small North American rodents of the genus *Dipodomys* and allied genera from their habit of sitting erect and progressing, like kangaroos, by a series of leaps. It is also applied to the little kangaroos of the genus *Hypsiprymnus* on account of their small size, although a more correct term would be rat-kangaroo. F. A. L.

Kan'gra: district and city of the Jalandar division of the Punjaub, British India. The district is on the southern slope of the Himalaya Mountains, between the Ravi and Bias rivers. Area, 9,069 sq. miles. The lower parts are devoted to rice and the sugar-cane; in the middle altitudes there is a temperate climate and wheat, maize, and potatoes are raised. In the highest valleys it is so cold that only barley and millet are cultivated, and the most of the space is devoted to flocks. Tea has been introduced, and is successfully cultivated at the lower elevations. Pop. 735,000. The village of Kangra is 65 miles N. N. E. of the city of Jalandar (see map of N. India, ref. 4–D). It is celebrated for the fortress that commands it, and for its manufactures of enameled gold ornaments. Its importance is decreasing, as it is being gradually deserted for Dharmsala, to the N. W. Pop. 6,000. MARK W. HARRINGTON.

Kanin': a large peninsula of Arctic Russia, just E. of the White Sea; formerly an island. It is inhabited by a few Samoyeds.

Ka'nizsa, Gross-Kanizsa, or **Nagy-Kanizsa**: town of Hungary; 136 miles by rail S. W. of Budapest. It is inhabited partly by Germans, partly by Magyars, manufactures tiles and liqueurs, and carries on an import trade in corn, cattle, and wine. Pop. (1890) 21,234.

Kankakee': city; capital of Kankakee co., Ill. (for location of county, see map of Illinois, ref. 4–G); on the Kankakee river, an affluent of the Illinois, which has been improved for navigation, and on the Cleve., Cin., Chi., and St. Louis, the Ill. Cent., and the Ind., Ill., and Ia. railways; 56 miles S. of Chicago. It is on rolling prairie-land, in a rich agricultural and stock-raising region, and near extensive coal-fields and beds of bog-iron ore. It has excellent water-power for manufacturing purposes, and two quarries of valuable building-stone. The city contains numerous manufactories, the State Hospital for the Insane, public library, and a monthly, 2 daily, and 3 weekly periodicals. Pop. (1880) 5,651; (1890) 9,025.

Kankakee River: a stream flowing W. S. W. from St. Joseph's co., Ind., through English Lake and a flat marshy region. Joined in Kankakee co., Ill., by the Iroquois or Des Plaines river, it flows N. W., and pours its sluggish waters into the Illinois.

Kano': the most important town of the empire of Sokoto, in the Sudan, Africa (see map of Africa, ref. 4–D). It has large manufactures of cotton and leather. Its people are chiefly Haussas. Monteil (1892) estimates the population at 120,000. A wall 26 feet high surrounds the town, which consists of large, square adobe houses ranged in wide, clean streets. It has large trade relations with other points in the Sudan and with Constantine, Tunis, and Tripoli.
Revised by C. C. ADAMS.

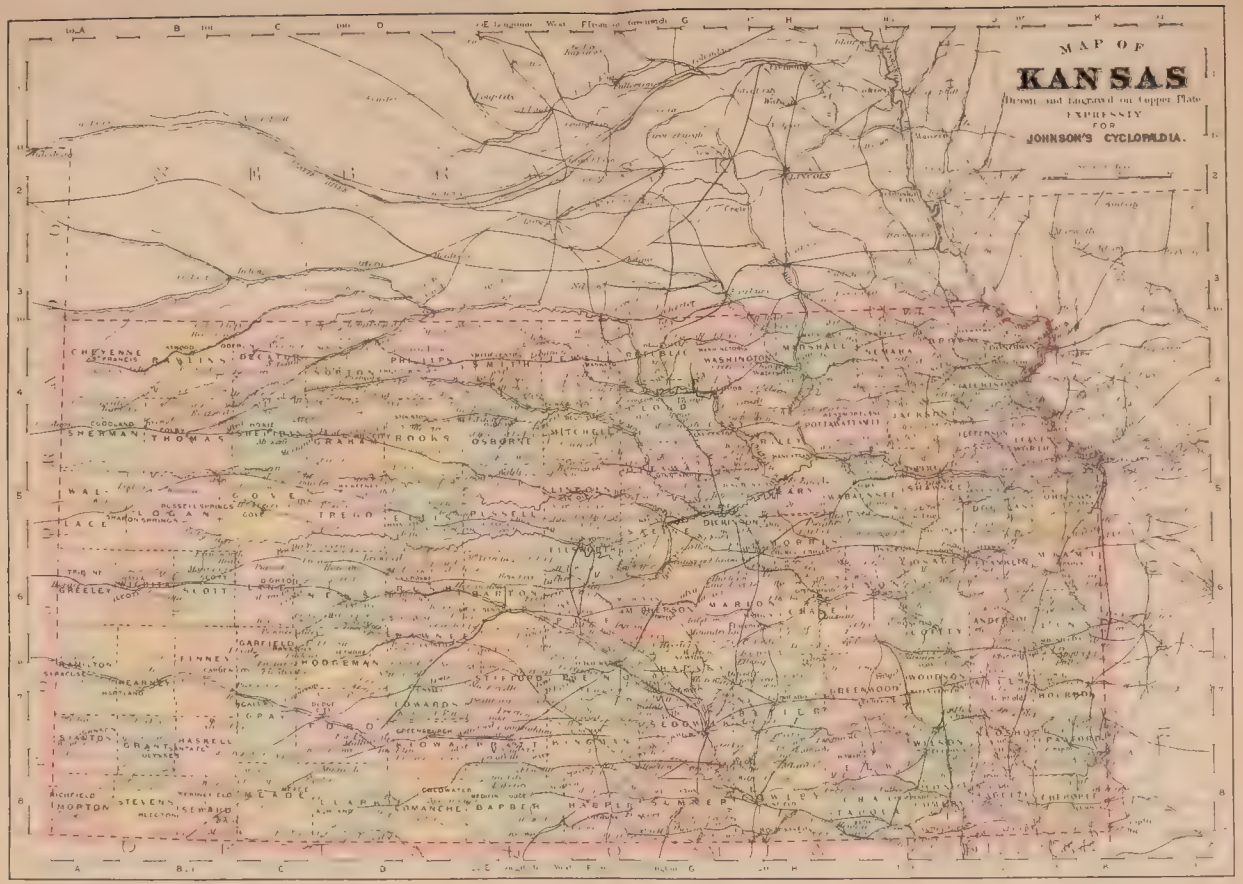
Kansa: See SIOUAN INDIANS.

Kansas: one of the U. S. of North America (North Central group); the geographical center of the U. S.; popularly known as the "Garden of the West" and as the "Sunflower State."

Situation and Area.—It lies between 94° 38′ and 102 W. lon., and 37° and 40° N. lat.; is bounded on the N. by Nebraska, on the E. by Missouri, on the S. by Oklahoma and Indian Territories, and on the W. by Colorado; greatest length from E. to W. 391–410 miles, greatest breadth from N. to S. 200 miles; area, 82,080 sq. miles (52,572,160 acres).

Seal of Kansas.

Topography.—Kansas has no mountains. It is a part of the great plains that sweep from the Rocky Mountains eastward to the Mississippi river. The surface is an undulating prairie, broken in places by narrow river-valleys. It slopes gently from the western boundary toward the E. and somewhat to the S., following the course of the rivers. The highest point on the western boundary, which is S. of the Smoky Hill Fork, is a trifle over 4,000 feet above the sea-level, although where the rivers enter the State the elevation is much less. Along the eastern boundary the elevation is about 1,000 feet, except in the river-valleys, where it is considerably less, being 750 feet at Kansas City, 800 feet at Fort Scott, and 817 feet at Chetopa, where the Neosho river cuts the southern boundary. Between the river-valleys, which are formed by erosion, are rolling prairies from 200 to 300 feet above the valleys. In the eastern part of the State there are wooded


MAP OF
KANSAS
Drawn and Engraved on Copper Plate
EXPRESSLY
FOR
JOHNSON'S CYCLOPAEDIA.

hills bordering on the valleys and in their immediate vicinity. The central portion of the State has very little timber, and the western portion has scarcely any trees except such as are cultivated. The Missouri river forms the northern third of the eastern boundary turning E. where the Kaw flows into it. The Kaw river, rising in Colorado, traverses the State N. of the center from E. to W. Its principal branches are the Solomon, Republican, Big Blue, Little Blue from the N. W., and the Smoky Hill and Saline from the S. W. The eastern and southeastern portions are watered by the Osage, which flows into the Missouri, and the Neosho, Walnut, Big Verdigris, and Little Verdigris, all tributaries of the Arkansas. In the southwestern portion of the State, the Arkansas river, entering from Colorado at lat. 38°, flows E., N. E., and then S. E., and finally S. as it crosses the southern boundary at lon. 97°. Its principal tributaries are the Cimarron, Medicine river, Chikaskia, Ninnescah, Walnut, and Pawnee Fork. None of the rivers are navigable except the Missouri, although small boats have ascended the Kaw as far as Topeka, a distance of 70 miles.

Geology.—Owing to the absence of mountains and deep gorges, and to the otherwise peculiar geological formation, the surface geology of Kansas has to do only with stratified rocks. Metamorphic rocks have been found in only two instances, once in Woodson County, by persons who were prospecting for gold, and in a drill at Paola, where a granitic rock was reached at a depth of 2,100 feet. The geology of Kansas has not been fully studied, but an approximately correct idea of the structure of the surface has been obtained. The first epoch, known as the Subcarboniferous, is represented by one well-known division called Keokuk, consisting of massive beds of limestone more or less porous, but in most instances sufficiently compact to afford good building-stone. Scattered through it are flinty nodules composed mostly of pure flint or chert. The Keokuk has a very irregular surface contour, and its outcropping area is very small. Where the limestone beds are tilted at a considerable angle, as at Galena, lead and zinc ores are found. Only a small territory in the southeastern part of Cherokee County has an outcropping of the Subcarboniferous group. The coal measures are formed of sandstone, limestone, and shales, with coal beds between them. These occupy the eastern third of the state. They are noted for the variety and amount of sandstones, many of which are used for building purposes, and for an excellent quality of flagstone. There are two measures of coal, the upper and the lower, the Leavenworth coal being of the latter, and found at a depth of 700 feet, and the Thayer coal seam in the upper coal measures. The lower coal measures are represented by eleven counties in the southeastern part, and the upper coal measures the remaining part of the coal lands of the State. The Permo-Carboniferous partakes of the nature of Carboniferous overlapped by and modified by the Permian. It includes the Fort Riley and Manhattan beds. The Permian includes the salt measures, the upper Fort Riley beds, and the Red beds. The salt measures are found in Ellsworth and McPherson Counties. They contain a little limestone, and shales which are impregnated with salt. The beds outcrop in Sumner County, while the rest of their margin is hidden. Over a large part of the area where they are known to exist, fully half of their 300 feet of thickness is solid salt. The Red beds, called so on account of the red appearance of the strata, extend from the east line of Harper, Kingman, and Reno Counties, westward over a triangular area covering about 4,000 sq. miles, and terminate at the 100th meridian. They are about 800 feet in thickness, and abound in red sandstone, and include the famous gypsum beds and gypsum hills. In the northwestern part of Barber County appear what are termed Trinity Sands, and Comanche Peak beds. They are in what is known as the Cretaceous epoch. The Cretaceous formation crosses Kansas from the N. E. to the S. W. in a very irregular tract. On the N. W. and S. it is overlapped by the Tertiary drift and loess. The Dakota group is represented by a strip through Central Kansas marked by ravines, rough sandstones, and by rounded prairie slopes. Beyond the Dakota are the Benton, Niobrara, and probably the Fort Pierre groups, the Tertiary grit, the plains marl, and finally in the northeastern corner of the State is found the glacial drift, and in the southwest are gravels, while all of the river-bottoms have more or less alluvial deposits. Kansas has become widely known among geologists for the character and number of its vertebrate fossils. The western half of the State has extensive denuded tracts of Cretaceous rocks, of the Colorado group, from which have been obtained for various museums many hundred specimens, including the remarkable toothed birds, twenty or more species of mosasaurs, several species of plesiosaurs, and numerous species of fishes and turtles. From the Lower Cretaceous or Dakota beds, in the more central portion of the State, have been obtained the most complete series of Cretaceous plants yet known, while the later Tertiary rocks in the northwestern portion have yielded many tons of mammalian remains. Although Kansas is pre-eminently an agricultural State, the mineral productions are rich and varied. The mineral resources of the State consist chiefly of lead, zinc, coal, salt, gypsum, ochers, building-stone of great variety and beauty, clays of all grades for the manufacture of fire-clay and vitrified brick, asphaltum, mineral oils, and natural gas. The following table gives the value of the products for 1892:

Lead and zinc ores	$1,000,000
Metallic ores	2,250,000
Coal	4,000,000
Building-stone	500,000
Salt	750,000
Plaster and cement	350,000
Oil and natural gas	60,000
Clays	250,000
Mineral paints	100,000
Total	$9,260,000

Lead and zinc ores are found in the extreme southeastern portion of the State in the vicinity of Galena. The ores occur in the limestone and flint rock or chert. The output of lead and zinc from Galena and Empire City for 1892 was:

Zinc ore in lb.	47,623,778;	value, $476,237.78
Lead ore "	14,376,340;	" 301,903.14

Zinc-smelting is carried on extensively at Weir City, Pittsburg, Girard, Scammon, and Galena. About one-fourteenth of all the zinc produced in the world is smelted in Kansas. Coal is found in nineteen different counties, with an aggregate annual output of 2,753,725 tons. It is all bituminous, and occurs in veins from 20 to 60 inches in thickness. The best coal bed is in the southeastern part of the State, and is known as Cherokee coal, mined chiefly in Cherokee and Crawford Counties. Crawford, Cherokee, Osage, and Leavenworth are the great coal-producing counties of the State. Kansas is well supplied with a variety of good building-stone. The principal varieties are sandstone, limestone, and a very compact limestone sometimes called marble. The limestone of the State is more abundant than sandstone, and is used in foundations for buildings and for the main structure of stone buildings. The best quality is found in the Subcarboniferous limestone in Cherokee County. The sandstones and shaly limestones are noted for their excellent flagstones, and in Cherokee, Bourbon, and other counties sandstone flags can be obtained 30 feet square and almost as smooth as a floor. These layers of rock vary from 2 to 6 inches in thickness, and are sometimes found one layer above another for a depth of 15 or 20 feet. Kansas claims to have the largest and best salt deposit in America. The south central part of the State, covering an area of about 2,000 sq. miles, is underlaid with a salt bed 300 feet in thickness. The first Kansas salt was placed in the market in 1889, when about $200,000 worth was sold, and since then the annual output has steadily increased until the sum of $780,000 was received in 1892. Rock-salt is mined at Kanopolis, Lyons, and Kingman. It is brought to the surface in large lumps, and sold in this form for stock, or is crushed and sent to the market as grain-salt. This salt is 87 to 99 per cent. pure, with an average for the mass as it is brought to the surface of over 97 per cent. A large amount of salt is produced by drilling holes in the salt and forcing water down, which is afterward lifted when fully saturated with salt and evaporated, leaving pure salt. About 1,000,000 barrels were obtained in this way in 1892. The gypsum beds have yielded a good return in plasters. There is sufficient gypsum in Kansas to supply the world's market for centuries. The principal plaster-works are located at Blue Rapids, Medicine Lodge, Hope, and near Salina. At Blue Rapids the output was 30,000 barrels in 1892. At Medicine Lodge the new American brand of Keene cement is being produced, and there was an output of 565 tons in 1892. Extensive oil-fields have been developed in Kansas, the center of which is Paola, in Miami County. Natural gas is abundant in some parts. It is in extensive use for fuel at Paola, Cherryvale, Humboldt, and Iola.

Soil and Productions.—The soil of Kansas [illegible]

of alluvium of the river-bottoms from 3 to 50 feet in depth, and the dark rich prairie soil of the uplands. In the river valleys there are upper and lower river bottoms. The extreme western portion of the State has a very light rainfall, but it yields abundantly with moderate irrigation. Irrigation is being developed rapidly, water being taken from the Arkansas river and other streams, and wells being bored and water pumped by machinery for the irrigation of small tracts. The number and species of plants indigenous to Kansas is about 2,000. With few exceptions the trees are small, found in the river-bottoms and in the territory adjacent to river-banks. The principal species are the black haw, sheep-berry, box-elder, soft maple, sugar-maple, wahoo, privet, blue ash, green ash, white ash, flowering dogwood, hackberry, basswood, mulberry, white elm, red elm, black locust, redbud, papaw, June-berry, prickly ash, water ash, downy sumac, sycamore, sand-bar willow, downy willow, black walnut, honey locust, soap-berry, Kentucky coffee-tree, Southern buckthorn, downy red haw, haw, holly, downy crab-apple, crab-apple, sassafras, persimmon, wild plum, chicasaw plum, wild black cherry, bur oak, post oak, chinquapin oak, white oak, pin oak, shingle oak, black jack, black oak, cottonwood, pignut hickory, pecan, black hickory, little shellbark hickory, big shellbark hickory, mocker nut, red cedar, and black willow. The only evergreen native to the State is the red cedar. Among notable native products is the wild sunflower, which grows luxuriantly, and has given to Kansas the name of the "Sunflower State." Native mammals include the black and brown bear, wolf, catamount or panther, two species of deer, wild-cat, opossum, raccoon, prairie wolf, antelope, two or three species of hare, several species of squirrels, field-mice, white rats, etc. Of the reptiles three species of rattlesnake, copperhead, and fifteen species of harmless snakes, and the horned toad are found, Among the batrachians are several species of frogs, toads, and lizards. The birds of Kansas are plentiful, especially in the central and eastern parts, there being 343 species which have been described by ornithologists.

Kansas is pre-eminently an agricultural State, although of its vast area of 52,572,168 acres only 18,360,260 acres are yet under cultivation. The following table shows the acreage, yield, and value of the principal crops in 1893:

CROPS.	Acreage.	Yield.	Value.
Corn	6,547,263	139,456,702 bush.	$43,231,578
Wheat	2,768,092	23,251,973 "	9,765,829
Oats	1,578,119	29,195,202 "	7,882,705
Rye	177,911	1,245,377 "	473,243
Barley	15,847	128,361 "	60,330
Buckwheat	3,675	35,648 "	25,310
Potatoes	106,091	4,668,004 "	3,687,723
Hay	3,339,282	4,374,459 tons	20,516,213
Totals	14,536,280		$85,642,931

The farm animals in Jan., 1894, comprised 950,564 horses, value $38,421,979; 97,019 mules, value $5,182,029; 668,914 milch cows, value $12,140,789; 1,978,322 oxen and other cattle, value $32,713,134; 323,392 sheep, value $635,789; and 2,249,714 swine, value $15,364,873; total value, $104,458,593.

Climate.—The climate is mild and healthful; cold is sometimes severe in winter, but is of short duration. Generally, winter does not begin until about the first of the year. The mild winter climate is interrupted by sudden storms which make the thermometer register below zero. The summer heat is not severe, and is tempered by cool breezes after nightfall. Hot spells are frequently caused by south winds blowing continuously for several days. The mean temperature is greater in the eastern portion than in the western. There is a great deal of high wind, mostly from the S. and S. W. In 1892 a straight wind reached a velocity of 90 miles an hour, but this was an extreme case. Kansas has experienced a few storms known as cyclones. These have occurred chiefly in the southwestern portion of the State. The following table, compiled at the meteorological bureau of the Kansas University at Lawrence, indicates the characteristics of the climate in that portion of the State:

WEATHER REPORT FOR 1893.

MONTHS.	Mean temp.	Maximum temp.	Minimum temp.	Rain, inches.	Snow, inches	Rainy days.	Thunder-storms.	Mean cloudiness.	Number of fogs.	Miles of wind.	Mean barometer	Maximum barometer.	Minimum barometer.
January	22·38	50·0	−0·5	0·08	1·00	3	..	41·00	..	11,830	29·142	29·580	28·624
February	25·10	68·5	−5·5	1·48	7·00	6	2	46·62	..	12,320	29·187	29·956	28·549
March	40·06	78·0	7·0	3·00	9·00	5	3	41·55	1	14,990	29·085	29·680	28·371
April	54·28	91·0	31·0	3·21		13	2	48·93		15,080	28·959	29·370	28·382
May	61·87	86·0	42·0	7·62	....	11	5	40·40		11,370	28·996	29·400	28·510
June	72·74	92·5	56·0	5·07	...	9	6	42·20		9,210	29·034	29·315	28·732
July	78·10	97·0	66·0	5·30	...	9	10	30·00	..	9,460	29·079	29·272	28·841
August	72·00	93·0	48·0	2·86	....	10	5	28·19		6,620	29·099	29·333	28·895
September	69·33	99·0	41·0	4·40	...	8	2	35·38		10,350	29·041	29·407	28·558
October	55·92	87·0	31·0	0·19	....	2	..	19·12	3	12,670	29·077	29·566	28·612
November	39·33	77·0	15·0	0·97		4	..	31·00	2	10,990	29·145	29·481	28·585
December	35·57	68·0	5·0	0·53	3·00	4	..	40·23	1	14,930	29·199	29·724	28·660
Mean	52·39	82·3	28·0	2·89	1·67	7	3	37·08	0·6	11,652	29·087	29·507	28·610

Divisions.—For administrative purposes the State is divided into 106 counties, as follows:

COUNTIES AND COUNTY-TOWNS, WITH POPULATION.

COUNTIES.	*Ref.	Pop. 1890.	Pop. 1895.	COUNTY-TOWNS.	Pop. 1895.
Allen	7 J	13,509	13,111	Iola	1,565
Anderson	6 J	14,203	18,457	Garnett	2,145
Atchison	4-J	26,758	26,995	Atchison	15,500
Barber	8 E	7,973	5,145	Medicine Lodge	.....
Barton	6-E	13,172	12,888	Great Bend	2,134
Bourbon	7-K	28,575	25,849	Fort Scott	11,108
Brown	4-J	20,319	19,414	Hiawatha	3,062
Butler	7-H	24,055	21,126	El Dorado	3,518
Chase	6-H	8,233	7,227	Cottonwood Falls	.....
Chautauqua	8-I	12,297	10,208	Sedan	1,085
Cherokee	8-K	27,770	30,651	Columbus	2,204
Cheyenne	4-A	4,401	3,729	St. Frances	.....
Clark	8 D	2,357	1,529	Ashland	.....
Clay	4-G	16,146	14,785	Clay Center	2,723
Cloud	4-G	19,295	17,055	Concordia	3,011
Coffey	6-I	15,856	15,752	Burlington	2,322
Comanche	8-D	2,549	1,720	Coldwater	.....
Cowley	8-H	34,478	28,660	Winfield	5,031
Crawford	7-K	30,286	33,846	Girard	2,703
Decatur	4-C	8,414	6,953	Oberlin	.....
Dickinson	5-G	22,273	20,926	Abilene	3,400
Doniphan	4-J	13,535	13,995	Troy	.....
Douglas	5-J	23,961	23,587	Lawrence	10,084
Edwards	7-D	3,600	3,222	Kinsley	.....
Elk	8-I	12,216	10,820	Howard	1,063
Ellis	5 D	7,942	7,478	Hays City	.....
Ellsworth	5-F	9,272	8,873	Ellsworth	1,415
Finney †	7-B	3,350	3,553	Garden City	1,392
Ford	7-D	5,308	4,940	Dodge City	1,857
Franklin	6-J	20,279	20,734	Ottawa	7,059
Garfield †	6-C	881	.....	.....	.....
Geary	5-H	10,423	9,395	Junction City	4,709
Gove	5-C	2,994	2,126	Gove	.....
Graham	4-D	5,029	3,825	Hill City	.....
Grant	7-B	1,308	532	Ulysses	.....
Gray	7-C	2,415	1,256	Cimarron	.....
Greeley	6-A	1,264	1,035	Tribune	.....
Greenwood	7-I	16,309	14,961	Eureka	2,138
Hamilton	7-A	2,027	1,411	Syracuse	.....
Harper	8-F	13,266	9,238	Anthony	1,367
Harvey	7-G	17,601	16,250	Newton	5,148
Haskell	7-B	1,077	595	Santa Fe	.....
Hodgeman	7-D	2,395	1,792	Jetmore	.....
Jackson	4-I	14,626	15,273	Holton	3,020
Jefferson	5 J	16,620	17,173	Oskaloosa	.....
Jewell	4 F	19,349	17,498	Mankato	.....
Johnson	5-K	17,385	16,794	Olathe	3,456
Kearney	7 B	1,571	1,159	Hartland	.....
Kingman	8-F	11,823	9,400	Kingman	1,700
Kiowa	7-D	2,873	2,200	Greensburg	.....
Labette	8-J	27,586	27,023	Oswego	2,145
Lane	6-C	2,060	1,490	Dighton	.....
Leavenworth	5-J	38,485	34,621	Leavenworth	20,822
Lincoln	5-F	9,709	9,065	Lincoln	.....
Linn	6-K	17,215	16,278	Mound City	.....
Logan	5-B	3,384	2,071	Russell Springs	.....
Lyon	6-I	23,196	23,794	Emporia	8,225
McPherson	6-G	21,614	20,317	McPherson	2,666
Marion	6-H	20,539	20,374	Marion	2,077
Marshall	4-H	23,912	24,567	Marysville	2,297
Meade	8-C	2,542	1,741	Meade	.....
Miami	6-K	19,614	19,739	Paola	3,009
Mitchell	4-F	15,037	13,327	Beloit	2,039
Montgomery	8 I	23,104	23,948	Independence	3,665
Morris	6-H	11,381	10,944	Council Grove	2,145

* Reference for location of counties, see map of Kansas.

† Since 1890 all the post-offices formerly in Garfield County have been credited to Finney County.

COUNTIES.	*Ref.	Pop. 1890.	Pop. 1895.	COUNTY-TOWNS.	Pop. 1895.
Morton	8-A	724	388	Richfield	.....
Nemaha	4-I	19,249	19,900	Seneca	1,961
Neosho	7-J	18,561	18,578	Erie	1,225
Ness	6-D	4,944	3,785	Ness City	.....
Norton	4-D	10,617	8,671	Norton	.....
Osage	6-I	25,062	24,818	Lyndon	.....
Osborne	4-E	12,083	10,877	Osborne	.....
Ottawa	5-G	12,581	10,424	Minneapolis	1,599
Pawnee	7-D	5,204	4,797	Larned	1,566
Phillips	4-D	13,661	11,712	Phillipsburg	.....
Pottawatomie	4-H	17,722	16,352	Westmoreland	.....
Pratt	7-E	8,118	6,583	Pratt	1,330
Rawlins	4-B	6,756	5,702	Atwood	.....
Reno	7-F	27,079	26,492	Hutchinson	8,515
Republic	4-G	19,002	16,676	Belleville	1,445
Rice	6-F	14,451	13,367	Lyons	1,445
Riley	4-H	13,183	12,394	Manhattan	2,980
Rooks	4-D	8,018	7,440	Stockton	.....
Rush	6-D	5,204	4,863	La Crosse	.....
Russell	5-E	7,333	7,470	Russell	.....
Saline	5-G	17,442	17,475	Salina	5,703
Scott	6-B	1,262	1,088	Scott	.....
Sedgwick	7-G	43,626	39,108	Wichita	20,841
Seward	8-B	1,503	826	Liberal	.....
Shawnee	5-I	49,172	47,978	Topeka	30,151
Sheridan	4-C	3,733	2,673	Hoxie	.....
Sherman	4-A	5,261	3,883	Goodland	.....
Smith	4-E	15,613	14,019	Smith Center	.....
Stafford	7-E	8,520	8,339	St. John	.....
Stanton	8-A	1,031	613	Johnson	.....
Stevens	8-B	1,418	684	Hugoton	.....
Sumner	8-G	30,271	24,138	Wellington	3,657
Thomas	4-B	5,538	3,512	Colby	.....
Trego	5-D	2,535	2,166	Wa Keeney	.....
Wabaunsee	5-I	11,720	11,812	Alma	.....
Wallace	5-A	2,468	1,592	Sharon Springs	.....
Washington	4-G	22,894	21,602	Washington	1,418
Wichita	6-B	1,827	1,438	Leoti	.....
Wilson	7-I	15,286	14,393	Fredonia	1,638
Woodson	7-I	9,021	9,313	Yates Center	1,599
Wyandotte	5-K	54,407	57,286	Kansas City	40,673
Totals	.....	1,427,096	1,334,668		

* Reference for location of counties, see map of Kansas.

Principal Cities and Towns (1895).—Kansas City, 40,673; Topeka (capital), 30,151; Wichita, 20,841; Leavenworth, 20,822; Atchison, 15,500; Fort Scott, 11,108; Lawrence, 10,084; Pittsburg, 8,982; Hutchinson, 8,515; Emporia, 8,225; Parsons, 7,573; Ottawa, 7,059; Arkansas City, 6,904; and Salina, 5,703.

Population and Races.—1860, 107,206; 1870, 364,399; 1880, 996,096; 1890, 1,427,096; native, 1,279,258; foreign, 147,838; males, 752,112; females, 674,984 (white, 1,376,553; colored, 49,710; Chinese, 93; Japanese, 4; and civilized Indians, 736); 1895, 1,334,668.

Industries and Business Interests.—While the principal industries are those connected with agriculture and mining, considerable manufacturing is carried on in the cities and large towns. In 1890 there were 4,471 manufacturing establishments, employing a capital of $43,926,002. Topeka has lumber and planing mills, marble and stone works, architectural and ornamental iron-works, foundries and machine-shops, flour and grist mills, and cigar, saddlery and harness, carriage and wagon, and confectionery factories; Pittsburg is one of the greatest zinc-smelting towns in the world; Argentine smelts large quantities of lead, zinc, and silver; Kansas City contains several large meat-packing houses and flour-mills; Lawrence manufactures barbed wire, flour, and paper; Leavenworth, bridge and other heavy iron-work, furniture, woolen goods, carriages and wagons, and canned goods; Wichita, flour, foundry and machine-shop products; and Medicine Lodge and Fort Scott, sugar from sorghum. In 1893 there were 142 national banks, with capital of $12,442,100, surplus and undivided profits of $3,104,411, and deposits of $20,974,815; and 445 State banks, with capital of $10,860,181, surplus of $1,862,157, and deposits of $20,844,588.

Finance.—The State debt in 1892 was $801,000, of which $545,000 was held in various State funds, and the combined county, city, township, village, and school-district debts aggregated $37,817,755, with $197,014 in sinking funds, making total net debt of all kinds $37,876,740. The assessed valuation of all taxable property was $342,682,845.

Means of Communication.—There are no canals in Kansas and no river communication, with the exception of the Missouri river bordering the State on the N. E., where small freight-boats have light traffic. Kansas ranks second among the States in railway mileage. The State board of railroad commissioners reported for the year ending June 30, 1893, a total mileage of 8,900. The combined capital of the corporations was $589,318,130; bonded indebtedness, $839,973,229; passenger earnings of the year, $40,579,944; freight earnings, $105,588,883; fatalities, 639; and injuries, 2,383. The central offices and the main shops of the Atchison, Topeka, and Santa Fé system are in Topeka, and the shops of the Union Pacific in Kansas City.

Post-offices and Periodicals.—On Jan. 1, 1894, there were 1,773 post-offices, of which 3 were first-class, 18 second-class, 105 third-class, 126 presidential, 1,647 fourth-class, 661 money-order offices, 2 money-order stations, and 38 postal-note offices. There were 44 daily, 1 semi-weekly, 642 weekly, 1 bi-weekly, 4 semi-monthly, 60 monthly, 1 bi-monthly, and 6 quarterly periodicals; total, 759.

Churches.—The census of 1890 gave the following statistics of the principal religious bodies:

DENOMINATIONS.	Organizations.	Church edifices.	Members.	Value of church property.
Methodist Episcopal	1,249	1,215	83,288	$1,912,015
Roman Catholic	367	357	67,562	[illegible]
Baptist	545	548	32,172	[illegible]
Disciples of Christ	352	345	25,200	[illegible]
Presb. in the U. S. of America	370	352	24,950	1,078,860
United Brethren	322	309	13,768	180,570
Congregational	183	152	11,945	485,975
Friends, Orthodox	65	65	7,762	74,415
Lutheran General Synod	62	63	6,269	136,830
Lutheran, Synodical Conference	71	47	5,906	95,030
African Methodist Episcopal	48	58	4,678	153,500
Evangelical Association	96	96	4,459	85,600

Schools.—In 1892 Kansas had a school population of 498,801; pupils enrolled in the public schools, 382,225; teachers, 11,888; school property, including buildings and grounds, valued at $10,703,708; permanent school fund, $5,581,488.73, exclusive of the university permanent fund of $126,343; and State normal permanent fund of $125,519. There were also 35 denominational colleges and academies, with 7,391 students and property valued at $2,583,759. Among the principal were Washburn College at Topeka, Baker University at Baldwin, Emporia College at Emporia, Wesleyan University at Salina, Ottawa University at Ottawa, and Southwest Kansas College at Winfield. The three principal institutions of Kansas are the State University, State Agricultural College, and the State Normal School. The State University at Lawrence has eight buildings, a school of liberal arts, school of law, school of music and painting, school of pharmacy, school of engineering, library of 19,000 volumes, and a museum of natural history. The total enrollment for 1893 was 1,038. The State Agricultural College at Manhattan had, in 1892, an enrollment of 22 members of the faculty, 12 assistants, 18 student assistants, and 584 pupils; amount of productive endowment, $502,927.35; value of buildings and grounds, $176,185; value of apparatus, $102,734.55. The college has in connection with it an agricultural experiment station. The State Normal School at Emporia had an enrollment in 1891–92 of 1,396 students, of which 187 belonged to the Model Training-school.

Libraries.—In 1892 there were 60 libraries of 1,000 volumes and over, which contained 213,384 volumes and 81,320 unbound pamphlets. They were classified as follows: General, 20; school, 12; college, 15; college-society, 3; theological, 1; public institution, 1; scientific, 1; historical, 2; garrison, 2; and society, 3.

Charitable, Reformatory, and Penal Institutions.—These institutions are under the supervision of the State board of charities, and comprise the State Insane Asylum at Topeka, State Insane Asylum at Ossawatomie, State Reform School at Topeka, Institution for the Deaf and Dumb at Olathe, Institution for the Education of the Blind at Kansas City, State Asylum for Idiotic and Imbecile Youth at Winfield, Soldiers' Orphans' Home at Atchison, and Industrial School for girls at Beloit. The State penitentiary, under control of a board of directors, is at Lansing.

History.—That portion of the State of Kansas lying E. of the 100th meridian originally formed a part of the Louisiana purchase of 1803, and at different periods was included in the Louisiana and Missouri Territories. A part of the southwestern portion, after the settlement of the boundary-line in 1819, belonged to Spain, and was a disputed Territory from 1845 to 1850. The first exploration in Kansas on record was that of Coronado in his search for Quivira, and it is believed that he marched across the State diagonally from the S. W. to the N. E. Many exploring parties crossed

Kansas at an early period seeking for countries beyond, [illegible] among which were Pike's expedition in 1806–07 and Long's in 1819–20. The famous Santa Fé trail started from Independence, Mo., and entering on the east line of Johnson co., Kan., extended a distance of 780 miles to Santa Fé. From 1822 to 1843 there was a constant movement of merchandise and immigrants over this road. There were no settlements in Kansas of any note prior to those established by the Osage missionaries in 1820. The history of Kansas from 1850 until the close of the war was closely interwoven with the slavery question. By the Missouri Compromise Act of 1820 slavery was prohibited in all the region lying N. of lat. 36° 30′, with the exception of that lying within the limits of Missouri. As a result of the Mexican war, the territory of the U. S. was extended from the 100th meridian westward to the Pacific, and as far S. as the 32° 30′ N. lat. Kansas thus became the battle-ground for the settlement of the great slave question. In May, 1854, Congress passed the Kansas and Nebraska bill, and organized the Territory of Kansas and Nebraska, declaring that the Missouri Compromise of 1820 was inoperative and void in regard to its locality. An immigrant aid association was formed in Massachusetts, Apr. 26, 1854, with ample funds, to assist immigrants to Kansas, and to furnish them with weapons for defense. Similar companies were formed in New York and Connecticut July 18, 1854. These companies began to hurry immigrants into the Territory of Kansas, who were to take up the lands and settle as permanent tillers of the soil. In the meantime the inhabitants of Missouri were passing over the line and pre-empting large tracts of the fertile soil. From this time on a struggle existed between the two parties, one holding that Kansas should be settled by free men and that slavery should not exist upon its soil; the other persisting in the right to establish their cherished institution wherever they chose. For four years the Territory was greatly disturbed by the conflicts of these parties. Lawrence was twice besieged and once burned. Pottawatomie, Ossawatomie, and Leavenworth were partially destroyed. Andrew H. Reeder, the first Governor of Kansas, issued the first election proclamation on Nov. 10, 1854, and the first territorial election was held for a delegate to Congress Nov. 28, in which there were a large number of illegal votes cast by persons passing over the Missouri border into Kansas. On Mar. 30, 1855, an election took place for the first territorial Legislature, and was sharply contested by the pro-slavery and the free-State parties. It resulted in the triumph of the pro-slavery party. An investigation took place, and a new election, ordered for districts 1, 2, 3, 7, 8, and 16, took place May 22. The territorial Legislature first assembled at Pawnee, July 2, and adjourned to meet at Shawnee Mission July 16, when the pro-slavery majority unseated the free-State members. Free-State conventions were held at Lawrence, Aug. 14, and at Big Springs, Sept. 5, the latter to nominate congressional delegates, and a free-State election was held Oct. 9. On Oct. 23 the free-State party framed a constitution in a convention at Topeka. This failed of approval in Congress, and in the following year the pro-slavery party framed a constitution in convention at Lecompton, which was rejected by popular vote. On July 5, 1859, a convention met at Wyandotte, which, with a Republican majority, framed a constitution prohibiting slavery. This was ratified by the people Oct. 4, and under it the Territory was admitted into the Union July 29, 1861.

GOVERNORS OF KANSAS.

Territorial.			
Andrew H. Reeder	1854–55	Thomas A. Osborn	1873–77
Wilson Shannon	1855–56	George T. Anthony	1877–79
John W. Geary	1856–57	John P. St. John	1879–83
Robert J. Walker	1857–58	George W. Glick	1883–85
James W. Denver	1858	John A. Martin	1885–89
Samuel Medary	1858–59	Lyman U. Humphrey	1889–93
Frederick P. Stanton	1859–61	L. D. Lewelling	1893–95
		Edmund N. Morrill	1895–97
		John W. Leedy	1897–
State.			
Charles Robinson	1861		
Thomas Carney	1861–65		
Samuel J. Crawford	1865–69		
James M. Harvey	1869–73		

AUTHORITIES.—Andreas, *History of Kansas*; Robinson, *The Kansas Conflict*; Thayer, *The Kansas Crusade*; *Biennial Reports of the State Board of Agriculture of Kansas*; *Public Documents of Kansas*; Haworth, *Mineral Resources of Kansas*, 1891.

F. W. BLACKMAR.

Kansas: village; Edgar co., Ill. (for location of county, see map of Illinois, ref. 7–G); on the Chi. and Ohio River and the Clev., Cin., Chi. and St. L. railways; 104 miles W. of Indianapolis, 156 miles N. E. of St. Louis. It is in an agricultural and stock-raising region, and contains grain warehouses, the shops of the Chi. and Ohio River Railroad, several manufactories, and a weekly newspaper. Pop. (1880) 723; (1890) 1,037.

Kansas City: city; capital of Wyandotte co., Kan. (for location of county, see map of Kansas, ref. 5–K); at the junction of the Kaw, or Kansas, and the Missouri rivers; is a terminus of the K. C., Wyan. and N. W., the Mo. Pac., Chi., R. I. and Pac., and the Union Pac. railways. It is bisected by the Kaw, and is separated from Kansas City, Mo., on the S. E. by the line dividing Missouri from Kansas. Part of its site is the gently rolling river bluffs, and part is the low, level land adjacent to the rivers. The city is a consolidation by the State Legislature in 1886 of the former cities of Kansas City, Armourdale, and the town of Armstrong, with the older and larger city of Wyandotte (founded in 1857), and was given its present name by Gov. John A. Martin. It is on a portion of the land at one time occupied by the Delaware tribe of Indians, and later by the Wyandottes on their removal in 1843 from Wyandot co., O. Kansas City has a school population of 7,500, with 18 free public-school buildings and 115 teachers, besides largely attended parochial schools; 45 Protestant and 5 Roman Catholic church organizations; 2 free hospitals; various charitable societies; 2 national banks with combined capital of $1,100,000, and 4 State banks with capital of $150,000; and 1 daily, 8 weekly, and 2 monthly periodicals. There are 28 miles of finely equipped electric and cable street-railways, which connect with the neighboring cities of Argentine and Rosedale, and with Kansas City, Mo. Fourteen bridges cross the Kaw within the city limits. Seventeen railways, representing more than 50,000 miles of track radiating in all directions, have a common terminus here or in the adjacent city. This city is chiefly noted as being with one exception the largest live-stock market in the world, the second most extensive slaughtering, meat-packing, and meat-exporting point, and being the principal grain-market W. of the Mississippi. The census returns of 1890 show that 232 manufacturing establishments (representing 39 industries) reported. These had $11,404,066 capital, employed 7,300 persons, paid $4,081,685 for wages, and $34,225,415 for materials, and had products valued at $44,022,939. The principal industry was slaughtering and meat-packing, which had 6 establishments, employed a capital of $8,964,586, and received $39,927,191 for products. Its receipts of live stock in 1893, valued at $92,000,000, comprised 1,746,692 head of cattle, 1,963,635 hogs, 571,645 sheep, and 34,848 horses and mules, requiring 109,324 cars. The animals slaughtered at the six packing establishments during 1893, and representing 750,000,000 lb. of product, included 916,127 head of cattle and 1,439,441 hogs. The carloads of grain inspected by the board of trade during 1893 numbered 40,578; of these 25,282 contained wheat. The grain elevators within the city have a storage capacity of 3,000,000 bush., and a daily receiving and discharging capacity of 600,000 bush. There are several steam flour-mills, one having a capacity of 2,000 barrels per day, and a considerable export trade in flour is carried on. Pop. (1890) 38,316; (1893) by city census, 41,775; (1895) 40,673.

F. D. COBURN.

Kansas City: a city and important railway center of Jackson co., Mo. (for location, see map of Missouri, ref. 3–E); at the confluence of the Missouri and Kansas rivers; on the boundary-line between Kansas and Missouri; 235 miles W. by N. of St. Louis. It was first laid out in 1830. The site is rolling and broken near the river, but is otherwise comparatively level. A high bluff divides the upper part of the city from the low lands or bottoms, where, with three exceptions, all the railway stations are located. Twenty-one lines of railway concentrate here, and the city is the natural center of the commerce of the States and Territories on the N., W., and S., and of Mexico. The city is in the main regularly laid out with wide streets, lighted with gas and electricity; has efficient water, sewerage, fire, and police services; is divided into 10 wards; has 13 lines of street-railway; 8 public parks in the city and vicinity; and 2 large railway bridges across the Missouri river, with a third under course of construction. The notable buildings include the U. S. post-office and custom-house, U. S. bonded warehouses, city-hall, county court-house, exposition building, board of trade building, Kansas City Club, Progress Club, and Young Men's Christian Association building.

There are 123 churches (with church property valued at $3,212,700), of the following denominations: Methodist 19, Baptist 19, Presbyterian 17, Roman Catholic 16, Methodist Episcopal 9, Protestant Episcopal 8, Unitarian 8, Christian 7, Congregational 6, Lutheran 5, Evangelical 4, Hebrew 3, and Reformed Episcopal 2. The public schools are in a flourishing condition. There are 35 public, 1 high, and 16 convent and parochial schools, with an enrollment of 21,327 pupils, 18,327 of whom attend the public, the balance the private and parochial schools. The expenditure for maintenance of public schools and buildings in the fiscal year 1892 was $448,199.56. The city has 3 medical colleges, a college of pharmacy, 2 dental colleges, 4 commercial colleges, a school of oratory, an art school, and 5 libraries and reading-rooms. There are 20 hospitals and asylums, 2 homes for women, 4 charitable and 3 Christian organizations, Industrial School for boys, Young Women's Christian Association, work-house, city and county jails, 173 secret society and benevolent organizations, 31 labor-unions, and 26 miscellaneous societies.

In the fiscal year 1892 the gross receipts of the city were $1,075,000, expenditures $925,000; the indebtedness was $1,193,500, sinking fund $53,000; and assessed value of property, at 40 per cent. of its commercial value, $64,792,975. There were 9 national banks, aggregate capital $7,500,000, deposits and surplus $22,592,437.68; 15 State and private banks, capital $1,636,305, deposits and surplus $4,467,892. The bank clearings were $480,268,515.

The census returns of 1890 showed that 1,473 manufacturing establishments (representing 123 industries) reported. These had a combined capital of $12,708,990; employed 14,692 persons; paid $9,360,323 in wages and $16,276,004 for materials; and had products valued at $31,571,559. The manufacturing interests are as yet little developed. The city has one of the largest smelting-works in the U. S., several iron-foundries, soap, cracker, confectionery, stove, boot, and shoe factories, 3 large breweries, 3 furniture-factories, oil, lead, and paint works, 5 flouring-mills, and many smaller establishments, besides 7 of the largest beef and pork packing establishments in the West. There are 272 wholesale houses, with aggregate capital of $11,158,800, and aggregate annual sales of $80,000,000. The live-stock trade is one of the most important industries. The yards and offices are on both sides of the State line, in Kansas City, Kan., and Kansas City, Mo. The total number of animals received in 1892 was 4,347,328, valued at $73,077,168. Both cities also constitute a noted beef and pork packing center. In 1892 there were 2,826,322 animals slaughtered, a capital of $15,400,000 was invested in the industry, and the seven establishments had an annual product valued at $48,502,767. Again, both cities constitute one of the largest grain-markets in the country. There are altogether 19 elevators, with an aggregate storage capacity of 4,864,000 bush., and an aggregate daily receiving and discharging capacity of 1,005,000 bush. During 1892 the total receipts of wheat, corn, oats, rye, and barley were 49,851,900 bush. The statistics of the live-stock, meat-packing, and grain industries include both cities, as no accounts are kept of each city separately. Pop. (1880) 55,276; (1890) 132,416; (1892) 137,022.

W. D. CHARDÉ.

Kansas (or **Kaw**) **River**: a river in Kansas, formed by the union of the Smoky Hill and Solomon rivers. Its principal affluents are the Republican, the Big Blue, and the Grasshopper rivers from the N., and the Wakerusa from the S. It has innumerable smaller tributaries. Steamboats have traversed its whole course at high water, but its navigation is not of any practical value. It falls into the Missouri on the Missouri State line, at Kansas City, Kan.

Kansas, University of: a State institution, originating in an act of Congress of Jan. 29, 1861, granting at Lawrence, Kansas, land for the founding of a university in Kansas. The Legislature of the State, on this foundation, organized the institution by act of Mar. 1, 1864, and reorganized it in 1889. As reorganized the university is divided into the three departments of literature, science, and art, within which are included schools of law, pharmacy, music, fine arts, engineering, and a preparatory course of medical study. The university is under the control of a board of seven regents, six of whom are appointed by the Governor and confirmed by the Senate; they serve four years. The chancellor is named by the regents. Instruction is free to residents of Kansas. The annual income and expenditures amount to $160,000. In 1893 there were 1,038 students, of whom 397 were women. The faculty numbers 48. Francis H. Snow is (1894) chancellor.

C. H. THURBER.

Kansuh: a province of China which in the period K'ien Lung (1757) extended westward from Shensi through the desert of Gobi as far as the T'ien Shan, but may now be considered to reach no farther W. than the Kia-yu gate in the Great Wall, or about lon. 98° E. It is bounded on the E. by Shensi, on the N. by Mongolia, and on the S. by Kokonor. Area, 125,450 sq. miles. Pop. 9,285,377. The capital is Lanchow-foo, 1,470 li (about 490 miles) W. of Si-ngan-foo, the capital of Shensi.

Kant, IMMANUEL: philosopher; b. Apr. 22, 1724, at Königsberg, Prussia, where his father, of Scottish descent, was established as a saddler. Kant was brought up in strict religious principles. From 1740 to 1746 he studied theology, philosophy, and mathematics in the Königsberg University. He was obliged to leave before taking the doctor's degree, being in straitened circumstances. From 1746 to 1755 he was engaged as tutor. He returned to the university at this time, and after receiving his doctorate became a privat docent (1755), continuing in this subordinate position until 1770, when he was appointed Professor of Logic and Metaphysics at the Königsberg University, which chair he kept till 1797, when old age compelled him to retire. He had, however, done but little university teaching since 1792, when the government had become hostile to his rationalistic attitude on religious questions, and in 1796 had forbidden the further publication of the parts of his work on *Religion Within the Limits of Mere Reason*, then appearing in *The Berlin Journal*. His bodily powers gave way and his memory failed after his retirement, though he published in 1798 a vigorous protest against censorship in religion (*Der Streit der Facultäten*). D. Feb. 12, 1804. He never married, though he was very fond of society, genial in his manners, and a favorite with all who knew him. It is a rather singular circumstance that he never left his native city of Königsberg except for a few miles' walk out in the country. In his first lectures at the university, Kant followed pretty closely the Wolffian school of philosophy, then prevalent all over Germany. Still even in those earlier works his dissatisfaction with the existing state of the science of philosophy, and a persistent endeavor to ascertain the source of that dissatisfaction and its remedy, are clearly discernible. The great works of the French and English skeptical writers of that time, and especially the works of Locke and Hume, completed the change that was taking place in his views. The lucidness of their style, too, forbade the employment of the extravagant jargon introduced by Wolff into the philosophical discussion of the German schools in their refutation, and forced Kant, for the satisfaction of his own mind, to enter upon a thorough investigation of all the problems of philosophy in a manner and style altogether new and his own. It was not till 1781, about ten years after he had begun his new researches, that he published their result in the *Critique of Pure Reason*, which was soon followed by the *Critique of Practical Reason* (1788) and the *Critique of Judgment* (1790). These three critiques form, indeed, only one great work, and can not be understood correctly except when thus studied in their unity. The distinguishing feature of the new system presented by Kant in these works is that instead of treating philosophy as a transcendent science, or a science that furnishes the grounds of all being, and expounds noumena as well as phenomena, it treats it from a transcendental point of view, explaining the subjective coefficient of experience, and showing the limits of knowledge. That is to say, Kant denies that by mere reasoning or argumentation we can discover any new truth or transcend the world of common consciousness, and that hence all the efforts of previous philosophers to discover such new truths have been futile. Philosophy can only explain and prove truth; and its problem is to discover and apply the touchstone by which this truth can be made. Now, all theoretical propositions that may be made are either identical (like A = A), and these need no proof, or synthetical (A is A and something else too; for instance, iron is not only a body, but also magnetic). Of these synthetical propositions, again, all those which are empirical can be proved only by experience; and hence pure reason is required only to prove those synthetical propositions which are not empirical—that is, which are *a priori*. For instance, if when the sun shines I observe a stone get warm, and say that the sun is the cause of that warmth, I imply an *a priori* synthetical proposition, because

the conception of cause is not any quality of the sun or the stone that I perceive empirically. I perceive only a change from cold to heat in the stone, but a million of such changes would not make the conception of change the conception of cause. It is this class of conceptions which require a rule whereby their proper application can be secured, for it is only by their improper application that disputes have become possible between philosophers. When quarrels have arisen, for instance, as to whether God is the cause of the world, or whether the soul be a substance, etc., the dispute would have been settled at once if a rule had been known whereby it could have been determined whether the synthetical conception of cause could be predicated of God, or that of substance of the soul. Kant discovered this rule, or the "supreme principle of all synthetical judgments," to be, that synthetical propositions *a priori* are valid only in so far as it can be shown that consciousness could not otherwise be possible. The whole *Critique of Pure Reason* is only an application of this principle to the various problems that have engaged philosophical speculation, and especially to the antinomies to which it has given rise. By this application Kant would root out the entire old science of metaphysics, and establish a universally valid critique of reason, or science of knowledge.

But not all the propositions of human reason are of a theoretical character, nor could they well be so, since otherwise human reason itself would remain unexplained. Theoretical reason always explains by the categories of causality, substantiality, and reciprocal relation, but all these categories explain only the *a priori* synthetical propositions or phenomena that occur within reason; not, however, reason itself. If reason itself has an explanation, therefore, it must be of an entirely different character—of an absolute character, in fact. It must be an immediate explanation, having no ground, no cause, no why or wherefore. This explanation, says Kant in his *Critique of Practical Reason*, is the Freedom, the Self-determination, or the Categorical Imperative, which manifests itself in each individual as the Moral Law. No one can demonstrate to another by argumentation that there occurs within him a phenomenon which tells him at every moment of his life what he ought to do or ought not to do, and impels him to do it or not to do it, no matter what his natural inclinations may be; each one can discover that this phenomenon does occur only in his own consciousness. Freedom, therefore, which is nothing but this categorical imperative or moral impulse, can never be proved by something else, as theoretical cognitions can be proved, but only by practical experience. If, however, this categorical imperative is once admitted, if any individual confesses that he has ever done a moral act, then it can be shown that he also admits a Supreme God and immortality. For no one could rationally perform one moral act if he did not presuppose that he could rise to such a perfection as to make all the acts of his life moral—a perfection to which finite beings can attain only in an infinite life. Nor could he rationally perform such an act did he not presuppose that his act would accord with all the other acts performed by moral beings—an accord which can be realized only by a God. (Compare Leibnitz's *Pre-established Harmony*.) These propositions Kant has further demonstrated in his *Religion Within the Limits of Mere Reason*, published in 1793.

The remaining problem now was: How can reason become conscious of its free acts—i. e. of itself as practical reason operating upon an outside world—if that outside world can be cognized only by its theoretical faculty; that is to say, under the categories? This question Kant solved in his *Critique of Judgment* by showing that we do view the outside world under other forms than those of theoretical reason—namely, under the forms of purposes or designs—forms which can be referred either to the outside world itself, in which case we arrive at teleological views of the world, or to our own reason, in which case we pass æsthetical judgments upon outside objects. In either case we posit ourselves as free judges; and thus the *Critique of Judgment* substantiates the immediate fact postulated by the *Critique of Practical Reason*, and completes the whole system of reason.

Having thus finished the work of his lifetime, Kant devoted the remaining years of his life to applying its principles more in detail to the sciences of law, morals, theology, and to natural science. Thus in 1785 he published *The Foundations of the Metaphysics of Ethics*; in 1786 *Metaphysical-fundamental Principles of the Science of Nature*; 1795–97, two works, *Eternal Peace* and *Metaphysical-fundamental Principles of a Science of Law and a Science of Morals*; and in 1798 concluded his literary labors by *Anthropology*, a book full of rare knowledge, shrewd observations on men, races, nations, and the sexes, which every one should read who wishes to become thoroughly acquainted with the author of the *Critique of Pure Reason*. It is, moreover, an excellent example of the exquisite clearness of style which distinguishes nearly all of Kant's writings. Preliminary to the *Critique of Pure Reason* scholars should read Kant's *Prolegomena* (1783), which is also a marvel of arrangement and lucidity of style.

For an account of the reaction against these doctrines of Kant, see FICHTE, HEGEL, PHILOSOPHY (HISTORY OF), and SCHELLING. The influence of his doctrines has extended to all nations where philosophy is cultivated. Up to the time of Kant the ontological point of view had prevailed substantially as delivered by Aristotle and restated by the schoolmen. With Kant begins the critical or psychological point of view. (See PHILOSOPHY, where this is called the fourth and fifth intentions of the mind, the old ontology being the third intention.) Skepticism in philosophy (see SKEPTICISM) arises through taking the psychological view and suggesting doubts founded on method of knowing. Critical philosophy undertakes to explore thoroughly and exhaustively this field of method, and thus settle forever the questions of skepticism. Kant and Fichte find limits to cognition which set aside the old ontological proofs of God, freedom, and immortality as invalid, saving them, however, as postulates of the Practical Reason. Schelling and Hegel, on the other hand, discover in the critical system more fundamental presuppositions (hinted at by Fichte in his *Way to a Blessed Life*), which agree substantially with the conclusions of the old ontology. This completes the constructive side of the critical system, and makes the positive results of philosophy doubly firm by adding to the ontological proof a psychological proof wherein the doctrines of skepticism are shown to presuppose the truth of what was established by ontology. Skepticism, then, is the first unconscious groping for the psychological basis for philosophy. It appeared in the doctrine of Nominalism (Roscellinus and Occam), and reached its culmination in the philosophy of Hume. Kant confesses that he set out from Hume, and his object was to inventory and explain the subjective factors of cognition, and thus turn skepticism into criticism.

Any notice of Kant should not fail to mention certain of his earlier writings, which, though not closely connected with the great work of his life, the foundation of the critical system, yet are sufficient to entitle him to distinction. In 1754, at the age of thirty, he suggested in an essay the slight retardation of the earth's daily motion by the action of the tides, and the explanation by the same cause of the fact that the moon turns the same face to the earth in all parts of her orbit. In his general history and theory of the heavens, published in 1755, he suggests the nebular hypothesis of the origin of the sidereal system, thus anticipating Laplace. He applies this theory to the explanation of satellites and rings. He made important suggestions in the philosophy of history in essays published in 1775, 1784, 1785, and 1786—including an acute criticism of Herder's ideas on world history in 1785. Other essays on the theory of earthquakes, winds, the moon's influence, the law of *vis viva*, heat and light as vibrations of an ether, besides lectures on physical geography, all rich in thought, were edited by his friends and pupils during his lifetime.

Editions of Kant's works are (*a*) by K. Rosenkranz and Schubert (12 vols.), (*b*) by Hartenstein (8 vols.), and (*c*) by Kirchmann (8 vols.). English translations exist of the following works: *Critique of Pure Reason*, by J. M. D. Meikeljohn, Max Müller, J. H. Stirling (the first third); the *Practical Reason*, by T. K. Abbott; of the *Critique of Judgment*, by J. H. Bernard; the *Metaphysic of Ethics* (with a portion of the *Practical Reason*), by J. W. Semple; the *Prolegomena*, by J. P. Mahaffey (who has also translated the elaborate exposition of Kant by Kuno Fischer) and by E. Belfort Bax; the *Philosophy of Law* (*Rechtslehre*), by W. Hastie; the *Anthropology* (first book, the *Jour. Spec. Philos.*), by A. E. Kroeger; other shorter pieces in *Selections from Kant*, by John Watson. An elaborate exposition of the system is found in Edward Caird's *The Critical Philosophy of Kant* (2 vols.). The extensive *Commentar zu Kants Kritik der Reinen Vernunft*, by H. Vaihinger (1881–82), should be named as a compendious survey of the literature.

Revised by W. T. HARRIS.

Kantemir', Antiokh Dmitrievich, Prince: Russian author; b. in Constantinople in 1708; was the son of the Hospodar of Moldavia, who, after the Peace of Pruth in 1711, emigrated to Russia. The boy was a good scholar, carefully educated; and while still a youth his first three satires met with much success, though they were only passed about in manuscript. In 1733 he was made minister-resident at London, and later ambassador at Paris, where he lived on intimate terms with the chief writers and thinkers of the day, until his death in 1744. He was the author of a number of translations, odes, etc., but his reputation rests on his nine satires, which, in spite of their clumsy, confused, archaic style, have no little freshness and vigor. Kantemir was one of the first writers in Russia to turn chiefly to France for his models, as was universally done for the rest of the eighteenth century. The best edition of his works is that published at St. Petersburg in 1867 (with biography, 2 vols.). His satires were translated into French in 1749, and from this version a German one was made three years later. See C. E. Turner, *Studies in Russian Literature* (London, 1886). A. C. Coolidge.

Kanuj: a town in the division of Agra, Northwest Provinces, British India; on the Kali Nadi, 3 miles from its junction with the Ganges (see map of N. India, ref. 6–F). It was at one time a flourishing town, but is now chiefly a vast field of ruins. Some Mohammedan tombs are interesting, and bear witness to the former splendor of the place. Pop. 18,000.

Ka'olin [from Chin. *Kao-ling*, liter., high ridge; *kao*, high + *ling*, ridge; the name of a hill of porcelain clay, in the vicinity of King-teh-chin, the great porcelain center of China]: a hydrated silicate of alumina (Al_2O_3,-$2SiO_2 + 2H_2O$) or clay used for the manufacture of porcelain. Kaolin is supposed to be derived from potash feldspar by the loss of all the potash and two-thirds of the silica, which ingredients are replaced by two equivalents of water. The proportion of silica to alumina varies largely in different countries, the kaolins of China and Japan containing twice as much silica as those of Passau and Gutenberg in Germany. Large beds of kaolin are found at St. Austell, in Cornwall, England, in Limoges, France, at Brandon, Vt., Perth Amboy, N. J., Richmond, Va., Aiken co., S. C., near Augusta, Ga., and in many other parts of the U. S.

Kapnist, kaap'nist, Vasilĭ Vasilevich: author; b. in 1757 in the village of Obukhovka, government of Poltava, Russia, where he also spent the latter part of his life, and died Oct. 28, 1824. He belonged to the reigning set of literary men in St. Petersburg, and like the rest wrote wearisome, artificial odes and other poems, most of them now long forgotten. He is best known, however, for his comedy *Ĭabeda* (Chicanery), a scathing satire on the official corruption then prevalent. The piece achieved great success, but nearly sent its author to Siberia. On the other hand, his rendering of Molière's *Sganarelle* fell flat, and his tragedy, *Antigone*, came to grief at its first performance. There were two editions of Kapnist's works during his lifetime, and a third, which is nearly complete, was published in 1849. *Ĭabeda* has been translated into French (Ghent, 1886), but was not put on sale. A. C. Coolidge.

Kara, kaa'ra: a river of Northern Siberia; tributary to the Arctic Ocean, and forming in part the boundary between Europe and Asia. The Kara Sea is in the Arctic Ocean of Siberia, and lies between Nova Zembla and the mainland. Kara means black and appears in many Asiatic geographical words, as in Kara-Kirghiz, the Black Kirghiz (*q. v.*).

Kara George: See Czerny George.

Karachi, kă-raa'chee: town of Sind, India; on an inlet of the Arabian Sea, 18 miles N. W. of the mouth of the Indus (see map of N. India, ref. 7–A). Karachi is the only seaport on these coasts, and it carries on an important trade. Pop. (1891) 105,199.

Karadžić, kă-raa'jich, Vuk Stefanović: writer; b. at Tršić, Servia, Oct. 27 (o. s.), 1787; was educated in cloisters and at Carlowitz; served in the Servian war of independence, and fled to Vienna in 1813. There he met the renowned Slavist Kopitar (*q. v.*), at whose advice he began to collect Servian folk-songs, proverbs, etc. He visited Russia in 1819, and Servia in 1820, and again in 1828, when Prince Miloš invited him to compile a code of Servian laws, but disagreeing, he returned to Vienna in 1830. As an alleged Panslavist, he was closely watched by the Austrian Government, and harassed in his literary labors. He died at Vienna, Jan. 14, 1864. Karadžić is the founder of the modern Servian literary language; he gathered its words, defined the laws of its grammar, and added new letters to its alphabet. His principal works are *Pismenica Serbskoga jezika* (Servian Grammar, Vienna, 1814, 1818); *Srpski rječnik* (Serbian-German-Latin Dictionary, Vienna, edition 1818 contains 26,270 words, ed. 1852 47,427 words); *Narodne srpske piesme* (Servian Folk-songs, Leipzig, 1823–24, 3 vols., and Vienna, 1833, 1 vol.; translated into many languages, English by Bowring); *Srbske narodne poslovice* (Serbian proverbs, Cetynie, 1836, and Vienna, 1849); *Srpske nar. pripovjetke* (Serbian Folk-tales, Vienna, 1853). He also published a model translation of the New Testament, *Novi Zavjet* (Vienna, 1853), and several historical works. J. J. Král.

Karahissar: See Afium.

Kar'aites [also spelled *Caraites*; from Heb. *karaīm*, readers, deriv. of *kara*, read]: Jewish sect, styled by themselves *Bene Mikra*, sons of Scripture, once very important in opposition to the Rabbinites, but now insignificant. Its fundamental doctrine was that the Scripture only were the source of religious authority, while the Talmud and the rabbinical traditions were to be rejected. Its founder was Anan ben David, b. of noble family, at Bazra, near Bagdad, 700 A. D. He received a thorough education, and early attracted followers by his ability and learning. He claimed the office of Prince of the Captivity in 760 when his uncle died, but the rabbins opposed him, and by circulating reports that Anan intended to head a rebellion against the Caliph of Bagdad, they roused a persecution which drove Anan and his followers out of the city. They went to Jerusalem and there founded the first congregation of Karaites. In the course of time the differences between themselves and the rabbinist Jews became quite marked. Though there was no dogmatic conflict between them, though the same basis of faith was common to both, yet their disagreements in other matters were too important and far-reaching to admit the hope of reconciliation. The common celebration of feast-days is at all times a strong bond of union between coreligionists. This bond Anan had already severed. Ever since his time the Karaites have determined the day of the new moon by direct observation, while the rabbinists continue to guide themselves by the calculations of their received calendar. The Karaites celebrated, and still celebrate, the Pentecost on the fiftieth day counting from the Sunday of Passover week; the rabbinists, on the fiftieth day counting from the second day of the feast. Also the rite of circumcision is practiced by the Karaites in a way not recognized as valid by the rabbinic law. In respect to dietary laws, the Karaites abandoned numberless restrictions held sacred by the rabbinists. The latter naturally broke off connection with those who habitually transgressed their laws. On the other hand, the Karaites aspired to the most austere purity in the social relations. As early as the days of Anan they, with the help of their peculiar method of exegesis, extended the number of forbidden marriages to such a degree that many matrimonial alliances which pass unchallenged among the rabbinists were by them regarded in the light of crimes. The offspring of such alliances were considered to have sprung from an incestuous intercourse, and intermarriage with them was impossible. Rabbinistic persecution created Karaism and the rabbinistic literary opposition created Karaite literature, which at first was written in Arabic, and later in a form of Neo-Hebrew peculiar to themselves. The center of this literary activity was first Jerusalem, then Constantinople, then in the Crimea. Considerable attention has been paid to it, especially by Abraham Firkowitsch. Revised by S. M. Jackson.

Karak': a small island in the Persian Gulf; situated in lat. 29° 14′ N., lon. 50° 20′ E. It is of coral formation, is without timber, but has a fertile soil and good water, and affords safe anchorage for vessels. In the eighteenth century the Dutch built a fort here. It is inhabited by between 2,000 and 3,000 Arabs.

Karakorum (in Mongol *Kara-Koron*, black camp): the old capital of the Mongol empire prior to the establishment of the court at Kambaluc (now Peking). The name occurs early in Chinese history. Genghis Khan established one of his principal camps here, but it was not until 1234, when Ogdai Khan inclosed it, that it became the imperial capital. It stood near the left bank of the upper course of the Orkhon, a tributary of the Selenga, in about lat. 47°. It was visited and described by Carpini in 1246, and by Rubruquis in 1253.

Karakorum Mountains: See Kuen-lun.

Karaman: town of Asia Minor; in the vilayet of Konieh, between the towns of Konieh and Mersin (see map of Turkey, ref. 6-F). Founded (1294) by Karaman Oglou on the site of ancient Laranda, it was until 1466 the capital of the sultanate of Karamania. Now it is unhealthful and insignificant. Pop. 12,000. E. A. G.

Karam'zin, Nikolaĭ Mikhaĭlovich: author; b. in the village of Borodítskiĭ, government of Simbirsk, Russia, Dec. 1, 1766. He was sent to school in Moscow. After completing his education, he served for a short time in a guard regiment in St. Petersburg, resigning on the death of his father, and spent two years in Simbirsk. He had early shown a taste for literature, and in 1785 he became editor of the *Detskoe Chtenie* (Reading for Children), a supplement to *The Moscow Gazette*, chiefly made up of translations. In 1789 he published a series of letters of travel under the title *Pisma Russkago Puteshestvennika* (Letters of a Russian Traveler). These had great vogue. They are brilliant, superficial, and in tone imitate Sterne's *Sentimental Journey*. For the next thirteen years he was occupied with literary work of all kinds. From 1790 to 1793 he was publisher of the *Moskovskiĭ Zhurnal* (Moscow Journal), and from 1801 to 1803 of the *Vestnik Evropy* (Messenger of Europe). His life after 1802 was devoted to the task of writing a full history of his country. He died May 24, 1826. Though Karamzin is now little read, he holds a most important position in Russian literature. He was not a fine poet, and his *Bednaïa Luisa* (Poor Luisa) and other novels of the sickly sentimental school, immensely popular as they were in their day, have little real merit. His history, however, for which he had practically no predecessors, though it worships absolutism, neglects the real life of the people, and has grown antiquated, still has value, and will always be remembered. He also did a great deal to make the masterpieces of European literature known to his countrymen, and it is hardly too much to call him the creator of modern Russian prose. He discarded archaic forms, and gave life, clearness, and grace to the written language by a style that became a classic model. There have been five editions of his miscellaneous works, the last in 1848; his translations have been published separately (9 vols.), and his twelve-volume *History of Russia* (till 1611) has gone through six editions (last 1851–53), besides being translated into French, German, and Italian. See *Studies in Russian Literature*, by C. E. Turner (London, 1882); Bowring's *Russian Poets* (a few specimens of poetical translations, 2 vols., 1821 and 1823); also in Russian, 2 vols. by M. P. Pogodin (Moscow, 1866), and articles by Solovev, Grot, Kalachov, etc. A. C. Coolidge.

Karankawa Indians: a family of North American Indians, believed to be extinct. The Karankawa language has been provisionally set down as belonging to a family unconnected with others, for the only information we have of it is derived from about 160 words. There were several tribes, now unknown even by name. They all inhabited the littoral tracts (of what is now Texas) extending from the mouth of the Brazos to that of the Rio Grande. At a later period they also settled above the tide-water belt. During and before the Texan war of independence (1835–36) their tribes frequented more especially Matagorda, La Vaca, and Kopano bays. They were of tall and robust stature, quite warlike, led a migratory life, and subsisted mainly by fishing and turtle-catching. They hunted somewhat, but were averse to the cultivation of the ground. Tribes belonging to this stock are distinctly recorded as early as Cav. de la Salle's adventurous expedition (1687), and a century later portions of them were placed upon two missions by the Spanish Government. At that time their population probably did not exceed 3,000 souls. We can with certainty consider the Cukanos and the Copanes as sub-tribes of this family. See Indians of North America, and Gatschet, *The Karankawa Indians*, in *Archæological and Ethnological Papers of the Peabody Museum*, vol. i. (Cambridge, Mass., 1891).

Karasu-Bazar: town; in the government of Taurida, Southern Russia; on the Karasu (see map of Russia, ref. 10–D). It has large manufactures of morocco, leather, and soap, and is the central market of the Crimea. The inhabitants are Greeks, Armenians, Tartars, Jews, and Russians. The trade is chiefly in the hands of the Armenians, who also own the bulk of the real estate. The Jews are mostly Krimtchaks, wearing the Tartar costume and using the Tartar language; they are chiefly engaged in making leather, knives, embroideries, etc. Pop. 12,800.

Karelian: See Finnish Language.

Karens: one of the aboriginal races occupying British Burma, numbering not less than 1,000,000. The early history of this people is obscure. A few traditions, lingual characteristics, customs, and physical peculiarities afford the only clew to their origin. They are, unquestionably, of Turanian and Mongolian stock, and related to the aborigines of China, Assam, Siam, and Tibet. The traditions say that the Karens came from the West—doubtless from the primitive "hive of nations" about the Caspian Sea; from "beyond the river of running sand" (probably the Mongolian desert of Gobi) through Yunnan.

Habitat.—Their modern home is in Central and Lower Burma, between the Irawadi and Menam rivers. In their native haunts they are nomadic, dwelling in temporary villages, building their houses rudely of bamboo and thatch. They live by rude agriculture and marauding, their crops consisting of hill-paddy, maize, roots, the betel-nut, and a little cotton, which they work up and weave into garments. Since their entrance into the country they have always been oppressed by their haughty rulers, the Burmans. Accordingly, they were compelled to find their abode in the highlands, or mountainous parts of the country, where, for the most part, they still dwell. As Great Britain, however, has extended her dominion in Burma, the Karens, under inducements held out by the new government to which they have been foremost to avow fealty, have settled in large numbers in the lower parts of the country, and are pursuing agriculture and other useful arts. Many have found their way eastward into Siam, and westward into Arakan.

Tribal Divisions.—The Karens are divided into many tribes and clans, using as many variations of dialect. The chief tribal distinctions, however, may be reduced to three: the Sgaus, the most numerous; the Pwos, the most Burmanized and sturdy; and the Bghais, the most fierce and warlike. Besides these, there are what Dr. Mason calls the Shan-Karens, and the "miscellaneous tribes."

Language.—The language of the Karens, like that of the Chinese, is monosyllabic. Words have often six tones, each tone forming a separate word with a definite meaning. The language, therefore, is musical, and the people are gifted with an inherent love of music, and a delicate ear for its acquisition. Since the introduction of Christianity among them, and the giving to them of a written language, with written hymns, the various tribes are verily singing themselves together—linguistically, socially, and religiously. They also manipulate musical instruments with great skill.

Religion.—The Karens, strictly speaking, have never been idolaters. They have neither images, priests, temples, nor cult. Some believe them to have descended from the Jews, so remarkably in keeping with the Hebrew scriptures are their traditions; e. g. respecting one *God*—whom they designate as Y'wah (Jehovah)—the creation, the temptation, the fall, and the coming redemption. Their religious leaders, including a quaint and crude order of prophets, have always kept alive in them the hope of such a redemption, one day to be revealed through a book once written on skins (parchments) in one-sided characters (possibly the Hebrew) which white strangers would bring to them. The true knowledge of the great Y'wah, however, was lost. They therefore gave themselves up to the worship of demons, or "Nats" (malevolent spirits), with which they believed the world to be filled, and which they must propitiate, especially in time of calamity. The Karen, therefore, lives his wild life in an atmosphere of intense spiritualism. The fields, the trees, the rocks, all nature is alive with evil spirits, which fill him with mortal dread for this life and the life to come. Through the influence of Baptist missionaries from the U. S., the first of whom entered the country in 1828, about 100,000 of these people have been Christianized. A college, a theological seminary, numerous schools, and fully 500 churches, with native pastors, have been established. Industries are flourishing among these converts.

Authorities.—*Burma: its People and Productions*, by Rev. F. Mason, D. D.; *Burma: Past and Present*, by Lieut.-Gen. Fytche, chief commissioner of Burma; *British Burma*, by Forbes; Malcom's *Travels in Asia*; Carpenter's *Self-support in Bassein*; Gammell's *History of Baptist Missions*; and Reports of the American Baptist Missionary Union. Henry C. Mabie.

Karikal', or **Karical** (also spelled *Carrical*): a French possession in India; on Coromandel coast, 150 miles S. of Madras; in lat. 10° 55′ N., on the estuary of one of the branches of the Kaveri (see map of South India, ref. 7–F).

Area, 52 sq. miles. Pop. (1891) 70,526, of whom hardly 1,000 are Europeans. The town of the settlement is very neatly built on one of the mouths of the Kaveri, and carries on a considerable trade with Ceylon, Europe, and the French colonies. Rice, betel, indigo, saffron, and tobacco are exported; European manufactures and timber are imported. The French originally bought the place from the Rajah of Tanjore in 1738, and it formed the basis of Lally's operations against Tanjore. Several times conquered by the British, it was finally restored to France in 1816.

Karlovo: a picturesque town of Eastern Roumelia; 30 miles N. of Philippopolis; at the base of the Mara Gheduk, the highest summit of the Balkans (see map of Turkey, ref. 3–D). It is a wealthy town about 100 years old, and manufactures laces and cloths. In 1877 it offered a vigorous resistance to Suleiman Pasha, and was pillaged. Pop. 9,000.

Karlsbad, Karlsburg, Karlskrona, etc.: See CARLSBAD, CARLSBURG, CARLSCRONA, etc.

Karma [Sansk., action, doing; in Pâli, *kamma*]: in the Buddhist theory of transmigration, the force which controls the destiny of sentient being. The term means "action," and in this connection denotes the accumulation of merit or demerit which remains when an individual existence has come to an end by the disintegration of the five bundles of qualities, sensations, powers, and tendencies of which it is composed. This merit or demerit contains within itself an active and persistent tendency to recombine another set of qualities and powers into a new sentient being whose nature, condition, locality, and future it determines, and into which it passes. Karma is thus the force of all the actions of the particular individual existence or life just ended, and of all of the same series that have preceded it. Just how this Karma acts is not explained, and to Western minds the whole subject is far from intelligible. Alabaster thinks it may be understood by comparison with the line of the mathematician which is defined as length without breadth. This line is produced by the motion of a point, but a point is defined as position without magnitude, so that a line arises from that which has no dimensions. It is but a succession of such points, each of which is a separate individual existence, the motion of the point producing a series of points or linkages which together form the chain. (Alabaster, *Wheel of the Law*, p. xl.) See BUDDHISM. R. L.

Karmadhā'raya: a technical term of the traditional Sanskrit grammar, used to denote a class of compounds whose characteristic features are that the whole word is of the same part of speech as the latter component, and that the former component expresses an adjective or adverbial modification of the latter; thus Sansk. *ēka-vīra'-*, sole hero, *su-kṛta'-*, well done. These are generally called in modern grammars descriptive compounds. They are represented, e. g. in Greek, by *ἀκρόπολις, περιπόνηρος*, in Latin by *laticlavus, perpugnax*, in English by *quicksilver, blackbird, nobleman, freeman, holiday*; *far-reaching, ill-looking*, etc. See IMMUTATA. BENJ. IDE WHEELER.

Karma'thians [named from Hamdan Karmath, one of their early leaders]: a Mussulman sect of reformers; originally a branch of the Ismaïlis, with whom they probably always held many doctrines in common. They endeavored to abolish slavery, which they denounced as a crime. For a time very powerful, they terrorized Arabia, Persia, and Syria. In 928 they threatened Damascus and Bagdad; in 930 they captured Mecca, then full of pilgrims, whom they slaughtered, desecrating the Kaaba and carrying off the Black Stone which they kept for twenty years. Their capital was Hedjer in Haça (Bahrein), where they were still powerful in the eleventh century. The sect is not yet entirely extinct. They now reject Islam and maintain secrecy as to their religious belief. EDWIN A. GROSVENOR.

Kar'nak: the name of a village in Upper Egypt, occupying a portion of the site of ancient Thebes. The temple of Amon, commonly known as the temple of Karnak, is located on the east side of the Nile, about 2 miles N. E. of Luxor, and opposite Gurnah on the west of the river. An avenue of sphinxes led to the water. Besides the great temple there are some twenty smaller edifices dedicated to Mut, Khonsu, Mentu, Ptah, and other deities. These ruins combine to make the most extensive collection in the world. The inscriptions found on some of the walls are of special interest to biblical scholars, since they give the names of many places in Syria and Palestine conquered by various Pharaohs. The Karnak list of kings is valuable historically. The great temple of Amon seems to have replaced earlier edifices dating from the twelfth and thirteenth dynasties. It was built by a long succession of kings beginning with the eighteenth dynasty and continuing down to the Roman times. Behind the first pylon is a great peristyle court, 275 feet deep by 338 feet wide, containing two independent smaller temples, one built by Seti II. and dedicated to the Theban triad, Amon, Mut, and Khonsu, and the other erected by Ramses III. in honor of Amon. Behind the second pylon is the great hypostyle hall begun in the eighteenth dynasty by Ramses I., completed by Seti I. (nineteenth dynasty), and decorated by Ramses II. It is 170 feet deep by 338 feet wide, and its roof is supported by 134 columns. Next follow two ruined pylons and the obelisk erected by HATASU (*q. v.*). A colonnade and the sanctuary follow, the most ancient portions of the building. Beyond is an open space where the earlier temple is supposed to have stood, followed by the great colonnade of Thothmes III. and another sanctuary. The whole is a wonderful aggregation of buildings, and, unlike the temple of LUXOR (*q. v.*), it is constructed with a unity of design only marred by minor temples inside or immediately adjacent to its courts. CHARLES R. GILLETT.

Karnal: city in a district of the same name; in the Delhi division of the Punjaub, British India; 80 miles N. N. W. of Delhi, and 5 miles from the right bank of the Jamna river (see map of North India, ref. 5–E). It is said by tradition to have been founded by King Karna, one of the heroes of the *Mahâbhârata*. It is one of the most ancient cities in India, and is on the margin of an ancient bed of the Jamna. Pop. 27,000. M. W. H.

Karnovich, EVGENIĬ PETROVICH: historian and novelist; b. near Yaroslav, Russia, Oct. 22, 1823. He was brought up in St. Petersburg, but from 1845 to 1857 was Professor of Greek at the high school in Tula, after which time he left the service of the state. Since 1859 he has been the editor of the weekly paper *Otgoloski* (Echoes). He has written historical works on *The Part of Russia in the Deliverance of the Christians from the Yoke of Turkey*, *Konstantin Pavlovich*, etc., and several novels, of which the best known, *Love and Crown*, has been translated into French, German, and Swedish. A. C. COOLIDGE.

Karpathian Mountains: See CARPATHIAN MOUNTAINS.

Karpiński, kaär-piń'ski, FRANCISZEK: poet, called the "Poet of the Heart"; b. at Hotoscow, Galicia, Poland, Oct. 4, 1741; studied theology and law at Lemberg, became secretary to Prince Adam Czartoryski in 1783, and lived at the court of King Stanislas. In 1791 he retired to an estate in Lithuania which he had received from the king. There he died Sept. 4, 1825. His songs are still very popular among the Poles. His collected works, including a number of idyls, a tragedy, *Judyta*, songs, a translation of the Psalms, Plato's *Discourses*, etc., were published in four volumes at Warsaw in 1806 under the title *Dzieła Franciszka Karpińskiego wierszem i prozą*; his *Memoirs* in two volumes at Lemberg in 1849. Revised by J. J. KRÁL.

Karr, JEAN BAPTISTE ALPHONSE: author; b. in Paris, Nov. 24, 1808. He was educated at the Collège Bourbon, and afterward was a teacher there. He began to write as a contributor to *Figaro*, of which he became later (1839) editor-in-chief. His first books were novels: *Sous les tilleuls* (1832); *Une heure trop tard* (1833); *Vendredi soir* (1835); *Le chemin le plus court* (1836); *Geneviève*, generally ranked as his best (1838); *Clotilde* (1839). In 1839 he began the publication of *Les Guêpes* (The Wasps), a monthly of universal satire (portions republished in book form in 1853 and 1859), which excited enmities and provoked an attempt on his life from Mme. Louise Collet. An interest in plants was shown in *Voyage autour de mon jardin* (1845), and he withdrew to Nice and became devoted to the cultivation of flowers. He was a voluminous writer in the various fields of the novel, drama, sketches of travel and politics, in which he was an opponent of clericalism (*Gaîtés romaines*, 1870; *Dieu et diable: Le credo du jardinier*, 1875). D. at Nice, Sept. 30, 1890.—His daughter THÉRÈSE (1838–87) was a popular writer of books. A. G. CANFIELD.

Karroo: a Hottentot word meaning hard; applied by the Boers to the steppes between the coast mountains in the southwest of Cape Colony, Africa, and the basin of the Orange river. The red, iron-impregnated loam and clay of the surface is soft and almost impassable in the rainy season. In the dry season the surface is rough, almost as hard

as a brickbat, and most desolate. Grass and several varieties of shrubs flourish in the wet season. The Great Karroo Plain is crossed by the railway from Cape Town to Kimberley. Barren Karroo, intersected by the 31st parallel, is almost directly N. of Cape Town. C. C. Adams.

Kars: a town and strong fortress in Russian Armenia; strategically important; situated on a table-land about 6,000 feet high (see map of Russia, ref. 12–F). It, with Ardahan, Bayezid, and Batum, formerly constituted the northeastern "quadrilateral" of the Ottoman empire. It fell into the hands of the Russians under Paskievitch in the war of 1828–29, but the concluding treaty restored it to Turkey. It was a second time taken (Nov. 28, 1855), after a long and desperate siege, by the Russians, but restored to the Ottomans by the treaty of Paris (1856). Again captured, with 17,000 prisoners and 300 cannon, by the Russians (Nov. 18, 1877), it, together with Ardahan and Batum, was formally ceded to Russia by the treaty of Berlin (1878). In any future war between Russia and Turkey it must inevitably play an important part. Pop. 3,941. Edwin A. Grosvenor.

Kar'shi: town of Bokhara, in Central Asia. It has some fine mosques, bazaars, and public baths, and carries on a considerable trade in cattle, carpets, and horse-cloths. Tobacco is extensively cultivated in the vicinity. Pop. 25,000.

Karst, The [Croat. *Kras*, Ital. *Carso*, Celtic for *country of stones*]: a plateau of Austria; at the base of the peninsula of Istria. It is remarkable for its scattered rocks, pits, caves, and subterranean streams. The pits are sometimes so small that one can leap over them, at other times so large that they contain groves, or even forests. The rain forms temporary lakes in them, and their bottoms are better adapted to cultivation than the general surface. The most famous of the caves is that of Adelsberg. M. W. H.

Karuizawa, kăă-roo-ĕĕ-zaa'waa': a village in Shinano, Japan; about 100 miles N. of Tokio, on the Nakasendo or "great mountain highway"; situated at the foot of the short western descent of the Usui pass (see map of Japan, ref. 6–D). It is a station on the through railway from the capital to the west coast. Its elevation is 3,200 feet above sea-level; it is at the head of a plateau, from which rises the active volcano Asama-yama (8,282 feet high). Its cool air and attractive surroundings have made Karuizawa a favorite summer resort of foreigners. To the S. E. are the magnificent rocks and groves of Myogi-san, once the residence of a prince-abbot. In 1893 a railway on the Abt or cog-wheel system was opened, connecting the upper and lower ends of the trunk railway between Tokio and the west coast, formerly broken by the lofty Usui pass, 4,000 feet high; this short section passes through no less than twenty-five tunnels.
J. M. Dixon.

Karyokinesis: See Mitosis and Cell.

Kasembe: See Cazembe.

Kashan': town; in the province of Irak-Ajami, Persia, 3,600 feet above the level of the sea (see map of Persia and Arabia, ref. 3–G). It is a beautiful city, with a palace, numerous mosques, baths, and promenades, and important manufactures of velvet, gold brocade, silk and stuffs. Kashan is said to be famous for three things: its brass-works, its scorpions, and the cowardice of its inhabitants. Pop. about 70,000. Revised by A. V. W. Jackson.

Kashgar: the capital of Chinese or Eastern Turkestan; situated in a fertile and well-watered plain, 4,043 feet above the level of the sea; lat. 39° 24′ 26″ N., lon. 76° 6′ 47″ E. (see map of China, ref. 3–A). It consists of two parts, an old city and a new, 5 miles apart, with the Kizil, a tributary of the Tarim, flowing between. The old city stands on high ground, and is defended by lofty dried-mud walls of considerable thickness. The new town, which was built in 1838, is surrounded by high massive walls pierced by a single gate. Situated as it is at the junction of the trade-routes leading from India, China, and the valley of the Oxus, Kashgar has always been an important commercial center. Now, however, trade is mainly with Russia. It is also important strategically, and has changed hands many times. In 1759 it was conquered by the Chinese, and held by them with short intervals until 1863, when it became the capital of Yakub Beg. In 1877 it again passed into Chinese possession. The palace of the Chinese governor of Eastern Turkestan stands in the new town. When Kashgar was visited by Sir T. D. Forsyth in 1873 the population of the city was 112,000.

Kashkar, or **Chitral** (the *Shangmi* of Hiuen Tsang): a little-known Mohammedan state on the upper Chitral river, on the southern slopes of the eastern Hindu Kush Mountains. It is now nominally a part of British India, forming its extreme north, being N. of Swat, E. of Kafiristan, S. of the Pamirs, and W. of Yassin. The population is estimated at 200,000. The ethnology is very intricate. Kashkar is divided into two semi-independent states, the royal families of which are closely related. The states were probably founded about the middle of the seventeenth century. They were invaded by the Chinese in about 1760 and sent tribute to that empire for many years. See Biddulph, *Tribes of the Hindu Koosh* (1880). Mark W. Harrington.

Kashmir, or **Cashmere** (ancient *Caspira*): a feudatory state of British India; between 32° 30′ and 34° 55′ N. lat., and 73° and 79° 40′ E. lon.; area, 80,900 sq. miles. On the N. is Chinese Turkestan, Tibet on the E., the Punjaub on the S. W., and the Pamirs and the wild and mountainous region between them and the Punjaub.

Surface.—Kashmir consists of part of the Himalaya range of mountains, and some elevated beautiful valleys. The valley of Kashmir, 5,100 sq. miles, is surrounded by the Himalayas, and at its lowest depression is 5,500 feet above the sea. It contains several lakes, and is beautiful and fertile. The other valleys, though less extensive, are very attractive. The Himalayas have one peak in Kashmir (Panjal) 15,000 feet high; there are several passes, of which the chief are by way of Murree along the Jhelum valley to the capital, and the more difficult one from Bhimbar across the lofty Panjal range. The Indus passes through Kashmir, and the Jhelum forms its western boundary.

Productions.—The soil is mostly very fertile in the valleys; some of it requires irrigation. It yields great crops of rice, wheat, barley, maize, and excellent fruits—apples, pears, peaches, apricots, cherries, etc. The forests are of deodar (a species of cedar), pine, and walnut. Large herds of cattle and goats are pastured on the mountain-slopes, and the hair or wool of the Kashmir Goat (*q. v.*) is in great demand for the Kashmir shawls made here. Firearms are made in Kashmir, and precious stones are cut.

History.—Kashmir was conquered by the Emperor Akbar in 1586, and annexed to the Mogul empire; the Afghans held possession 1752–1819, and the Sikhs from 1819 till 1849, when it was ceded to the British, who transferred it to their feudatory, Ghulab Singh, whose Kashmir empire was composed of Kashmir, Baltistan, and Loday or Ladak. He was succeeded in 1857 by his son, Ranbir Singh.

Population 2,511,090, mostly Mohammedans. Of these, 400,000 are in the valley of Kashmir. The people are of good stature and great physical beauty. Capital and chief city, Srinagar or Kashmir (see map of North India, ref. 3–D). Revised by Mark W. Harrington.

Kaskaskia: village (founded by the French under La Salle in 1682); Kaskaskia precinct, Randolph co., Ill. (for location of county, see map of Illinois, ref. 10–D); on the Kaskaskia river near its junction with the Mississippi; 40 miles S. of Belleville. The Kaskaskia (or Okaw) river, which rises in Champaign co., Ill., and flows about 300 miles in a generally S. W. direction, is here navigable. The village was the capital of Illinois Territory, and for many years was a place of importance, but has declined. Pop. of precinct (1880) 1,213; (1890) 862.

Kaskaskias: See Algonquian Indians.

Kasson, John Adams, LL. D.: lawyer; b. at Charlotte, Vt., Jan. 11, 1822; graduated at the University of Vermont in 1842; studied law in Massachusetts, and practiced at St. Louis until 1857, when he removed to Iowa. He was appointed assistant postmaster-general in 1861; elected to Congress as a Republican in 1862; was commissioner to international postal congress at Paris in 1863; again elected to Congress in 1864, and again in 1872 and 1874; afterward minister to Austria, and again elected M. C. 1880 and 1882. Resigned 1884, and was U. S. minister to Germany 1884–85.

Kastamu'ni: city in Asia Minor; capital of the vilayet of the same name; 45 miles from the Black Sea (see map of Turkey, ref. 4–F). It contains thirty-six mosques, has an extensive trade in mohair, and manufactures large quantities of cotton and leather goods. The dynasty of the Comneni originated here. Pop. 40,000. E. A. G.

Katch: See Cutch.

Katagum, kăă-tăă-goom': town of Central Africa, in the Sudan, capital of a district of the same name in the east part of Sokoto. The town is fortified with walls and ditches. Pop. about 8,000.

Kate, Jan Jacob Lodewijk, ten: See Ten Kate, Jan Jacob Lodewijk.

Ka'ter, Henry, F. R. S.: mechanist; b. at Bristol, England, Apr. 16, 1777; went in 1796 to India, where he was engaged for several years on the trigonometrical survey; ranked as lieutenant in the military service, and retired on half pay in 1814, after which he devoted himself chiefly to scientific studies. He invented about 1825 the important trigonometrical instrument called a floating collimator; applied the principle of the interchange of the centers of oscillation and suspension of the pendulum to the determination of gravity; experimented on telescopes, etc. He wrote for the *Philosophical Transactions*; was principal author of Lardner and Kater's *Treatise on Mechanics* in the *Cabinet Cyclopædia*, and wrote *An Account of the Construction and Verification of Certain Standards of Linear Measure for the Russian Government* (1832). D. in London, Apr. 26, 1835. Revised by E. L. Nichols.

Kater's Pendulum: named from its inventor, Henry Kater (*q. v.*), and used for the measurement of the force of gravity. It depends upon the principle that in the case of a physical (compound) pendulum the centers of oscillation and of suspension are interchangeable. Kater's pendulum is a bar pendulum with two sets of knife-edges. It is symmetrical in form but not in the distribution of masses, with reference to the geometrical center. On account of the greater accuracy with which the effective length can be determined, Kater's method has almost entirely superseded that of Borda, and his reversible pendulum, modified and improved, is the standard for geodetic work. E. L. N.

Kathay: See Cathay.

Kathode [from Gr. *κάθοδος*, a way down: *κατά*, down + *ὁδός*, way]: the terminal of an electrolytic cell by means of which the current passes from the electrolyte to the metallic portions of the circuit. The opposite electrode, that through which the current enters the cell, is called the anode. In electrolysis, the metal thrown out of composition by the current is always deposited upon the kathode. E. L. N.

Kathodograph: See X-rays, in Appendix.

Katif, kăa-teef': town of Arabia; situated on the Persian Gulf, in lat. 26° 25′ N. (see map of Persia and Arabia, ref. 5–G). The bay on which it stands affords good anchorage, and, being the seaport of Nejd, it has a considerable trade. The ground is low and muddy, and the city damp and dirty; but the vicinity is very fertile, covered with palm-groves and gardens. Pop. of town estimated at 6,000, with district 92,000. Revised by M. W. Harrington.

Kat'rine, Loch: a lake in Scotland, in the county of Perth. It is 8 miles long and three-quarters of a mile wide, and remarkable as well for the depth and purity of its water as for the beautiful scenery surrounding it. Glasgow, which is nearly 25 miles distant, receives its water-supply from this lake.

Kation [from Gr. *κατά*, down + *ἰών*, going]: (in electrolysis) a term applied to that portion of the decomposed electrolyte which makes its appearance at the kathode. When a chemical compound is decomposed by the action of the electric current, it is always broken up into two parts, the acid radical and the metal. Of these the acid radical travels against the current and appears in nascent form at the anode, while the metallic group travels with the current and is deposited upon the surface of the kathode. The latter group (the metal) is called the kation, the former, in contradistinction, is called the anion. See Electricity, Electrolysis, and Voltameter. E. L. Nichols.

Katkov', Mikhail Nikiforovich: journalist; b. in 1818, in Moscow, Russia, and brought up there. At college he belonged to a set of young liberals, many of whom afterward became famous in different ways. He studied for two years in Germany, then was Professor of Philosophy at the University of Moscow, but resigned his place on account of some new government regulations. In 1856 he founded the *Russkiĭ Vestnik* (Russian Messenger), and in 1861 became editor of the *Moscovskyĭa Vedomosti* (Moscow Gazette). Up to this date he had been a liberal, particularly anxious to develop local self-government, and to give the landed aristocracy a position similar to that they held in Great Britain; in fact, he had the reputation of being an Anglomaniac. The violence of the revolutionary party and the Polish insurrection in 1863, which excited Russian patriotism to the utmost, brought about a complete change in his attitude. Henceforward he preached with great violence in favor of absolutism and of a policy of Russianizing every part of the empire, to the exclusion of all Western ideas. He had struck the right note, for he gave expression to the public opinion of his country and its passions. This he continued to do for years, so strong in his position that he defied with impunity the official censorship of the press. Under Alexander III. his influence became even greater, so much so that his open attacks almost brought about the downfall of the foreign minister, M. de Giers. He died Aug. 1, 1887. Katkov is usually regarded as one of the leaders of the Panslavists, but this is not strictly correct. While sympathizing with other Slav nations (except the Poles), his chief interest and his policy were first and foremost "Russia for the Russians." See *La France, la Russie, et l'Europe*, by Anatole Leroy-Beaulieu (1888). A. C. Coolidge.

Katse'na: town of the empire of Sokoto, in the Sudan, Africa (see map of Africa, ref. 4–D). It was a large and flourishing city, but after its capture in 1808 by the Fulbes, who almost destroyed it, its trade and manufactures were removed to Kano. Pop. (Barth, 1851–53) about 7,000.

Kattegat: See Cattegat.

Kattiawar, Kathiawar, or **Surashtra** [from a tribe of Rajputs called Kattis, called by the Greeks *Σαυραστρήνη*]: a great peninsula in Western India, with the Gulf of Cambay on the E. and the Gulf and Rann of Cutch on the W. It is said to be divided into 188 distinct states tributary to Great Britain, for the most part, but a few are yet independent. Total area, 20,559 sq. miles. The country is well watered, and the soil of good quality. Cotton is exported in great quantities. Horses (of excellent breed) and sheep are staple productions. The country is rich, and the residence on the soil of so many petty princes conduces to its prosperity. A railway extends from the N. to Bhaunagar on the middle of the coast of the Gulf of Cambay, and from there westward nearly across the peninsula. Pop. about 2,500,000. Rajkat, near the center, is the residence of the British political agent. Mark W. Harrington.

Kattimandu', or **Cuttimundoo**: the milky latex or sap of *Euphorbia nereifolia*, an East Indian plant. This substance resembles gutta-percha, and has considerable value in the arts. The leaves are used by the natives for their diuretic, cathartic, and deobstruent powers, and the juice is an ingredient in anti-rheumatic liniments.

Katydid [named in imitation of its peculiar note]: a large green orthopterous insect (*Cyrtophyllus concavus*) of the U. S., belonging to the group *Locustariæ*. It is arboreal in its habits, and is widely distributed. Its note is produced by the friction of transparent membranes attached to the wing-covers, and is heard only at night.

Kauai, kăa'oo-aa'ĕe: one of the Hawaiian islands; situated in lat. 22° N., lon. 159° 30′ W. Area, 640 sq. miles. Pop. 9,000. It is high—Waialeale, the highest point, rising about 5,000 feet—of volcanic origin, but very fertile. Lihue, Haualei, Koloa, and Nawiliwili are the principal towns: the valley and falls of the Hauapepe are very picturesque; at the mouth of the Waimea river is the spot where Capt. Cook landed in 1778: Haeua Point contains several curious lava caves; and other attractions include the Wailua Falls and the valley of Kalihiwai. The greater part of the island is covered with sugar-cane plantations.

Kaufman: city; capital of Kaufman co., Tex. (for location of county, see map of Texas, ref. 2–I); near Trinity river; on the Tex. Trunk and the Tex. Mid. railways: 36 miles S. E. of Dallas. It is in an agricultural and stock-raising region, and on the dividing-line between the timbered portion of East Texas and the great wheat belt of North Texas. It contains 4 churches, public-school building (cost $12,000), cottonseed-oil mill (cost $30,000), 2 cotton-gins, improved system of water-works, ice-factory, electric-light plant, and 2 weekly newspapers. Pop. (1880) 490; (1890) 1,282; (1893) estimated, 2,000. Editor of "Sun."

Kaufmann, kowf'măan, Constantine, von: Russian general, governor-general of Turkestan, and adjutant-general to the czar; b. at Maidani, 1818; made himself famous by his successful expedition into Central Asia. He fought in the Caucasus 1843–56; was governor-general of Turkestan 1867; conquered Samarcand 1868; captured Khiva June 10, 1873. Through his victories the unconditional authority of Russia in Central Asia was established. After the bloody defeats of the Russian forces in 1879 by the Turkomans, Gen. Kaufmann was placed at the head of an expedition

again in Nov. in 1880, which was equally successful. D. Mar. 16, 1882. Revised by F. M. Colby.

Kauffman, Maria Anne Angelica Catherine: called Angelica Kauffman; painter; b. at Coire, Switzerland, Oct. 30, 1741. Her teacher was her father, and she had opportunities for studying the great pictures of Italy. She was already a popular artist before her twenty-fifth year, living chiefly in Rome. In 1765 she settled in England; became very popular in polite society, both personally and as a portrait-painter, and was especially under the influence of Sir Joshua Reynolds, whose art is reflected in her own. She was one of the first group of Royal Academicians, 1769. Her pictures are not now highly esteemed, but she is remarkable as one of the two or three women who have made a lasting name in fine art. Among her pictures in public galleries are *Religion and the Virtues* and her own portrait, in the London National Gallery; *Ariadne* and a portrait of the *Princess Marie of Courland*, in the Dresden Gallery; and *Christ and the Woman of Samaria*, in the Pinakothek of Munich. D. in Rome, Nov. 5, 1807. Russell Sturgis.

Kaukauna: city; Outagamie co., Wis. (for location of county, see map of Wisconsin, ref. 5–E); on the Chi. and N. W. and the Mil., Lake Shore and W. railways; 7 miles E. by N. of Appleton. It has a national bank with capital of $50,000, a State bank with capital of $80,000, a weekly newspaper, and pulp and paper factories. Pop. (1880) 834; (1890) 4,667; (1895) 5,451.

Kaulbach, kowl'bäḥ, Friedrich August, von: painter; b. at Hanover, June 2, 1850. His father was a painter, and his great-uncle was Wilhelm von Kaulbach (*q. v.*); he studied under Diez at Munich, but his own work shows rather a close and loving study of the sixteenth-century painters of Germany and Flanders. His pictures, exhibited at Paris in 1878 and in Vienna in 1882, were a surprise to most students. He has succeeded Piloty as director of the Munich Academy of Fine Art. R. S.

Kaulbach, Henry Adolphus Newman, LL. B.: Canadian senator; b. at Lunenburg, Nova Scotia, Dec. 28, 1830; graduated at Harvard College; was admitted to the bar in 1855, and appointed a queen's counsel in 1873. He is a lieutenant-colonel of militia, was a representative in the Nova Scotia Assembly 1863–67, and became a member of the Dominion Senate in 1872. He is an extensive land proprietor and shipowner.—His brother, Charles Edwin, b. at Lunenburg, July 13, 1834, has been high sheriff of Lunenburg County; is a lieutenant-colonel of militia: member of Canadian Parliament 1878–82, 1883–87, and again elected in 1891.
Neil Macdonald.

Kaulbach, Wilhelm, von: historical painter; b. at Arolsen, Germany, Oct. 15, 1805. He was a pupil of Cornelius at the Düsseldorf Academy; an officer of the Legion of Honor; grand commander of St. Michael; commander of the Order of Francis Joseph, and member of most of the art academies of Europe. He went to Rome to study in 1839, though before that time he had executed decorative paintings in several public buildings in Munich; in 1847 went to Berlin to decorate the hall of the new museum, a work that occupied him a number of years, and in 1849 was appointed director of the Munich Academy. D. at Munich, Apr. 7, 1874. Frescoes by him are at the New Pinakothek, Munich, and cartoons in the Raczynski Gallery, Berlin. Works in oil are in the museums at Nuremberg, Pesth, Stuttgart, and Munich. In the Pennsylvania Academy of Fine Arts, Philadelphia, is a *Portrait of Louis I. of Bavaria*.
William A. Coffin.

Kaunitz, kow'nits, Wenzel Anton, Prince, Count of Rietberg: statesman; b. in Vienna, Austria, Feb. 2, 1711; studied at Leipzig and Leyden; traveled through England, France, and Italy, and entered the diplomatic career in the Austrian service in 1741. By the consummate skill with which he negotiated the Peace of Aix-la-Chapelle in 1748, and still more by his astonishing success in forming an alliance between Austria and France while ambassador in Paris (1750–52), he acquired great fame as a diplomat; and 1753 Maria Theresa made him chancellor and placed him at the head of the Austrian Government. This position he held for nearly forty years, and he was generally considered the greatest statesman of his age. Under the reign of Joseph II. his influence decreased, especially after the failure of his negotiations for the annexation of Bavaria to Austria. In 1792 he retired on account of old age. D. June 27, 1794. His policy was exclusively Austrian, and centered in the one idea of making Austria great, but probably some of the most important political transactions—as, for instance, the division of Poland, and the Church reforms of Joseph II.—were not originally planned by him. Personally, he was a man of perfect honesty, with a taste for science and art, generous and amiable in spite of his enormous vanity. See Beer, *Denkschriften des Fürsten Kaunitz* (1872).
Revised by C. K. Adams.

Kava: See Ava.

Kava-kava: sometimes called *Piper methysticum*; a small shrub; a native of the South Sea islands, where it is also called ava-ava and kawa. It is about 6 feet in height, with stems from 1 to 1½ inches in thickness. The part employed in medicine is the rhizome. Said to possess particular advantage as a medicine in certain conditions of the genito-urinary organs. H. A. Hare.

Kavel'in, Konstantin Dmitrievich: author; b. in St. Petersburg, Russia, Nov. 4, 1818. He studied philology and law at the University of Moscow, and taught civil law there from 1844–48, after which he was given a position in the Ministry of the Interior. He had become well known by his *History of the Civil Procedure and of the Organization of the Courts in Russia from the Twelfth Century to the Present Time* (1843); by his *General Sketch of the Juridical Development of Russia before Peter the Great* (1847); and by various essays collected in an edition of his complete works (4 vols., Moscow, 1857). He was particularly active in the emancipation of the serfs, for which he made out a programme that was copied with little change in the great decree of 1861. Later, he was for a short time connected with the University of St. Petersburg, then was sent to France and Germany to study the question of higher education, upon which he wrote some excellent reports. In his last years Kavelin was professor at the Military Legal Academy. In 1870 he published *Problems of Psychology*, and in 1875 *Problems of Art*. D. May 3, 1886. A. C. Coolidge.

Kawi, or **Kavi**, kaa'vēē: the ancient sacred language of Java in the East Indies, based in its vocabulary chiefly upon the Sanskrit, a knowledge of which was brought by Brahmanic emigrants from India about the beginning of the Christian era. It gradually became corrupted by the ordinary Javanese tongue to the extent of about two-fifths of its vocabulary, and its inflexions are essentially Javanese. The alphabet is nearly the same as the Devanagari, although the order of the consonants is varied. The name of the language signifies learned or wise, and has been applied only since it began to be distinguished from the aboriginal languages by the composition of a literature. This took place in the early centuries of the Christian era. A considerable number of works is still extant, devoted largely to legends of the Creation and poems concerning mythical heroes. In the fifteenth century the sacred language, as well as the religion taught through it, was driven from Java, and took refuge in the neighboring small island of Bali, where some knowledge of it is still retained by the natives. See William von Humboldt, *Ueber die Kawi-Sprache* (3 vols., 1836–40); Lassen, *Indische Alterthumskunde* (iv., 524 ff.).

Kaye, John, D. D.: bishop; b. at Hammersmith, England, Dec. 23, 1783; graduated at Christ's College, Cambridge, in 1804; became master of his college in 1814; Regius Professor of Divinity in 1816; Bishop of Bristol in 1820, and of Lincoln in 1827. He wrote *The Ecclesiastical History of the Second and Third Centuries, illustrated from the Writings of Tertullian* (1826); *Writings and Opinions of Clement of Alexandria* (1835); *Writings and Opinions of Justin Martyr* (1836); *Government of the Church during the First Three Centuries* (1855); several charges to his clergy; and two or three anonymous treatises directed against Roman Catholicism. D. at Riseholme, Feb. 18, 1853. His collected works appeared in London in 1888 (8 vols., with memoir by J. A. Jeremie). Revised by W. S. Perry.

Kaye, Sir John William: military historian; b. in England in 1814; served for some years in the army of the East India Company; returned to England in 1845, and devoted himself to literature. In 1856 he entered the Indian home civil service; in 1859 became secretary in the political and secret department of the India Office; and was knighted in 1871. He published a *History of the War in Afghanistan* (1851–53); *History of the Administration of the East India Company* (1853); *Life and Correspondence of Lord Metcalfe* (1854); *Life of Sir John Malcolm* (1856); *Chris-*

tianity in India (1859); *History of the Sepoy War* (3 vols., 1866–76); and *Essays of an Optimist* (1870). D. July 24, 1876. Revised by C. K. Adams.

Kazan', or **Kasan**: government of Russia; bounded by Viatka, Novgorod, and Astrakhan. Area, 24,601 sq. miles. The surface is flat, but the soil fertile, affording excellent pasture. Cattle and bees are reared, good timber is grown, and the fishing in the Volga is considerable. The manufacturing industry is of some importance and on the increase. More than 13,000 persons are employed in the weaving and dyeing of linen and hempen goods. Pop. 2,162,339.

Kazan: the capital of the government of Kazan, Russia; on the Kazanska, 4 miles from its influx in the Volga (see map of Russia, ref. 6–G). It has a university with four faculties, and nearly 1,000 students, a theological seminary, a military school, two gymnasia, and several other educational institutions, and it forms the intellectual center of Eastern Russia in Europe. It manufactures leather, soap, hardware, and spirits, and its trade is very extensive. It was destroyed by fire in 1815 and 1842. Pop. 134,400.

Kazbin', **Kasvīn'**, or **Casbin**: town; in the province of Irak-Ajami and district of Kasbin, Persia; 90 miles N. W. of Teheran; in a beautiful plain, covered with orchards and encircled by hills (see map of Persia and Arabia, ref. 2–G). It manufactures velvet, silk, satin, brocade, coarse cotton fabrics, and articles of iron and brass. Its breeds of camels and horses are very celebrated. The area it occupies is very large, but a great portion of it is covered with ruins. Pop. estimated at 40,000.

Kaz'inczy, Franz: author; b. at Er-Semlyén, Hungary, Oct. 27, 1759; studied law, and held several minor offices during the earlier part of his life, though literature was always his principal occupation. Being implicated in the conspiracy of Martinovics, he was condemned to death in 1793. He was pardoned, but kept in prison for seven years. After his liberation in 1801, he devoted himself exclusively to literature, and exercised a great influence both by his own works and by his numerous translations from the German, French, and English. He was one of the leaders of the movement by which the Latin language was laid aside and the native tongue adopted as the medium of Hungarian literature. D. at his villa near Ughely, Nov. 22, 1831.

Kea, kee'ă: native name of a large parrot (*Nestor notabilis*), inhabiting the mountainous regions of New Zealand; noted for its flesh-eating habits. Its natural food is fruit and grubs, but since the introduction of sheep, and the destruction of much of its food by the practice of burning over the ground, it has become carnivorous, feeding not only on the offal from slaughtered sheep, but in winter attacking and killing many young and weakly animals. The kea is about a foot and a half long; the bill is long and sharp; the general color is dull green, reddish on the rump and under wing-coverts, the feathers darker edged.

F. A. Lucas.

Kean, Charles John: actor; son of Edmund Kean; b. at Waterford, Ireland, Jan. 18, 1811; was educated at Eton, but was withdrawn before completing his studies, in consequence of his father's broken fortunes; declined a cadetship in the service of the East India Company, and made his first appearance on the stage at Drury Lane theater on Oct. 1, 1827, in the character of Norval. His reception was cold, and success came to him slowly. In 1830 he visited the U. S., and appeared as Richard III. at the Park theater, New York; returned to England Jan., 1833, and played in the provincial theaters; made a professional trip to Hamburg; went to London in 1838, and took position, as Hamlet, in the front rank of his profession. In 1839 he visited again the U. S. and Havana; returned to London in 1840; in 1842 married Miss Ellen Tree, who died Aug. 20, 1880; crossed the Atlantic once more with his wife in 1846; in 1847 went back, and after playing engagements in several cities identified his fortunes with the Princess theater, London, which he made popular and lucrative. In 1865 he and his wife made a professional tour round the world, visiting Australia and playing in the principal cities. He returned to England in 1866 in broken health, and died in London, Jan. 22, 1868. His production of *Richard III.* and of *King John*, first attempted in the U. S. on a scale of splendor till then unknown, had great celebrity. Mr. Kean gained his chief reputation in the tragedies of Shakspeare—*Hamlet*, *Macbeth*, *Richard II.*, *Richard III.*, *Romeo and Juliet*—but was inferior to his father. Revised by B. B. Vallentine.

Kean, Edmund: actor; b. in London in 1787. His father, it is believed, was connected as a mechanic with the Royalty theater; his mother was Nance Carey, an actress of little repute. He was born and reared amid the associations of the stage; for fourteen or fifteen years was connected with strolling companies, and played in every variety of *rôle*. His first appearance on the London stage was at Drury Lane Jan. 26, 1814, in the character of Shylock. His success was immediate, and was raised to the highest point by his impersonations of Hamlet, Richard III., Macbeth, Othello, Iago, Lear, Sir Giles Overreach, Sir Edward Mortimer, and other parts then popular. He visited the U. S. in 1820, and again in 1825; his last appearance was at Covent Garden, Mar. 25, 1833, with his son Charles, as Othello; his strength failed him in the middle of the play, and he was borne out in the arms of his son. Kean was a man of genius and accomplishment, a student in his profession, of extraordinary powers of mimicry and conversation, but irregular in life, capricious in temper, and eccentric in habit. He died at Richmond, May 15, 1833. In moments he was surpassingly great, but his reliance on his genius made him unequal. His biography by *Barry Cornwall* (Mr. Procter) gives an interesting account of the actor and the man. Macready, in his *Reminiscences*, calls Kean "one of the most extraordinary theatrical geniuses that have ever illustrated the dramatic poetry of England." Kean was small of stature, but graceful, and when under the influence of passion, effective and even grand. His countenance was expressive, his eye brilliant, his action free and noble, his voice flexible and strong. His power of impersonation was wonderful; in his best moments "he seemed to clutch the whole idea of his character." See the *Life* by Molloy (2 vols., 1888).

Revised by B. B. Vallentine.

Keane, John, Lord: soldier; b. at Belmont, Ireland, in 1781; entered the British army in boyhood; served in Egypt, and in Spain during the Peninsular war, gaining the rank of major-general; commanded the British expedition against New Orleans in 1814 until superseded by Pakenham; was severely wounded at the battle of New Orleans. D. at Burton Lodge, Hampshire, England, Aug. 24, 1844.

Keane, John Joseph, D. D.: bishop in the Roman Catholic Church; b. in Ballyshannon, County Donegal, Ireland, Sept. 12, 1839; at the age of seven was taken by his family to the U. S. He studied classics at St. Charles's College, Maryland, and theology at St. Mary's Seminary, Baltimore. He was ordained in 1866 and appointed assistant rector of St. Patrick's church, Washington, D. C., where he remained until his consecration as Bishop of Richmond, Aug. 25, 1878. In 1886 he was appointed rector of the Catholic University, and the papal brief of Aug. 29, 1888, which transferred him from the see of Richmond to the titular see of Ajasso, left him free for the duties of his new position. In 1896 he resigned this office and was called to Rome, where he became canon of St. John Lateran and assistant bishop at the pontifical throne. He is an associate editor of this cyclopædia, having charge of the department of Roman Catholic Church history, doctrine, etc.

Kearney: city (founded in 1872); capital of Buffalo co., Neb. (for location of county, see map of Nebraska, ref. 11–E); on the Burl. and Mo. River, the Kearney and Black Hills, and the Union Pac. railways; 136 miles W. of Lincoln. It is in the choice agricultural, stock-raising, and well-watered region of the Platte river valley, 2,150 feet above sea-level, and derives abundant water-power from the Platte river by means of a canal 13 miles long. It has 4 national banks with combined capital of $500,000, a state bank, and 3 daily, 3 weekly, 2 monthly, and 2 other periodicals. Pop. (1880) 1,782; (1890) 8,074.

Kearny, kär'nē, Philip: general; nephew of Gen. Stephen Watts Kearny; b. in New York, June 2, 1815; graduated at Columbia College, and studied law, but in 1837 accepted a lieutenancy in the First Dragoons, of which regiment his uncle was then colonel, and soon after visited Europe under orders of the Government to examine and report upon the tactics of the French cavalry service. Here he attended the Royal Cavalry School at Saumur, and subsequently served as a volunteer in the Chasseurs d'Afrique in Algeria, winning the cross of the Legion of Honor. He returned to the U. S. in 1840, and was attached to the staff of Gen. Scott 1841–44, when he rejoined his regiment in the West. He served with great gallantry in the Mexican war; became captain of dragoons in 1846, and was breveted major for bravery at Contreras and Churubusco. In the final as-

sault on the city of Mexico he lost an arm; subsequently served in California and in command of an expedition against the Indians on Columbia river. He resigned Oct., 1851, and went to Europe, where he continued his military studies; served in the Italian war of 1859 as a volunteer aide to Gen. Maurier of the French army, being engaged at Magenta and Solferino, and for bravery was a second time decorated with the cross of the Legion of Honor. The outbreak of civil war in the U. S. caused his hasty return home. Appointed at once a brigadier-general of volunteers, he was assigned to the command of a brigade of New Jersey troops. In the Peninsular campaign of 1862 he commanded a division, and at Williamsburg and Fair Oaks his services were most valuable, as well as throughout the subsequent hard fighting. At Harrison's Landing he was promoted major-general of volunteers, to date July 4, 1862. Subsequently, in the second battle of Bull Run, he was again conspicuous, and at Chantilly, where he was killed Sept. 1, 1862, while reconnoitering in advance of his troops. See de Peyster, *Personal and Military History of Philip Kearny* (New York, 1869).
Revised by JAMES MERCUR.

Kearny, STEPHEN WATTS: general; b. at Newark, N. J., Aug. 30, 1794. On the outbreak of the war with Great Britain he abandoned his studies at Columbia College, and entered the army as first lieutenant Thirteenth Infantry Mar., 1812; in the following October he was distinguished in the assault on Queenstown Heights, and was promoted to be captain Apr., 1813. After the war he was retained in the army, and rose through successive grades to be brigadier-general in 1846. In the war with Mexico he commanded at the beginning the Army of the West, which made conquest of the province of New Mexico; having established a provisional government at Santa Fé, he continued his march to California, and Dec. 6, 1846, fought the battle of San Pascual, where he was twice wounded; subsequently commanded the troops of sailors and marines and detachment of dragoons in the battles of San Gabriel and Plains of Mesa, Jan. 8 and 9, 1847. He was Governor of California from Mar. to June, 1847; joined the army in Mexico, and was Governor of Vera Cruz Mar., 1848, and May, 1848, of the city of Mexico. For his services in New Mexico and California he was breveted major-general. He was author of *A Manual for the Exercise and Manœuvering of U. S. Dragoons* (Washington, 1837); *Organic Law, and Laws for the Government of the Territory of New Mexico* (Santa Fé, 1846). D. at St. Louis, Mo., Oct. 31, 1848. Revised by JAMES MERCUR.

Kearsarge, keer'sărj, **Mount**: a conspicuous mountain in Carroll co., N. H.; lat. 44° 6′ 20″ N., lon. 71° 5′ 40″ W.; height, 3,250 feet. The U. S. vessel which sunk the Confederate cruiser Alabama in 1864 was named after this mountain. Another mountain of the same name, in Merrimack co., N. H., called by the Indians Cowissewaschook, is 2,950 feet high.

Keating, JOHN M.: gynæcologist; b. at Philadelphia, Pa., Apr. 30, 1852; graduated at Seton Hall College and the University of Pennsylvania; became lecturer on Diseases of Children in the University of Pennsylvania, and Professor of Principles and Practice of Medicine in the Woman's Medical College of Philadelphia. He was editor of *Cyclopædia of the Diseases of Children*, *International Clinics*, *The Climatologist*, and published *With General Grant in the East* (Philadelphia, 1880); *The Mother's Guide in the Management and Feeding of Infants* (1881); *Diseases of the Heart and Circulation in Childhood* (with Dr. W. A. Edwards); *Maternity, Infancy, and Childhood*; *How to Examine for Life Insurance*; *A New Pronouncing Dictionary of Medicine* (with Henry Hamilton); *Mother and Child* (with Dr. Edward P. Davis).

Keats, JOHN: poet; b. in London, England, Oct. 29, 1795; was the son of a livery-stable keeper; went to a school at Enfield kept by the father of Charles Cowden Clarke; served, 1810–15, an apprenticeship to a surgeon, and then studied in London, and practiced till 1817; became the friend of Leigh Hunt, Lamb, and other authors; published in 1817 a volume of verses, followed in 1818 by *Endymion*, and another volume of poems in 1820, which included the unfinished epic *Hyperion*. D. of consumption in Rome, Feb. 23, 1821. The fame of Keats as a poet has much widened since his death. His exquisite sense of beauty and the almost perfect art of his best work have given him the highest place among "the inheritors of unfulfilled renown." The *Life, Letters, and Literary Remains* of Keats were published in two volumes by R. Monckton Milnes in 1848; *The Letters of John Keats to Fanny Brawne*, with introduction and notes by Henry Buxton Forman, appeared in 1878; and a *Life* by Sidney Colvin in 1886. Revised by H. A. BEERS.

Ke'ble, JOHN, M. A.: clergyman and poet; b. at Fairford, Gloucester, England, Apr. 25, 1792; was graduated with double first-class honors at Corpus Christi, Oxford, and became a fellow of Oriel 1811; was public examiner at Oxford 1813–16; took deacon's orders 1815, priest's 1816; was a tutor at Oxford 1818–23; became Professor of Poetry 1831, and held the position for the full term of ten years; was one of the original Tractarians, and a leader of the Anglo-Catholic movement; became vicar of Hursley 1836. D. at Bournemouth, Mar. 29, 1866. In 1827 he published *The Christian Year*, a volume of sacred poetry which attained a wide popularity, and upon which his fame chiefly rests; also published *Prælectiones Academicæ* (1844); *Lyra Innocentium* (1847); *The Psalms in English Verse*, *De Poetica Vi Medica* (1847); some volumes of sermons, and many tracts and pamphlets upon ecclesiastical subjects. See *Memoir of Rev. John Keble*, by Sir John T. Coleridge (London, 1869). A permanent memorial exists in Keble College at Oxford, incorporated in 1870. Revised by W. S. PERRY.

Kechuas: See INDIANS OF SOUTH AMERICA.

Kecskemet': the capital of the district of Pesth-Solt, Hungary; 55 miles by rail S. E. of Budapest (see map of Austria-Hungary, ref. 6–H). The rearing of cattle and horses is the chief pursuit of the inhabitants, and the annual cattle-fair held in this city is the most important in the country. Pop. (1890) 48,493.

Keel [may in form represent O. Eng. *cēol*, ship: O. H. Germ. *chiol*, large boat: Icel. *kjōll*, ship < Teuton. *keulaz*, possibly connected with Gr. *γαῦλος*, Phœnician ship, jar. The meaning, however, connects *keel* with Icel. *kjōlr*, keel, from which it may have been borrowed; cf. Dutch *kiel*, Fr. *quille*, Ital. *chigla*, Span. *quilla*, from same source]: in ship-building, the beam which passes under the ship's hull from stem to stern. It is usually made up of several heavy timbers bolted together lengthwise. The ship's ribs, stern, and stern-post spring from the keel, which is external to the hull, as the keelson is internal. Below the keel one or more false keels are bolted on. In iron vessels the keel is frequently dispensed with, and, as the whole weight of the ship and its contents exercise an oblique lateral pressure on each side of the keel-line, sufficient strength is obtained, in the absence of a keel, by internal tie-beams.

Keeley, LESLIE E., M. D., LL. D.: physician; b. in St. Lawrence co., N. Y., in 1836; moved in early life to Michigan; graduated at Rush Medical College, Chicago, Ill., in 1863; served as a surgeon in the U. S. volunteers during the civil war; settled in Dwight, Ill., in the latter part of 1866. In 1879 he announced that he had discovered "in gold as a chloride" a cure for the alcohol and opium habits. In the spring of 1880 he opened an institute at Dwight for the cure of these diseases. A company was formed, and branch institutes, known as "Keeley institutes," were established in various parts of the U. S. It is claimed that of over 200,000 cured, at the end of the year 1893, only 5 per cent. had relapsed. The medicine and mode of administration employed in the Keeley cure are secret, and the regular medical profession has not accepted the claims for it with favor. Published analyses have stated that no gold salt is contained in the solutions. Dr. Keeley is the author of *The Morphine-eater; or from Bondage to Freedom*, etc. (Dwight, Ill., 1881), and of numerous fugitive articles on his "cure."
S. T. ARMSTRONG.

Keeling Islands (from William Keeling, the discoverer in 1609), or **Cocos Islands**: a group of small low islands belonging to Great Britain. They are in lat. 11° 49′ to 12° 13′ S., and about lon. 97° E.; 700 miles S. W. of the Straits of Sunda. There are twenty-three islands in a ring, around a central lagoon about 10 miles across in its longest diameter. Total area, 8 sq. miles. Pop. (1885) 536, of whom 377 were natives; (1891) 554. The islands are thickly planted with cocoanut-palms, and export large quantities of copra, cocoanuts, and oil. The group was annexed to Great Britain in 1856, and placed under the governor of the Straits Settlements in 1886. M. W. HARRINGTON.

Keen, WILLIAM WILLIAMS, M. D., LL. D.: surgeon; b. in Philadelphia, Jan. 19, 1837; graduated at Brown University in 1859 and at Jefferson Medical College in 1862; was assistant surgeon Fifth Massachusetts Regiment in 1861, and acting assistant surgeon, U. S. army, from 1862 to 1864;

studied in Europe from 1864 to 1866, when he returned to Philadelphia to practice; conducted the Philadelphia School of Anatomy from 1866 to 1875; lectured on pathological anatomy at Jefferson Medical College from 1866 to 1875. He was Professor of Artistic Anatomy at the Pennsylvania Academy of Fine Arts from 1876 to 1890; Professor of Surgery at the Women's Medical College from 1884 to 1889; and Professor of Surgery at the Jefferson Medical College since 1889 to the present date. He received the degree of LL. D. from Brown University in 1892. From the beginning of his career he paid special attention to the surgery of the nervous system, his earliest work being on reflex paralysis due to gunshot injury (1864); and he has been one of the pioneers in cerebral surgery, in 1888 proposing and performing the operation of tapping and draining the lateral cerebral ventricles. In 1890 he published his experiments relating to the determination of rupture of the bladder by the injection of filtered air; and in 1891 he proposed exsecting the nerves supplying the posterior rotator muscles of the head for the relief of spasmodic wryneck. He has published numerous papers on surgical topics in the various medical journals of the U. S. In 1870 and 1872 he edited Heath's *Practical Anatomy* and Flower's *Diagrams of the Nerves of the Human Body*, and in 1879 the series of American Health Primers (12 vols.). He was the editor of the American edition of *Gray's Anatomy*, and one of the editors of *The American Text-book of Surgery* (1892). In 1894 he was elected *membre correspondant étranger* of the Société de Chirurgie of Paris. S. T. Armstrong.

Keene: city (settled in 1734); capital of Cheshire co., N. H. (for location of county, see map of New Hampshire, ref. 10–D); on the Ashuelot river, and the Boston and Maine, the Conn. River, and the Fitchburg railways; 92 miles N. W. of Boston. It is on a wide plain surrounded by lofty hills, and is laid out with broad thoroughfares, the five principal ones radiating from Central Square. The city is supplied with water from Silver Lake and Woodward Pond, 3 and 4 miles distant respectively. It contains a public library with over 8,000 volumes, 4 national banks with combined capital of $450,000, 3 savings-banks, and 1 daily and 3 weekly newspapers. The manufacturing establishments comprise the locomotive repair-shops of the Fitchburg Railroad, several steam furniture-factories, shoe-factory, machine-shops, iron-foundry, steam-tanneries, flannel-mills, and toy, glue, carriage, sleigh, and sash and blind factories. Pop. (1880) 6,784; (1890) 7,466. Editor of "Evening Sentinel."

Keene, Charles Samuel: illustrator and draughtsman; b. at Hornsey, near London, Aug. 10, 1823. At the age of nineteen he was apprenticed to the brothers Whymper, wood-engravers. He afterward worked for illustrated journals, and especially for *Punch*, where his drawings first appeared in 1851. The first signed drawing was in 1854. Although his work appeared almost weekly in comparison at first with that of John Leech (*q. v.*), and afterward with that of du Maurier (*q. v.*), it holds its own against both, and no designs which *Punch* published during the forty years of his connection with it are more important as fine art or as illustration of life and manners and national characteristics. *Punch's Pocket-book*, an annual publication, contained many of Keene's designs, and is especially valuable for his own handiwork, as seen in the large etchings, for all the other designs named above were rendered in wood-engraving. *Once a Week*, a periodical, contained a number of Keene's drawings, among others the illustrations to Charles Reade's *A Good Fight* and George Meredith's *Evan Harrington*. He illustrated Douglas Jerrold's *Mrs. Caudle's Curtain Lectures*, Mark Lemon's *Number Nip*, and in his youth a number of books less well known. His etchings were seldom published apart from the illustration of books. There is one in *Passages from Modern English Poets, illustrated by the Junior Etching Club*, and one is named as published in *The Etcher* for Mar., 1881. He received a gold medal for his beautiful work in black and white at the Paris Exhibition of 1889. D. in London, Jan. 4, 1891. Russell Sturgis.

Keene, Laura: the stage-name given to Miss Mary Moss by Charles Reade; b. in Chelsea, London, in 1820; first appeared on the stage of Madame Vestris's theater in London in 1845; married Henry Wellington Taylor in 1847; and acted with success in the U. S. and in Australia. She married John Lutz in 1857. At the Olympic theater in New York she introduced in 1858 the very successful comedy of *Our American Cousin*. She was successful in the principal cities in the U. S. until her death at Montclair, N. J., Nov. 4, 1873. It was at one of her representations of *Our American Cousin* that President Lincoln was assassinated in 1865. Revised by B. B. Vallentine.

Keep, Robert Porter, A. B., Ph. D.: author and teacher; b. in Farmington, Conn., Apr. 26, 1844; graduated at Yale in 1865; was tutor in Yale 1867–69; U. S. consul at Athens 1869–71; teacher of Greek at Williston Seminary, Easthampton, Conn., 1876–85; has been principal Free Academy, Norwich, Conn., since 1885; has published a translation of Autenrieth's *Homeric Dictionary* (1876); *Stories from Herodotus*, book vii. of *History* (1879); Homer's *Iliad*, books i.–iii. (1879); *Essential Uses of the Moods in Greek and Latin* (1882); Homer's *Iliad*, books i.–vi. (1883); *Greek Lessons* (1885). C. H. Thurber.

Keeseville, keez'vil: village; in Essex and Clinton cos., N. Y. (for location of counties, see map of New York, ref. 2–J); on both sides of the Ausable river, and on the Keeseville, Ausable C. and Lake Cham. Railroad; 4 miles W. of Lake Champlain, 14 miles N. W. of Burlington, Vt. The two parts of the village are connected by three bridges, one an iron suspension bridge, across the river. The village has excellent water-power. A woolen-mill was erected here in 1813, and a rolling-mill in 1816. The manufactures include foundry products, agricultural implements, furniture, nails, wagons, and harness. Pop. (1880) 2,181; (1890) 2,103. Editor of "Essex County Republican."

Keewatin, kē̆e-waa'tin [native Indian, meaning North Wind, according to Saint-Martin]: a district of the Dominion of Canada, between Ontario and Manitoba, extending N. along the west coast of Hudson's Bay to the Arctic Ocean, including Melville peninsula and that of Boothia Felix. Area about 267,000 sq. miles. Population very small; governed by the governor of Manitoba. Created in 1876, and increased by the addition of a portion of Manitoba in 1883. The western boundary is the meridian 100° W.; the southern the Albany river. The northern third or half is in the Barren Lands of Canada, and is incapable of supporting a population. The southern part is less inhospitable, and has a climate colder than elsewhere in the same latitudes of North America except in the adjoining regions to the east. There are some forests of small value. The mineral wealth is said to be considerable. Mark W. Harrington.

Kehrer, kā'rer, Ferdinand Adolf, M. D.: gynæcologist; b. at Guntersblum, Rheinhessen, Germany, Feb. 16, 1837; educated at Worms and at Giessen; became privat docent in the University of Giessen 1863; Professor Extraordinary of Theoretical Obstetrics 1868; Professor of Obstetrics 1872; and was appointed Professor of Obstetrics and Gynæcology in the University of Heidelberg 1881. He has published *Beiträge zur vergleichenden und experimentellen Geburtskunde* (1864–77); *Beiträge zur klinischen und experimentellen Geburtskunde und Gynæcologie* (1879–90); *Lehrbuch der Geburtshilfe für Hebamen* (1881; 2d ed. 1891); *Lehrbuch der operativen Geburtshilfe* (1891), etc.

Keicho: See Hanoi.

Keigh'ley (locally **Keithley**), keeth'li: a market-town in the northern division of the West Riding of Yorkshire, England; 9 miles N. W. of Bradford (see map of England, ref. 6–H). It has water communication with both the eastern and the western coast by the Liverpool-Hull Canal. It owes its importance to the development of its manufacturing industry (worsted and woolen goods, machinery, machine-tools, sewing-machines, etc.). Pop. (1890) 30,811.

Kei Islands: a group of islands in the Malay Archipelago, S. of New Guinea, in lat. 5° 25′ S., lon. 132° E. It consists of two large and a number of small islands. Great Kei comprises an area of 294 sq. miles; Little Kei of 283 sq. miles. They are of volcanic origin, mountainous, fertile, and rich in timber, cocoanuts, tortoise-shells, sago, and different fruits. The inhabitants, partly Christians, partly Mohammedans, are hospitable, industrious, and honest. Pop. (1887) 20,030, three-fourths on Great Kei.

Keil, kīl, Heinrich: Latinist; b. in Gressow, near Wismar, Germany, May 25, 1822; became professor at the University of Erlangen in 1859; was called to Halle in 1869. Besides the monumental edition of the *Grammatici Latini* (7 vols., Leipzig, 1855–80), he published standard text editions of Pliny the Younger (1870); Varro, *De re rustica* (1882); Cato, *De agricultura* (1892); Probus's commentary to Vergil's *Bucolics* and *Georgics*; the scholia to Apollonius Rhodius in Merkel's and to Nicandros's *Theriaka* in O. Schneider's edition, and other minor works. Alfred Gudeman.

Keil, Johann Carl Friedrich, D. D.: Lutheran theologian; b. at Oehlitz, Saxony, Feb. 26, 1807; studied at Dorpat (1827–30) and Berlin (1831–33); became privat docent at Dorpat 1833; professor extraordinary 1838; professor ordinary 1839; retired on a pension to Leipzig 1859. D. at Röcknitz, Saxony, May 5, 1888. He is best known as a joint editor with Delitzsch of a series of commentaries upon the Old Testament. He supplied the comments on Genesis and Exodus (Leipzig, 1861; 3d ed. 1878); Leviticus, Numbers and Deuteronomy (1862; 2d ed. 1870); Joshua, Judges, and Ruth (1863; 2d ed. 1874); Samuel (1865; 2d. ed. 1875); Kings (1866; 2d ed. 1876); Chronicles, Ezra, Nehemiah, and Esther (1870); Jeremiah and Lamentations (1872); Ezekiel (1868; 2d ed. 1882); Daniel (1869); Minor Prophets (1867; 3d ed. 1888)—all translated in Clark's Foreign Theological Library (Edinburgh); published *Biblical Archæology* (Frankfort, 1857; 2d. ed. 1875; Eng. trans. in Clark's Foreign Theological Library, Edinburgh, 1887). He held tenaciously to conservative views, while Delitzsch made many concessions to the "advanced" critical school.

Samuel Macauley Jackson.

Keim, kīm, Karl Theodor, D. D.: theologian; b. at Stuttgart, Germany, Dec. 17, 1825. After studying at Tübingen and Bonn, and holding a pastorate at Esslingen, Würtemberg (1856–60), he became Professor of Theology in Zurich, and later (1873) in Giessen. He was an unhappy, disappointed man, conscious of rare abilities, and chafing under supposed neglect, for the positions he held were considered comparatively obscure. D. at Giessen, Nov. 17, 1878. He was a remarkable scholar, and produced the standard life of Jesus from the rationalistic standpoint. It was translated into English, *Jesus of Nazareth and the National Life of Israel* (3 vols., Zurich, 1867–72; Eng. trans., 6 vols., London, 1873–82). See his memoir by H. Ziegler, in his posthumous *Rom und das Christenthum* (Berlin, 1881).

Kei River, Great: a stream which separates the formerly so-called British Kaffraria, now a part of the Cape Colony, from Kaffraria proper. It empties into the Indian Ocean. Like all rivers of Kaffraria, it is unfit for navigation, its bed being very rocky and irregular.

Keith, keeth, George: clergyman; b. at Aberdeen, Scotland, in 1638; was educated for the Presbyterian ministry at the University of Aberdeen; adopted Quaker principles about 1664, and in 1677 accompanied Robert Barclay, William Penn, and others to Holland on a mission for the dissemination of Quaker tenets. In 1682 he took charge of a Quaker school at Edmonton, and was imprisoned in Newgate for refusing to take an oath and preaching without license (1684). Soon afterward he visited North America; became surveyor-general of East Jersey, and in 1689 took charge of a Quaker school in Philadelphia. The next year he went to New England as a Quaker preacher, and was engaged in disputes with Increase and Cotton Mather. Returning to Philadelphia, he became involved in controversy with his own sect, charged William Penn with deism, and in return was denounced as an apostate. Keith thereupon founded a sect known as Keithians, Christian Quakers, or Baptist Quakers, but ultimately entered the Church of England, and was employed by the Society for Propagating the Gospel in Foreign Parts as a missionary. From 1702 to 1704 he made a tour of the Northern colonies, and converted many hundreds of Quakers, who were baptized by him. Returning to England in 1704 he was appointed rector of Edburton in Sussex, where he died Mar. 27, 1716. He was a man of deep learning, well versed in Platonism, and wrote many theological tracts both for and against Quakerism; also a journal of travels in North America (1706), and a *New Theory of the Longitude* (1709). See Janney's *History of the Friends* (Philadelphia, 1867); Proud's *History of Pennsylvania*; Hawkins's *Mission of the Church of England*; Wagstaff's *History of the Friends*; *History of the Collection of the Protestant Episcopal Church*, i.; *Digest of the Records of the Society for Propagating the Gospel* (1701–1892); and Watts's *Bibliotheca Britannica*.

Revised by W. S. Perry.

Keith, George Keith-Elphinstone, Admiral, Viscount: naval officer; b. at Elphinstone, Scotland, Jan. 7, 1746; entered the navy in boyhood, and, as post-captain commanding the frigate Perseus, took part in the actions against American privateers and blockade-runners 1776–82. Keith was a member of Parliament 1780–93. In 1793 he served with the Mediterranean squadron under Lord Hood at Toulon, and as admiral was dispatched in 1795 to operate against the Dutch colonies. He took possession of Cape Colony in South Africa, Ceylon, Cochin, Malacca, and the Molucca islands, and in Aug., 1796, captured a Dutch squadron near Saldanha Bay, West Africa. For these brilliant services he was created an Irish peer, as Baron Keith of Stonehaven Marischal. In Mar., 1800, he blockaded Masséna in Genoa, co-operating with the Austrians, who took that city. He co-operated with Abercrombie in the Egyptian expedition, and in 1815 commanded the Channel fleet, which prevented the escape of Napoleon I. and brought about his surrender to Capt. Maitland of the Bellerophon. In 1814 he was created Viscount Keith of the peerage of the United Kingdom. D. at Tullialan, Perthshire, Scotland, Mar. 10, 1823. Revised by C. K. Adams.

Keithsburg: city; Mercer co., Ill. (for location of county, see map of Illinois, ref. 4–B); on the Mississippi river, and the Chi., Burl. and Q. and the Ia. Cent. railways; 150 miles N. W. of Springfield. It is in an agricultural region, and has three weekly newspapers. Pop. (1880) 942; (1890) 1,484.

Kekrops: See Cecrops.

Kelat: city of Baluchistan. See Khelat.

Keller, Gottfried: poet and novelist; b. at Zurich, Germany, July 19, 1819; studied painting at Munich and afterward philosophy and literature at Heidelberg and Berlin. Returning to Switzerland he was given an office in the municipal government of Zurich which he held until 1876, when he devoted himself entirely to his literary pursuits. D. July 14, 1890. Keller's first novel, *Der grüne Heinrich* (1854), received little attention by the contemporary critics, though it is probably his best work, and even his later publication, *Die Lente von Seldwyla* (1856), a collection of exquisitely written short stories, was appreciated for a long while only by a small circle of admirers. Not, however, until Paul Heyse had greeted him as the "Shakspeare of the German novel," and the celebrated critic Fr. Th. Vischer had written an admirable review of his writings, did the German people begin to prize the treasures hidden in his stories. Keller indeed ranks among the best writers of German fiction, combining in his style the classic repose and gracefulness of Goethe with the humor of Jean Paul. Among his short stories may be mentioned especially *Romeo und Julie auf dem Dorfe* (1876). Besides the works already mentioned he published *Sieben Legenden* (1872); *Züricher Novellen* (1876); *Das Sinngedicht* (1881); *Martin Salander* (1886). He was less successful as a lyric poet in his *Gedichte* (1883). See Fr. Ph. Vischer, *Altes und Neues*, ii., 135; Otto Brahm, *Gottfried Keller* (1883). Julius Goebel.

Kelley, Edgar Stillman: composer; b. at Sparta, Wis., Apr. 14, 1857; after studying with local teachers, went to Stuttgart; on his return, settled in San Francisco, where he composed incidental music to *Macbeth*, which has been performed many times, and gave him his reputation. Later he settled in New York, and devoted himself to composing and teaching. He has composed much in different lines. His opera *Puritana*, produced in the summer of 1892 in New York, was very successful. D. E. Hervey.

Kellogg, Alfred Hosea, D. D.: Presbyterian minister and Oriental scholar; b. in Philadelphia, Pa., Sept. 10, 1837; graduated at Princeton College (1859) and Seminary (1862). He was pastor at Easton, Pa. (1862–65), of the University Place church, New York city (1865–70), the Central Presbyterian church, Philadelphia (1873–77), and of the Jefferson Avenue church, Detroit, since 1882. He has published *Abraham, Joseph, and Moses in Egypt*, the Stone lectures in Princeton Seminary (New York, 1887), and similar works.

Willis J. Beecher.

Kellogg, Clara Louise: singer; daughter of George Kellogg, an inventor and a native of Connecticut; b. in Sumterville, S. C., July 12, 1842; spent her childhood in Connecticut. She studied vocal music chiefly in New York city; made her first appearance in opera as Gilda in *Rigoletto* at the Academy of Music, New York, in the season of 1861–62; in 1867–68 was enthusiastically received at her Majesty's theater, London, and elsewhere in England; from 1868 till 1872 sang in opera in the U. S., and in 1872 at Drury Lane theater, London, with Christine Nilsson. After her return to the U. S. she sang in Italian opera for a time, and then organized an English opera company, which was highly successful. In 1876 she organized an Italian opera company, and after its dissolution made concert-singing her specialty. In 1879–80, and in 1883, she appeared in opera in Europe. Later, with a company of her own, Miss Kellogg made a

tour through the U. S. She was married to her manager, Carl Strakosch, in 1887. She has since retired from professional life. Revised by B. B. VALLENTINE.

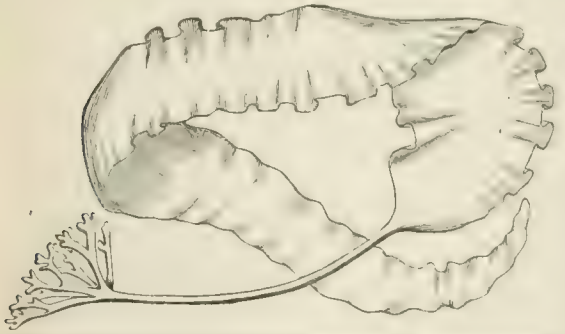
Kellogg, SAMUEL HENRY, D. D., LL. D.: a Presbyterian minister, missionary, and scholar; b. in Quogue, Long Island, N. Y., Sept. 6, 1839; graduated at the College of New Jersey (1861) and at Princeton Theological Seminary (1864). He was tutor in the college 1863–64; missionary in Futtegurh, India, 1865–71, and in Allahabad 1872–76; pastor of Third Presbyterian church, Pittsburg, Pa., 1877; Professor of Systematic Theology, Western Theological Seminary, 1877–86; pastor of St. James's Square Presbyterian church, Toronto, Canada, 1886–92; returning to India in the autumn of 1892, as missionary of the Presbyterian Church in the U. S., to engage in Bible translation work and other literary work in the Indian vernaculars. He has published *A Grammar of the Hind Language and Dialects* (Allahabad, 1876; a new and enlarged edition was published, 1892, under the patronage of her Majesty's India Council); *The Jews: or Prediction and Fulfillment* (New York, 1883); *The Light of Asia and the Light of the World* (London and New York, 1885); *From Death to Resurrection* (New York, 1885); *An Exposition of the Book of Leviticus*, vol. iii. of the *Expositor's Bible* (London, 1891); *The Genesis and Growth of Religion*, being the Stone lectures at Princeton Seminary (London and New York, 1892). WILLIS J. BEECHER.

Kells: a market-town of County Meath, Ireland, on the Blackwater; 39 miles N. W. of Dublin (see map of Ireland, ref. 9–I). It is notable on account of its many and important antiquarian remains—the house of St. Colomba, a perfect specimen of an ancient round tower, etc. Pop. 2,822.

Kelly, HOWARD ATWOOD, M. D.: gynæcologist; b. in Camden, N. J., Feb. 20, 1858; was educated at the University of Pennsylvania; founded Kensington Hospital for Women; was Associate Professor of Obstetrics in the University of Pennsylvania; is Professor of Gynæcology and Obstetrics in Johns Hopkins University. He has published numerous papers, mainly in *The American Journal of Gynæcology and Obstetrics*.

Ke'loid, more correctly **Che'loid** [liter., claw-shaped; Gr. χηλή, claw, hoof + *-oid*, like. The form *keloid* is by confusion with Gr. κήλη, tumor]: a name applied to two apparently distinct skin diseases: (1) A sort of fibroid tumor of the true skin, often appearing on the scar of a cut or burn. It is almost certain to return after excision, and is thus far not curable. This is the keloid of Alibert. (2) A much more general disease, sometimes spreading over the whole body. Congested tubercles, generally originating near the sternum, advance over the body, are very irritable, and cause trouble by itching, especially in warm weather. Cold applications and tonic treatment palliate but do not cure it. Negroes are more subject to this disease than white persons.

Kelp: brown seaweeds of the family *Laminariaceæ*, common along the seacoast. Many of the species are of large size, ranging from 6 to 10 feet, in the "devil's apron" of the Atlantic coast of North America, to several hundred feet, in the giant kelp of the Pacific Ocean. "In the southern hemisphere they form dense submarine forests of gigantic size, making even deep water impassable for boats, and forming a home for myriads of marine animals." (*Bennett.*) The plant body is composed of considerably differentiated tissues, and is simple and leaf-like, or more commonly subdivided. It is attached to the sea-bottom by root-like organs (rhizoids), above which is usually a tough cylindrical stem. They reproduce by forming zoöspores in modified hairs, which are scattered over the surface of the thallus, or cover restricted areas. The kelps are of economic importance as one of the sources of iodine. Some species are used as food by the inhabitants of northern countries; the hard dried stems of others are made into canes, etc., and the great masses thrown ashore by storms are used by farmers for enriching the soil. CHARLES E. BESSEY.



Kelp, or devil's apron (*Laminaria saccharina*, greatly reduced.

Kelso: a burgh of barony and market-town of Roxburghshire, Scotland; situated on the Tweed, near its junction with the Teviot; 45 miles S. E. of Edinburgh (see map of Scotland, ref. 11–H). The trade of the town is chiefly connected with the agricultural pursuits of the adjacent districts. Close by are the ruins of the ancient abbey church, demolished by the English in 1545. Pop. (1891) 4,174.

Keltic Language: See CELTIC LANGUAGES.

Kelts: See CELTS.

Kelung: See KILUNG.

Kelvin, LORD: See THOMSON, SIR WILLIAM.

Kemble: a name distinguished in the records of the English stage. The founder of the family, Roger, an actor and theatrical manager, born in Hereford, England, Mar. 1, 1721, died in 1802, had twelve children, the eldest of whom, Sarah, married an actor named Siddons. (See SIDDONS, SARAH.) The oldest son was JOHN PHILIP, born in Prescot, Lancashire, Feb. 1, 1757. This was the "great Kemble." He was educated partly at the Roman Catholic seminary of Sedgley Park, in Staffordshire, and afterward at the English College at Douai, in France; returned to England at the age of nineteen, and made his first appearance at Wolverhampton, Jan. 8, 1776, in the character of Theodosius; made his first appearance in London at Drury Lane, in Sept., 1783, as Hamlet; became manager of that theater in 1790; in 1803 bought a sixth share in Covent Garden theater, and became manager of it. The theater was burned in 1808, but immediately rebuilt. An increase in the prices of admission to the new house (from six to seven shillings for the boxes, and from three to four shillings for the pit) caused the O. P. (old price) riots, which lasted for some months and menaced the ruin of the establishment. At this time Mr. Kemble was grossly insulted and abused. In 1817 he took leave of the London stage, retired soon afterward to the south of France, and finally took up his residence at Lausanne, Switzerland, where he died Feb. 26, 1823. Mr. Kemble's style of acting was more suited to the lofty and majestic than to the pathetic and tender. In parts like Cato, Coriolanus, Rolla, Macbeth, Hamlet, Lear, King John, he was supreme. His person was of heroic mold, his action was stately, his declamation noble and true. In moments of passion he rose to great power. But his form lacked suppleness, his limbs were rigid, his voice was husky and unmusical, and a constitutional asthma gave a labored character to his utterance. As an artist he had not "the art to conceal his art"; as a scholar he was close and exact; as a companion he was genial; as a man he was held in high esteem. His *Life* was written by his friend, Mr. Boaden, in 2 vols., 1825. —GEORGE STEPHEN, brother of John Philip, born in Kingston, Herefordshire, May 3, 1758, made his *début* in London at Covent Garden in 1783, and was theatrical manager in London, Edinburgh, and Glasgow. D. June 5, 1822.—ELIZABETH (Mrs. Whitlock), sister of John Philip, was born in Warrington, Lancashire, Apr. 2, 1761; made her first appearance at Drury Lane in 1783. She played with great success in the U. S. from 1792 till 1807. She performed several times before George Washington. On her return to England she retired from the stage. D. Feb. 27, 1836. In person and voice she was said strikingly to resemble Mrs. Siddons.—CHARLES, eleventh child of Roger, was born at Brecon, South Wales, Nov. 27, 1775; was educated at Douai; made his *début* at Drury Lane in 1794, playing Malcolm, with his brother John as Macbeth, and his sister, Mrs. Siddons. He was an excellent comedian, appearing at his best in characters like Benedick, Petruchio, Charles Surface, very creditably in Cassio, Mark Antony, Edgar, but failing in deeply tragic parts. He adapted German and French plays for the London stage, and in late life was appointed examiner of plays. He visited the U. S. in 1832 with his daughter, Fanny Kemble, and retired from the profession in 1840. D. in London, Nov. 12, 1854.—FRANCES ANNE (commonly called Fanny), daughter of Charles, was born in London, Nov. 27, 1809. She possessed the family talent for the stage, but not the family passion for it. She appeared at Covent Gar-

den in Oct., 1829, as Juliet to her father's Romeo. Her success was marked in characters like Juliet, Portia, Bianca, Belvidera, Lady Teazle, and Julia in *The Hunchback*. In 1832 she visited the U. S. with her father, and met with an enthusiastic reception. In 1834 she married Pierce Butler, a planter of Georgia, and retired from the stage, but the marriage was unfortunate, and in 1848 they were divorced. She then resumed her maiden name, and gave readings from Shakspeare with remarkable success. After 1860 Mrs. Kemble spent much of her life in England, and resided there continuously after 1877. D. Jan. 16, 1893. Mrs. Kemble was the author of several books in prose and verse, including *Francis the First*, a play, written when she was seventeen years old, and performed in London; *A Journal of a Residence in America* (2 vols., London and Philadelphia, 1835); *Residence on a Georgia Plantation* (1863), and a volume of poems.—ADELAIDE, younger sister of Frances, was born in London in 1814. Her talents, both for the dramatic and lyric stage, were brilliant, but her marriage in 1843 to Edward Sartoris prevented her pursuing a career which, beginning in Venice, had given continued promise of success in Trieste, Milan, Padua, Bologna, and was culminating in London, where she sang in *Norma*, *Figaro*, *Sonnambula*, *Semiramide*, and other operas. She published in 1867 *A Week in a French Country-house*.—Her son, ALGERNON CHARLES (d. at Capri, Italy, Feb. 3, 1893), married the daughter of President Grant in May, 1874.

Revised by B. B. VALLENTINE.

Kemble, JOHN MITCHELL: Anglo-Saxon scholar; oldest son of Charles Kemble; b. in London in 1807; graduated at Trinity College, Cambridge; visited Germany in 1829, and became acquainted with the brothers Grimm, and other eminent philologists; devoted himself to the study of the earliest Teutonic dialects, and published in 1833 *The Anglo-Saxon Poems of Beowulf*, with a glossary and translation. He edited from 1835 to 1844 *The British and Foreign Quarterly Review*, and published in 1839–40 the *Codex Diplomaticus Ævi Saxonici*, and in 1849 *The Saxons in England*, his best-known work. D. in Dublin, Mar. 26, 1857.

Kemény, kem'ayñ, SIEGMUND, Baron: poet, politician, and romanticist; b. in Maygar-Kapud, Transylvania, in 1816. After studying at Zalathna and Nagy-Enyed, he practiced law 1837–39, and went vigorously into political life. In 1841 he became editor of the opposition journal, *Erdélyi Hiradó*, and member of the Transylvanian Parliament, taking sides with the opposition. He made himself favorably known also by his writings on purity of government, and by his novel *Gyulai Pál* (Paul Gyulai, 1844–46). In 1848 he removed to Pest, becoming associate editor of *Pesti Hirlap* (Pest Journal). He was a member of the Hungarian National Assembly in 1848, and Minister of the Interior in 1849. After the disastrous overthrow at Vilagos (1849) he changed his position, became an advocate of union with Austria, and severely criticised the revolution. As editor of the *Pesti Napló* he worked to bring about an understanding between the Left Center and the Deak party. (See DEAK.) After 1850 he published a number of biographical romances, among which are *Férj és nö* (Man and Wife) and *Szerdem és hiúság* (Love and Vanity). In 1847 he was made honorary member of the Hungarian Academy, and was president of the Kisfaludy Society up to 1873. His complete literary-critical works were issued at Pest in 1870 under the title *Kemény Zsigmond tanulmányai* (Studies by S. Kemény). D. at Pussta-Kamaras, Transylvania, Dec., 1875.

C. H. TOY.

Kemp, JAMES, D. D.: bishop; b. in Aberdeenshire, Scotland, in 1764; graduated at Marischal College, Aberdeen, in 1786, emigrated to the U. S. in 1787; took orders in the Protestant Episcopal Church in 1789; held various rectorships in Maryland; became in 1814 a suffragan in that diocese, and in 1816 the diocesan bishop. Bishop Kemp has the distinction of having been the first, and thus far (1897) the only, suffragan bishop in the Protestant Episcopal Church. The canons now in force expressly forbid the appointment of suffragans, the policy of the Church being to emphasize the parity of the members of the Episcopal order. He was, 1816–27, provost of the State University. D. in Baltimore, Oct. 28, 1827. Revised by W. S. PERRY.

Kemp, JOHN: cardinal; b. at Wye, Kent, England, in 1380; was educated at Oxford; was commissioner to Aragon in 1415; was made Archdeacon of Durham 1416; Bishop of Rochester in 1419, of Chichester in 1421, of London in November of the same year; chancellor and Archbishop of York in 1426; resigned the Great Seal in 1432; was joint ambassador to France, and became cardinal-priest in 1439; endowed the College of Wye in 1447; was again chancellor in 1450; was made Cardinal-Bishop and Archbishop of Canterbury by papal bull in 1452. D. Mar. 22, 1454.

Kem'pelen, WOLFGANG, Baron von: mechanist and author; b. at Pressburg, Hungary, Jan. 23, 1734; was the inventor of a so-called automaton chess-player, made for the amusement of the Empress Maria Theresa (1769), which was exhibited in Paris in 1784, and afterward in Great Britain and the U. S. It is not properly an automaton, but an ingenious contrivance for concealing a living player, as is fully explained in Tomlinson's *Amusements in Chess* (1845), but its mechanical ingenuity is great. Baron Kempelen also invented in 1778 an automaton speaking human figure, which he explained in an illustrated work, *Le mécanisme de la parole* (1791). He filled several political posts at the Austrian court, and published poems and dramatic pieces. D. in Vienna, Mar. 26, 1804.

Kemper, JACKSON, D. D., LL. D., Cantab.: bishop; b. in Pleasant Valley, Dutchess co., N. Y., Dec. 24, 1789; graduated at Columbia College in 1809. In 1811 he took deacon's orders in the Protestant Episcopal Church, and in 1812 was ordained a priest. After holding rectorships in Philadelphia for twenty years, and one for some time in Norwalk, Conn., he was made missionary Bishop of Indiana and Missouri, and was afterward transferred to the then Northwestern Territory, including Iowa, Wisconsin, etc. In 1854 he became diocesan Bishop of Wisconsin. D. at Delafield, Waukesha co., Wis., May 24, 1870.

Kempis, THOMAS À: ecclesiastic and author; b. at Kempen, near Cologne, in 1380; his family name was Hamerken, (Lat. *Malleolus*). In 1400 he entered the monastery of Mt. St. Agnes, near Zwolle, of which his elder brother was prior, and in 1413 was ordained priest; in 1425 was elected subprior. D. July 26, 1471. By the other monks of the monastery he was highly esteemed for his deep piety, his untiring industry as a scholar, and his great gifts as a teacher and supervisor of the novices; and his authorship soon spread his fame far outside the boundaries of his personal acquaintance. He wrote several books, among them a chronicle of the monastery of Mt. St. Agnes. A collected edition of his works was published by the Jesuit Sommalius (Antwerp, 1607). But the book which sent his name to the remotest corners of the world is his *De Imitatione Christi*. It has been translated into all languages in which books are printed and read, and it is used as a book of devotion and religious instruction by all Christians, without regard to differences in creed, race, or standpoint of mental development. With the exception of the Bible, it is probably the book most read in Christian literature. In its original form it was in rhythmic sentences, and an English translation, in which for the first time they were given, appeared in 1889 in London and New York. In consequence of his personal humility, and in harmony with the moral maxims of his order (*ama nesciri*), Thomas à Kempis never mentioned himself directly as author of the book; on the other hand, there exist copies of the work, the oldest of 1441, which ascribe the authorship to the celebrated theologian Jean Gerson, chancellor of the University of Paris. These two circumstances have occasioned a very sharp controversy between French, German, and Italian theologians, and the question seemed at one time doubtful. (See *Gersen, Gerson oder Kempis*, Vienna, 1828.) Some maintain that it has been decided finally in favor of Thomas à Kempis. He is mentioned by three contemporary writers as the author of the book. There is a perfect harmony in doctrines and in style between *De Imitatione Christi* and other devotional writings of Thomas à Kempis. It can be satisfactorily explained how the copyists could make the mistake and ascribe the authorship to the celebrated chancellor (or to St. Bernard, or an Italian abbot, Gersen, for there are many rivals). A new edition of the book, in two volumes, after an autograph by Thomas à Kempis, was edited by K. Hirsche (Berlin, 1873–83). An exact facsimile was published in London in 1879. See S. Kettlewell, *Thomas à Kempis and the Brothers of the Common Life* (2 vols., 1882; 2d ed. 1884). For bibliography, see C. Wolfsgruber, *Giovanni Gersen, sein Leben und sein Werk de Imitatione Christi* (Augsburg, 1880); also J. B. Malou, *Recherches critiques sur le véritable auteur de l'Imitation de Jésus-Christ* (Paris, 3d ed. 1858). On the Continent national and corporate feeling have had much to do with the obscurity that yet hangs over the problem, and

it is far from being settled; see Hergenroether, *Church History* (3d ed. 1885, ii., 800); Kurtz, *Lehrbuch der Kirchengeschichte* (§ 115, 8); Denifle, in the *Zeitschrift für Katholische Theologie* (1882, vi., 692); and Funk, *Historisches Jahrbuch* (1881, 149, 481; 1884, 226).

Revised by JOHN J. KEANE.

Kempt [name of a governor of Canada, 1828–30]: a town of Nova Scotia, county of Hants; on the south shore of Mines Basin, the eastern prolongation of the Bay of Fundy. Pop. 2,000.

Kemptville: a town of Ontario, county of Grenville, on the railway; 29 miles S. of Ottawa (see map of Ontario, ref. 2–H). The river Rideau affords important water-power and there are many mills. Pop. 2,900.

Ken, THOMAS, D. D.: bishop and author; b. at Berkhampstead, England, in July, 1637; was educated at Winchester and Oxford; took holy orders 1662; traveled on the Continent and visited Rome in 1675; became in 1679 chaplain to Mary, Princess of Orange (the future Queen of England); and subsequently (1680) to Charles II.; in 1683 he was chaplain to Lord Dartmouth on the Tangier expedition. In 1684 he was appointed by Charles II., who greatly admired him, Bishop of Bath and Wells. He attended that king on his deathbed. On the accession of James II. he was one of the seven bishops committed to the Tower for refusing to obey illegal commands of that monarch. Bishop Ken, however, refused to take the oath of allegiance to William III., and was deprived of his bishopric in consequence (1691). He passed his declining years at Longleat, Wiltshire, engaged in writing devotional works. D. at Longleat, Mar. 19, 1711. His prose works were republished in London in 1889, his *Christian Year of Hymn and Poems* in 1868. See his *Life* by John Lavicount (London, 1851); by a layman (Anderson), 2d ed. revised and enlarged 1854; and that by E. H. Plumptre (2 vols., 1888; 2d ed. 1890).

Revised by W. S. PERRY.

Kenai, kee'nāă-ĕe: a peninsula on the south coast of Alaska; between Cook's Inlet and Prince William's Sound. The coast is much indented; Day's harbor and Resurrection Bay afford good anchorage. The interior is little known. It is mountainous and infertile; glaciers are said to occupy some of the valleys.

Kendal: town; in Westmoreland, England; 22 miles by rail N. of Lancaster (see map of England, ref. 5–F). Certain kinds of cloth were manufactured here for centuries under the name of "Kendals"; and there are now manufactures of heavy textile fabrics, leather, and paper. Pop. (1891) 14,430.

Kendal, MARGARET: actress; b. at Great Grimbsy, England, Mar. 15, 1848. Her maiden name was Madge Robertson. In 1852, when only four years old, she appeared at the Marylebone theater, London, as the Blind Child in *The Seven Poor Travelers*. She made her professional *début* in London, July 29, 1865, at the Haymarket theater as Ophelia in a revival of *Hamlet*. After fulfilling engagements in the provinces, she returned to London appearing at Drury Lane and the Haymarket. In 1869 at the Gaiety theater she sustained the part of Lady Clara Vere de Vere in Robertson's play of *Dreams*. In October of the same year at the Haymarket theater she appeared as Lilian Vavasour in *New Men and Old Acres*. In 1874 she married WILLIAM HUNTER KENDAL (*q. v.*). She joined the company of the Prince of Wales's theater, and Jan. 12, 1878, made a noteworthy success as Dora in the English version of Sardou's play of *Diplomacy*.

B. B. VALLENTINE.

Kendal, WILLIAM HUNTER: actor; b. in London, Dec. 16, 1843. His family name was Grimston. He was intended for a mercantile career, but entered the dramatic profession in 1861, and appeared on the stage for the first time in London at the Soho, afterward the Royalty theater. The following year he joined the company of the Theater Royal, Glasgow, where he remained until 1866. He first appeared in London at the Haymarket theater in a piece entitled *A Dangerous Friend*, and his talent met with gratifying recognition. At the same theater he subsequently played Orlando in a revival of *As You Like It*. He appeared at this house for some time, taking important parts such as Captain Absolute and Charles Surface, and in a number of old comedies. He also played in W. S. Gilbert's most successful pieces, *The Palace of Truth* and *Pygmalion and Galatea*. In 1875 Mr. Kendal was married to Madge (Margaret) Robertson, and as Mr. and Mrs. Kendal they have since acted in the same companies. One of his great successes was in the part of Captain Beauclerc in Sardou's play of *Diplomacy*, called in French *Dora*. In this he first appeared at the Prince of Wales's theater, London, Jan. 12, 1878. In 1889, 1891, and 1893 Mr. and Mrs. Kendal made successful tours through the U. S.

B. B. VALLENTINE.

Kendallville: city (founded as a town in 1850); Noble co., Ind. (for location of county, see map of Indiana, ref. 2–F); on the Lake Sh. and Mich. S. and the Gr. Rap. and Ind. railways; 25 miles N. of Fort Wayne, 140 miles E. of Chicago. It contains 12 churches; owns water and electric-light plants; has several manufactories, and a daily, a monthly, and 2 weekly periodicals; and is a live-stock market of note. It is in a rich agricultural region and contains the East Indiana fair-grounds. Pop. (1880) 2,373; (1890) 2,960; (1893) estimated, 4,000.

EDITOR OF "SUN."

Kendrick, ASAHEL CLARK, D. D., LL. D.: educator; b. at Poultney, Vt., Dec. 7, 1809; graduated at Hamilton College, Clinton, N. Y., in 1831; was Professor first of Ancient Languages and subsequently of the Greek Language alone in the Literary and Theological Seminary at Hamilton (which afterward became Madison University) from 1831 to 1850; and Professor of Greek in the University of Rochester. D. Oct. 21, 1895. He published several introductory Greek textbooks; a *Greek Ollendorff* (New York, 1852); the *Anabasis* of Xenophon, with notes and vocabulary (1873); *Echoes*, being translated poems from the German and French (Rochester, 1855); *Our Poetical Favorites* (3 vols., New York, 1870, 1875, 1880); a revised edition of Olshausen's *New Testament Commentary* (6 vols., 1856–58); translated Moll's *Commentary on the Epistle to the Hebrews* in Lange's *Biblical Commentary* (1867). He prepared *Life and Letters of Mrs. Emily C. Judson* (1861), and revised and edited trans. of Meyer's *Commentary on John* (1884). He was one of the New Testament revisers.

Kenealy, ke-nee'li, EDWARD VAUGHAN HYDE, D. C. L.: journalist and author; b. in Cork, Ireland, in 1819; was educated at Trinity College, Dublin; published translations of songs and ballads from and into thirteen languages, ancient and modern; was a contributor to Dr. Maginn's *Homeric Ballads*, to the *Dublin University Magazine*, and *Fraser's Magazine*; published in 1845 *Brallaghan, or the Deipnosophists*; in 1850 *Goethe, a New Pantomime*, both works abounding in wit and brilliant criticism. Dr. Kenealy became very extensively known as the impassioned advocate of "the Claimant" in the celebrated Tichborne case (1873); founded a newspaper, *The Englishman*, in 1874, which attained an immense circulation; was elected a member of Parliament, and took his seat in Apr., 1875. D. in London, England, Apr. 16, 1880.

Kenilworth: town; in Warwickshire, England (see map of England, ref. 10–H). It contains some ruins of Kenilworth Castle, which became notable in the history of Queen Elizabeth on account of the gorgeous manner in which the Earl of Leicester entertained her here for seventeen days. The entertainment forms the subject of a romance of Walter Scott and a novel of Ludwig Tieck. Pop. (1891) 4,173.

Ken'ites [from Heb. *Kēnī*, Kenite, liter., lancer]: a nomadic people between Sinai and Palestine, first mentioned in Gen. xv. 19 and numerous times later, and always as having friendly relations with the Chosen People. They inhabited the desert lying between Southern Palestine and the Sinai Mountains, and roamed over this region and along the eastern coast of the Gulf of Akabah. Jethro, the father-in-law of Moses, is called a Midianite in Ex. iii. 1 and Num. x. 29, and a Kenite in Judg. i. 16. The Kenites may have been descended from Abraham by Keturah. Many of them accompanied the Israelites in their desert march and entered with them into the Promised Land, but retained their nomadic habits. Ultimately they were scattered both N. and S. of Canaan. The Rechabites were Kenites (1 Chron. ii. 55; cf. Jer. xxxv.).

Revised by S. M. JACKSON.

Kennan, GEORGE: traveler; b. at Norwalk, O., Feb. 16, 1845; was for several years a telegraph operator and during the period 1865–68 journeyed through Siberia locating telegraph routes for the Russian Government. In 1870–71 he explored the mountains of the Eastern Caucasus, also Daghestan. In 1885–86, in company with George A. Frost, an artist, he made a journey of 15,000 miles through Russia and Siberia for the purpose of investigating the Russian exile system. His conclusions were embodied in a series of papers published in *The Century Magazine* (1889–90), and

again as a volume entitled *Siberia and the Exile System* (2 vols., New York, 1891). Another work by him is *Tent Life in Siberia* (New York, 1870). H. A. BEERS.

Kennebec River: a stream which rises in Moosehead Lake, although its principal head-stream, the Moose river, rises more than 50 miles W. of that lake, of which it is a tributary. The river falls some 1,000 feet in 100 miles, reaching tide-water at Augusta, where the river is crossed by a large dam, affording great water-power. Sea-going steamboats and coasting vessels ascend to this point, except at low water, when they stop at Hallowell or Gardiner, and in winter when navigation ceases entirely. Small steamboats ascend to Waterville, 18 miles above Augusta, where, as at many points above, there is much valuable water-power. The river is navigable for ships to Bath, 12 miles. Its banks are fertile and beautiful, and are the seat of a large trade in lumber, provisions, hay, cattle, etc.

Kennebunk: town; York co., Me. (for location of county, see map of Maine, ref. 11–A); on the Kennebunk and Mousam rivers, and the Boston and Maine Railroad; 3 miles N. of the Atlantic Ocean, 8 miles S. of Biddeford. It contains 9 churches, 2 high schools, 2 libraries, several summer hotels, and a weekly newspaper; has fine beach privileges and considerable coasting trade, and manufactures leatheroid, leather-board, boots and shoes, lumber, twine, and shipping. Pop. (1880) 2,852; (1890) 3,172.

EDITOR OF "EASTERN STAR."

Kennedy, JOHN PENDLETON, LL. D.: author and legislator; b. in Baltimore, Md., Oct. 25, 1795; was educated at the University of Maryland; served for a short time in the war of 1812, after which he studied law, but devoted much of his time to literature, editing a new publication entitled *The Red Book*. He was elected to the State Legislature in 1820; was a member of Congress 1839–45, and in 1852 he was appointed by President Fillmore Secretary of the Navy. As the head of the Navy Department the Japanese expedition of Commodore Perry and the second Arctic exploration of Dr. Kane were mainly due to him. In politics Kennedy had been an earnest Whig of the Henry Clay school, but early showed strong anti-slavery feelings, and during the civil war his sympathies were entirely on the Federal side. D. at Newport, R. I., Aug. 18, 1870. He is best known as the author of works of fiction, among which are *Swallow Barn* (1832); *Horseshoe Robinson* (1835), a tale of Revolutionary times; and *Rob of the Bowl* (1838), the scene of which is laid in Maryland in colonial times.

Revised by C. K. ADAMS.

Kennett, WHITE, D. D.: bishop and historian; b. at Dover, England, Aug. 10, 1660; was educated at St. Edmund Hall, Oxford, of which he became vice-principal; was made in 1707 dean, and in 1718 Bishop of Peterborough. He was a man of indefatigable industry, and accumulated a vast collection of historical MSS., largely in his own handwriting, which now form part of the Lansdowne collection in the British Museum. Besides more than fifty miscellaneous publications, he wrote a *History of England from the Accession of Charles I. to that of Queen Anne*, forming part of Hughes's collection (1706; 2d ed. 1719); *Bibliothecæ Americanæ Primordia, an Attempt Toward Laying the Foundation of an American Library* [the catalogue of the collection mentioned below] (1713; republished with additions by Henry Homer, 1789); and *A Register and Chronicle, Ecclesiastical and Civil, from the Restoration of King Charles II.* (vol. i., fol., 1728). His American library was collected with a view to writing a work under the title *A Full History of the Propagation of Christianity in the English North American Colonies*, which was never executed. D. in London, Dec. 19, 1728. See his *Life* by Rev. W. Newton (1730).—His brother, BASIL KENNETT, D. D., born at Postling, Kent, Oct. 21, 1674; graduated at Corpus Christi College, Oxford, 1693; was chaplain at the British Factory at Leghorn, Italy (1706–13), and was elected in 1714 president of his college at Oxford, where he died Jan. 3, 1714–15. He wrote *Romæ Antiquæ Notitia, or the Antiquities of Rome* (London, 1696), a work which for a century was the standard school-book on the subject; an *Exposition of the Apostles' Creed* (1705); a *Paraphrase on the Psalms in Verse* (1706). Revised by W. S. PERRY.

Kennett Square: borough (as a village, antedates 1760; incorporated as a borough in 1855); Chester co., Pa. (for location of county, see map of Pennsylvania, ref. 6–I); on the Phila., Wil. and Balto. Railroad; 30 miles S. W. of Philadelphia. It contains 7 churches, Martin Academy (Friends), and 3 weekly and 2 monthly periodicals; is in an agricultural region, and manufactures road-machines, scrapers and rollers, rock-crushers, engines, phosphates, foundry products, and decorated pottery. It was the rendezvous of the British troops prior to the battle of Brandywine in 1777. Pop. (1880) 1,021; (1890) 1,326; (1893) estimated, 1,400.

EDITOR OF "KENNETT ADVANCE."

Ken'nicott, BENJAMIN, D. D.: biblical scholar; b. at Totnes, Devonshire, England, Apr. 4, 1718, of poor parents; was aided by a subscription to enter Wadham College, Oxford, 1744; wrote while an undergraduate two dissertations, *On the Tree of Life* and *On the Oblations of Cain and Abel*; was fellow of Exeter College (1747–71), and keeper of the Radcliffe Library (1767–83), and after many years' labor produced his great work, the *Vetus Testamentum Hebraicum cum Variis Lectionibus* (Oxford, 2 vols., 1776–80). D. at Oxford, Aug. 18, 1783.

Kenny, Sir EDWARD: Canadian statesman; b. in County Kerry, Ireland, in 1800; removed to Halifax, Nova Scotia, in 1824, and established himself in business. He has been mayor of Halifax and sat in the legislative council of Nova Scotia for twenty-six years, eleven of which he was president of that body. He was receiver-general of Canada 1867–79; president of the privy council 1869–70; had a seat in the Senate 1867–70; and was appointed administrator of the government of Nova Scotia, and knighted in 1870. D. at Halifax, May 16, 1891.—His son, THOMAS EDWARD, b. in Halifax, Nova Scotia, Oct. 12, 1833; educated at Stonyhurst College, England, and at St. Jervais College, Liège, Belgium, is engaged in business in Halifax; is president of the Merchants' Bank, Halifax, and a member of the royal commission on railways. He entered the Parliament of Canada in 1887, and was re-elected at the general election in 1891. NEIL MACDONALD.

Kenosha: city; capital of Kenosha co., Wis. (for location, see map of Wisconsin, ref. 7–F); on Lake Michigan, and the Chi. and N. W. Railway; 34 miles S. of Milwaukee, 51 miles N. of Chicago. It has an excellent harbor, 2 parks, 2 water-cure establishments, a national bank with $50,000 capital, a State bank with $100,000 capital, and a daily and 5 weekly newspapers. It is in a dairy and agricultural region, and manufactures carriages, wagons, furniture, and other wooden goods. Pop. (1880) 5,039; (1890) 6,532; (1895) 8,122.

EDITOR OF "TELEGRAPH-COURIER."

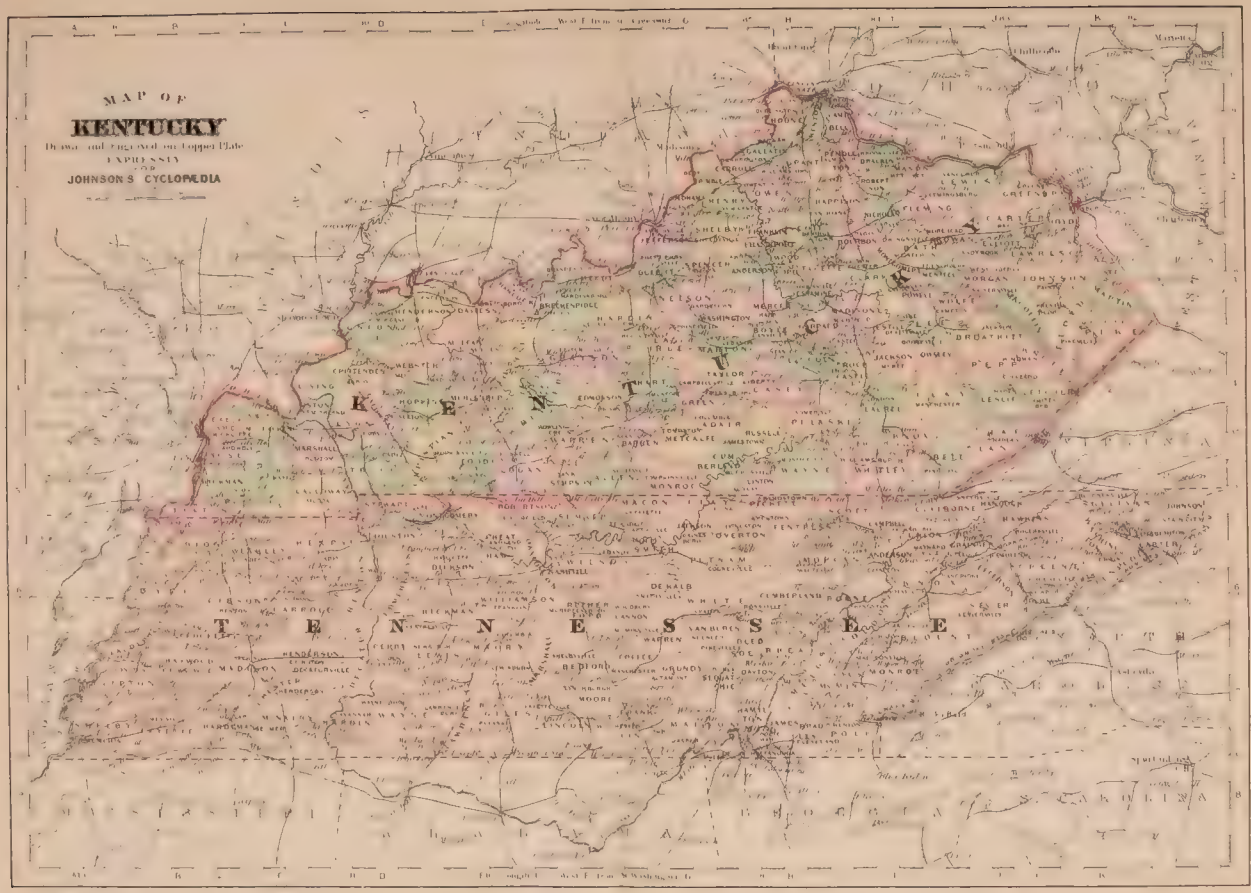
Kenosis: See CHRISTOLOGY.

Kenrick, FRANCIS PATRICK, D. D.: archbishop; b. in Dublin, Ireland, Dec. 3, 1797; studied at Rome, where he was ordained a priest in 1821. He was sent to the U. S., and was for nine years conductor of the Roman Catholic seminary at Bardstown, Ky. In 1828 appeared his *Letters from Omicron to Omega*, a controversial work. In 1830 he was made Bishop of Arath *in partibus*, and coadjutor to Bishop Conwell, of Philadelphia, to which see he was translated in 1842. He founded the seminary of St. Charles Borromeo in Philadelphia in 1832, and in 1851 became Archbishop of Baltimore, and in 1852 apostolic delegate for the specific purpose of holding a plenary council of the hierarchy of the U. S.; in 1859 honorary primate of the U. S. He published *Theologia Dogmatica* (4 vols., 1839–40); *Theologia Moralis* (3 vols., 1841–43), and several other works, mostly polemical. D. at Baltimore, July 8, 1863. For many years before his death he was engaged upon a revision of the Douai English Bible with copious notes, of which had appeared New Testament (2 vols., 1849–51), Psalms, Proverbs and Canticles (1857), Job and the prophets (1859).

Revised by J. J. KEANE.

Kensett, JOHN FREDERICK: painter; b. at Cheshire, Conn., Mar. 22, 1818; worked as a lad with his uncle, Alfred Daggett, an engraver; began the practice of landscape painting in 1845; passed several years in Europe; in 1848 returned to the U. S. He executed a great number of pictures, chiefly landscapes, singularly equal in merit. He was made a member of the National Academy of Design in 1849, and was for some years a member of the national art commission formed to superintend the decoration of the Capitol at Washington. D. in New York, Dec. 14, 1872.

Kent: county in the southeastern extremity of England, lying between the mouth of the Thames and the Strait of Dover. Area, 1,555 sq. miles. The ground is undulating, traversed by the North Downs; the soil is very fertile and the climate mild and genial. The whole county, popularly


MAP OF
KENTUCKY
Drawn and Engraved on Topped Plate
EXPRESSLY
FOR
JOHNSON'S CYCLOPÆDIA
KENTUCKY
TENNESSEE

termed "the Garden of England," consists of gardens in which vegetables and fruits are raised for the market of London, and meadows on which a multitude of sheep are reared. Hops are the principal product. Pop. (1891) 1,142,281. Maidstone is the assize town.

Kent: village; Portage co., O. (for location of county, see map of Ohio, ref. 3–I); on the Cuyahoga river, and the Cleve., Canton and S., the Erie, and the Pitts. and W. railways; 10 miles N. E. of Akron, 32 miles S. E. of Cleveland. It has fine water-power, railway machine-shops, and two weekly newspapers. Pop. (1880) 3,309; (1890) 3,501.

Kent, Edward Augustus, Duke of: b. Nov. 2, 1767; was the fourth son of King George III.; joined the army; participated in the capture of some of the French West India islands; was appointed governor of Nova Scotia and commander-in-chief of the British forces in North America. The island of St. John changed its name to Prince Edward in his honor. On his return to Europe he married (May 20, 1818) a German princess, Maria Louisa Victoria (b. 1786; d. Mar. 16, 1861), widow of the Prince of Leiningen, daughter of the Duke of Saxe-Coburg. From this marriage the reigning Queen of England, Alexandrina Victoria, was born in 1819. The duke died Jan. 23, 1820.

Kent, James, LL. D.: jurist; b. at Philippi, Putnam co., N. Y., July 31, 1763; was the son of Moss Kent, surrogate of Rensselaer County. He graduated at Yale College in 1781; was a student with Egbert Benson; was admitted to the bar in 1787, and settled at Poughkeepsie; was a member of the Legislature in 1790 and 1792. In 1793 he removed to New York, and became a master in chancery, a leader among the Federalists, an associate and friend of Hamilton and Jay, and Professor of Law in Columbia College. While here he became profoundly versed in the civil law. In 1797 he became recorder of New York, then an officer presiding over a court of civil jurisdiction; in 1798–1804 was a puisne judge of the Supreme Court of New York, and in 1804–14 chief justice. In the latter year he was appointed chancellor of New York, and held the office till 1823. He was in 1822 a member of the constitutional convention at Albany; in 1824 resumed his professorship in Columbia College. D. in New York city, Dec. 12, 1847. His legal and chancery decisions are mostly preserved in Caines's and in Johnson's reports. His *Commentaries on American Law* (4 vols., 1826–30) is one of the greatest and most useful legal works of the age, and its merits have been as freely acknowledged in Great Britain as in the U. S. He was one of the fathers of American jurisprudence.

Kent, William: architect, painter, and sculptor; b. in Yorkshire, England, about 1685; was apprenticed to a coach-painter, and showed so much talent that he was enabled by the help of patrons to study the fine arts at Rome. In 1716 he was invited by the Earl of Burlington to return to England as his guest, and resided with that nobleman for the remainder of his life. His real importance was as the founder of what was afterward called landscape-gardening in England, that is, the laying out of grounds without formal lines, terraces, etc., so as to avoid artificiality. (See Landscape-gardening.) Kent was a dexterous and rapid designer, especially in decoration, but reached no great excellence, architecture being perhaps his greatest success. Holkham palace in Leicestershire was designed by him. D. Apr. 12, 1748.

Kent Island: the largest island in Chesapeake Bay; belongs to Queen Anne co., Md. It is 15 miles long, and is very fertile. It has four churches and important oyster-fisheries. It is the site of the earliest settlement in the State. It was colonized in 1631 by William Clayborne, an adventurer from Virginia, and a party of his followers. Pop. (1890) 2,230.

Kenton: city (founded in 1833); capital of Hardin co., O. (for location of county, see map of Ohio, ref. 3–D); on the Scioto river, and the Erie, the Clev., Cin., Chi. and St. L., and the Tol., Col. and Cin. railways; 56 miles N. of Springfield, 142 miles N. by E. of Cincinnati. It is in an agricultural and lumbering region; contains 12 churches, 5 Union school-buildings, 2 national banks with combined capital of $150,000, a State bank with capital of $100,000, and a monthly, 2 daily, and 4 weekly periodicals; and has important manufactures. Pop. (1880) 3,940; (1890) 5,557; (1893) estimated, 6,500. Editor of "Republican."

Kentucky: one of the U. S. of North America (South Central group); name derived from the Iroquois Indians, "Kentake" meaning prairie or meadow land (in allusion to the large treeless tract in the south central part of the State, called "The Barrens" by the pioneers), and not, as is commonly supposed, "Dark and Bloody Ground."

Situation and Area.—It is in the east central section of the Mississippi valley, between 5° 3′ and 12° 26′ W. lon. from Washington, and 36° 30′ and 39° 6′ N. lat.; bounded on the N. by Illinois, Indiana, and Ohio, on the N. E. by West Virginia, on the S. E. by Virginia, on the S. by Virginia and Tennessee, and on the N. W. and W. by Illinois, Indiana, and Missouri; greatest length from E. to W. about 500 miles; greatest breadth from N. to S. about 180 miles; area (last State survey), 41,263 sq. miles, or 26,408,320 acres.

Seal of Kentucky

Topography.—With the exception of about 2,000,000 acres of high lands in the mountains, and about 500,000 acres of low lands in the river bottoms, the surface is a plateau sloping gently from the mountains on the E. to the rivers on the W. and N. W. Its slope is about 2 feet to the mile, and its average elevation above the sea about 800 feet. The principal portion of its mountain area is in the southeast part, where the valley, through which the upper Cumberland river flows, is walled in by the Cumberland Mountain on its E. and the Pine Mountain on its W. This valley, about 15 miles in width and 75 in length, contains the counties of Bell and Harlan, and is from 1,000 to 1,500 feet above the level of the sea. Some of its mountain-peaks rise 2,500 feet above the valley, and give it a boldness and beauty of landscape rarely to be met with in the Appalachian chain. Besides the Mississippi, the Ohio, and the Big Sandy rivers which lie on its borders, there are five internal rivers, the Licking, Kentucky, Salt, Green, and Cumberland, all navigable. The Tennessee rises within a mile of the source of the Cumberland, but runs most of its course in Tennessee and Alabama, then enters Kentucky near the Cumberland, and runs parallel with it to the Ohio. All the channels of these rivers are so deep that there are no very hurtful inundations, and the Kentucky, with its perpendicular walls hundreds of feet in height, reminds one of the cañons of some of the rivers of the Pacific slope.

Geology.—The surface now seen in Kentucky was formed in the Lower Silurian sea at a time so remote as to baffle efforts at computation. In this sea the Lower Silurian, the Upper Silurian, the Devonian, and the Subcarboniferous formations were laid down, and then the whole pushed up by some subterranean force until they occupied their present position, 5,000 feet or more above their original level, when it is believed that the Carboniferous formations were laid upon them to the depth of another 3,000 feet or more. Then the work of denudation began, and the coal-measures were swept from all the State except about 12,000 sq. miles in the east portion and 4,000 in the west, where the two great coal-fields of the State are found. These fields were once united, but the work of erosion removed the intervening formations and left a gap of 100 miles between them. In the north central portion of the State whatever formations were laid down above the Lower Silurian were swept away, leaving the blue limestone of the Lower Silurian formation on the surface of thirty-two counties. The whole area of this Lower Silurian limestone is about 10,000 sq. miles, and forms what is known as the Blue Grass region. The river bottoms are generally narrow, but there are perhaps 1,000 sq. miles of what are known as alluvions, with terraces showing the height of running streams at different epochs. In the coal-fields are extensive beds of iron ore, and quarries of stone of large variety and of the best quality for building and other purposes. More than one-third of the entire surface, or 10,000,000 acres, is covered with the original forest which contains the oak, hickory, walnut, cherry, poplar, sycamore, buckeye, maple, hackberry, gum,

beech, ash, pine, linden, and cedar. At many points in the Blue Grass region are valuable salt-springs. Petroleum is found in the counties on the Cumberland river and its affluents, and natural gas in Meade County. The Subcarboniferous limestone areas in the Green river region contain numerous caverns, some of which, notably the MAMMOTH CAVE (*q. v.*), extend several miles.

Soil and Productions.—The soil is locally classified as first, second, and third rate. In the north central part is an area of some 6,500,000 acres, the Blue Grass region, which always has been classed as first-rate. It rests on the blue limestone of the Lower Silurian formation, and the disintegration and decay of this rock keeps the soil perennially rich. There are fields in this region which have been cultivated 100 years without losing their fertility. Along the bottoms of the different rivers are some 500,000 acres of alluvial lands which are also classed as first-rate. They are kept constantly fertile by the inundations of the streams along which they lie. The soil classed as second-rate rests on the Upper Silurian, the Devonian, the Subcarboniferous, the Carboniferous and the Tertiary formations, as they appear in different localities, and has an area of about 15,000,000 acres. It is classed as second-rate because the unapproachable Blue Grass fields and fine river bottoms make a distinction necessary. It would rank as first-rate almost anywhere else. Crops are grown upon it equal to those of other States, and it only lacks the perennial renewals furnished by the decaying limestone of the Blue Grass region and the soil-charged inundations of the river-bottoms to make it first-rate. It has to be kept up to a high standard of production by artificial fertilizers, which are not needed in the Blue Grass region and river-bottoms. With about 6,500,000 acres rated as first-class, and 15,000,000 more as second-class, there are left about 4,500,000 acres classified as third-rate and waste lands. Of this acreage there are possibly 1,000,000 in swamps and arid wastes of little or no value; but the other 3,500,000 acres are generally forest-clad and underlaid with coal, iron, and stone, and have a limited capacity for producing grasses which render them valuable parts of the State. The soil and climate make agriculture and stock-raising natural industries. There are in the State about 170,000 farms, comprising about 12,000,000 acres.

The following table shows the acreage, yield, and value of the principal crops in 1893:

CROPS.	Acreage.	Yield.	Value.
Corn	2,893,960	68,008,060 bush.	$29,243,466
Wheat	936,678	10,584,461 "	6,033,143
Oats	584,626	12,978,697 "	4,412,757
Rye	37,866	499,831 "	289,902
Tobacco	307,697	216,926,385 lb.	16,486,405
Potatoes	46,840	3,185,120 bush.	1,783,667
Hay	663,566	882,453 tons	8,966,637
Totals	5,471,233		$67,215,977

The farm animals in Jan., 1894, comprised 430,941 horses, value $24,237,842; 150,225 mules, value $8,253,398; 329,552 milch cows, value $6,719,565; 599,004 oxen and other cattle, value $9,417,597; 1,163,098 sheep, value $2,797,483; and 1,749,849 swine, value $8,595,892; total value, $60,021,777.

In the calendar year 1892 there were 119 bituminous coal mines in operation, which had a combined output of 2,972,640 short tons, and nine cannel-coal mines, which produced 53,842 short tons. These mines showed an increase in number in a year of fourteen, and employed 9,324 persons, 7,517 working underground. Coke-making, which has been retarded by a lack of transportation facilities, had a total production of 36,860 short tons.

Climate.—The climate partakes of the peculiarities of the Mississippi valley, but is not subject to the extremes of heat and cold common to other States in the same locality. The temperature seldom exceeds 100° F. in summer, or falls below zero in winter. The following table shows the mean temperature and precipitation for each month in the year 1893:

MONTHS.	Mean temp.	Mean precip. in inches.	MONTH.	Mean temp.	Mean precip. in inches.
January	35° F.	4 21	July	78° F.	3 84
February	39	4 47	August	76	3 74
March	44	4 26	September	69	2 95
April	56	4 36	October	58	2 86
May	66	3 71	November	46	4 12
June	75	4 31	December	39	3 95

During 1893 the mean annual temperature was 56·8°; mean annual precipitation, 46·78 inches; clear days, 109; partly cloudy, 134; cloudy, 122; and rainy, 131.

Divisions.—In 1776 Kentucky was a part of Fincastle County of Virginia, when it was made a separate county by the name it now bears. In 1780 Virginia divided the county of Kentucky into the counties of Fayette, Lincoln, and Jefferson. In 1784 Nelson County was taken from Jefferson; in 1785 Bourbon from Fayette, and Mercer and Madison from Lincoln; and in 1788 Mason was taken from Bourbon and Woodford from Fayette. Hence, in 1792, when Kentucky was separated from Virginia and admitted into the Union, she had nine counties which had been established by the parent State. After Kentucky became an independent State, the work of making new counties went rapidly on. Beginning with nine in 1792, 110 new ones were added before the close of the first century, or more than one for each year of the century.

The following table shows the 119 counties into which the State is now divided, with their populations, county-seats, etc.:

COUNTIES.	* Ref.	Pop. 1880.	Pop. 1890.	COUNTY-TOWNS.	Pop. 1890.
Adair	4-G	13,078	13,721	Columbia	.....
Allen	5-F	12,089	13,692	Scottsville	575
Anderson	3-H	9,361	10,610	Lawrenceburg	1,382
Ballard	4-B	14,378	8,390	Wickliffe	959
Barren	5-G	22,321	21,490	Glasgow	2,051
Bath	3-I	11,982	12,813	Owingsville	763
Bell	5-J	6,055	10,312	Pineville	.....
Boone	2-I	11,996	12,246	Burlington	.....
Bourbon	3-I	15,956	16,976	Paris	4,218
Boyd	2-K	12,165	14,033	Catlettsburg	1,374
Boyle	3-H	11,930	12,948	Danville	3,766
Bracken	2-I	13,509	12,369	Brookville	330
Breathitt	4-J	7,742	8,705	Jackson	.....
Breckinridge	3-F	17,486	18,976	Hardinsburg	681
Bullitt	3-G	8,521	8,291	Shepherdsville	251
Butler	4-E	12,181	13,956	Morgantown	250
Caldwell	4-D	11,282	13,186	Princeton	1,857
Calloway	5-C	13,295	14,675	Murray	518
Campbell	2-I	37,440	44,208	Alexandria	.....
Carlisle†	5-B		7,612	Bardwell	578
Carroll	2-H	8,953	9,266	Carrollton	1,720
Carter	2-J	12,345	17,204	Grayson	433
Casey	4-H	10,983	11,848	Liberty	.....
Christian	5-E	31,682	34,118	Hopkinsville	5,833
Clark	3-I	12,115	15,434	Winchester	4,519
Clay	4-I	10,222	12,447	Manchester	.....
Clinton	5-H	7,212	7,047	Albany	.....
Crittenden	4-D	11,688	13,119	Marion	840
Cumberland	5-G	8,894	8,452	Burkesville	.....
Daviess	3-E	27,730	33,120	Owensboro	9,837
Edmonson	4-E	7,222	8,005	Brownsville	113
Elliott	3-J	6,567	9,214	Sandy Hook	.....
Estill	3-I	9,860	10,836	Irvine	.....
Fayette	3-H	29,023	35,698	Lexington	21,567
Fleming	2-I	15,221	16,078	Flemingsburg	1,172
Floyd	3-K	10,176	11,256	Prestonburg	305
Franklin	3-H	18,699	21,267	Frankfort	7,892
Fulton	5-B	7,977	10,005	Hickman	1,652
Gallatin	2-H	4,832	4,611	Warsaw	676
Garrard	3-H	11,704	11,138	Lancaster	.....
Grant	2-H	13,083	12,671	Williamstown	573
Graves	5-C	24,138	28,534	Mayfield	2,909
Grayson	4-F	15,784	18,688	Leitchfield	421
Green	4-G	11,871	11,463	Greensburg	552
Greenup	2-J	13,371	11,911	Greenup	669
Hancock	3-E	8,563	9,214	Hawesville	1,013
Hardin	3-F	22,564	21,304	Elizabethtown	2,260
Harlan	5-J	5,278	6,197	Harlan	361
Harrison	2-H	16,504	16,914	Cynthiana	3,016
Hart	4-G	17,133	16,439	Munfordville	.....
Henderson	3-D	24,515	29,536	Henderson	8,835
Henry	2-G	14,492	14,164	New Castle	485
Hickman	5-B	10,651	11,637	Clinton	1,347
Hopkins	4-D	19,122	23,505	Madisonville	2,212
Jackson	4-I	6,678	8,261	McKee	.....
Jefferson	3-G	146,010	188,598	Louisville	161,129
Jessamine	3-H	10,864	11,248	Nicholasville	2,157
Johnson	3-K	9,155	11,027	Paintsville	506
Kenton	2-H	43,983	54,161	Independence	.....
Knott†	4-J		5,438	Hindman	.....
Knox	5-I	10,587	13,762	Barboursville	1,162
Larue	4-G	9,793	9,433	Hodgensville	542
Laurel	4-I	9,131	13,747	London	.....
Lawrence	3-K	13,262	17,702	Louisa	834
Lee	3-I	4,254	6,205	Beattyville	.....
Leslie	4-J	3,740	3,964	Hyden	80
Letcher	4-K	6,601	6,920	Whitesburg	.....
Lewis	2-J	13,154	14,803	Vanceburg	1,110
Lincoln	4-H	15,080	15,962	Stanford	1,385
Livingston	4-C	9,165	9,474	Smithland	541
Logan	5-E	24,358	23,812	Russellville	2,253
Lyon	4-D	6,768	7,628	Eddyville	680
McCracken	4-C	16,262	21,051	Paducah	12,797
McLean	4-E	9,293	9,887	Calhoun	637
Madison	3-I	22,052	24,348	Richmond	5,073
Magoffin	3-J	6,944	9,196	Salyersville	339

* Reference for location of counties, see map of Kentucky.
† Formed since census of 1880.

COUNTIES.	* Ref.	Pop. 1880.	Pop. 1890.	COUNTY-TOWNS.	Pop. 1890.
Marion	4-G	14,693	15,948	Lebanon	2,816
Marshall	5-C	9,647	11,287	Benton	344
Martin	3-K	3,057	4,209	Inez	
Mason	2-I	20,469	20,773	Maysville	5,358
Meade	3-F	10,323	9,484	Brandenburg	495
Menifee	3-I	3,755	4,666	Frenchburg	222
Mercer	3-H	14,142	15,034	Harrodsburg	3,230
Metcalf	4-G	9,423	9,871	Edmonton	
Monroe	5-G	10,741	10,989	Tompkinsville	
Montgomery	3-I	10,566	12,367	Mt. Sterling	3,629
Morgan	3-J	8,455	11,249	West Liberty	234
Muhlenburg	4-E	15,098	17,955	Greenville	968
Nelson	3-G	16,609	16,417	Bardstown	1,524
Nicholas	2-I	11,869	10,764	Carlisle	1,081
Ohio	4-E	19,669	22,946	Hartford	740
Oldham	2-G	7,667	6,754	La Grange	670
Owen	2-H	17,401	17,676	Owenton	847
Owsley	4-I	4,942	5,975	Booneville	
Pendleton	2-I	16,702	16,346	Falmouth	1,146
Perry	4-J	5,607	6,331	Hazard	
Pike	4-K	13,001	17,378	Pikeville	456
Powell	3-I	3,639	4,698	Stanton	
Pulaski	4-H	21,318	25,731	Somerset	2,625
Robertson	2-I	5,814	4,684	Mt. Olivet	327
Rockcastle	4-I	9,670	9,841	Mt. Vernon	
Rowan	3-I	4,420	6,129	Morehead	491
Russell	5-H	7,591	8,136	Jamestown	154
Scott	3-H	14,965	16,546	Georgetown	
Shelby	3-G	16,813	16,521	Shelbyville	2,679
Simpson	5-F	10,641	10,878	Franklin	2,324
Spencer	3-G	7,040	6,760	Taylorsville	619
Taylor	4-G	9,259	9,353	Campbellsville	1,018
Todd	5-E	15,994	16,814	Elkton	1,158
Trigg	5-D	14,489	13,902	Cadiz	890
Trimble	2-G	7,171	7,140	Bedford	250
Union	3-D	17,809	18,229	Morganfield	1,094
Warren	5-F	27,531	30,158	Bowling Green	7,803
Washington	3-G	14,419	13,622	Springfield	642
Wayne	5-H	12,512	12,852	Monticello	413
Webster	4-D	14,246	17,196	Dixon	546
Whitley	5-I	12,000	17,590	Williamsburg	1,376
Wolfe	3-J	5,638	7,180	Campton	317
Woodford	3-H	11,800	12,380	Versailles	
Totals		1,648,690	1,858,635		

* Reference for location of counties, see map of Kentucky.

Principal Cities and Towns, with Pop., 1890.—Louisville, 161,129; Covington, 37,371; Newport, 24,918; Lexington, 21,567; Paducah, 12,797; Owensboro, 9,837; Henderson, 8,835; Frankfort (capital), 7,892; Bowling Green, 7,803; Hopkinsville, 5,833; Maysville, 5,358; Richmond, 5,073; Winchester, 4,519; Dayton, 4,264; Paris, 4,218; and Ashland, 4,195.

Population and Races.—In 1860, 1,155,684; 1870, 1,321,011; 1880, 1,648,690; 1890, 1,858,635; native, 1,799,279; foreign, 59,356; male, 942,758; female, 915,877 (white, 1,590,462; colored, 268,071; Chinese, 28; Japanese, 3; civilized Indians, 71).

Industries and Business Interests.—While essentially an agricultural and grazing State, Kentucky has large manufacturing interests. In 1890 there were 7,745 manufacturing establishments, employing a capital of $79,811,980. The principal industries are the manufacture of flour, foundry and machine-shop products, tobacco and cigars, whisky, malt liquors, iron and steel, jeans, leather, carriages and wagons, hydraulic cement, furniture, agricultural implements, lumber, and saddlery and harness, and slaughtering and meat packing. On Dec. 9, 1892, there were 82 national banks, which had a combined capital of $15,409,400, surplus and profits of $5,391,831, and individual deposits of $18,720,187. The State banks on June 30, 1892, numbered 162, and had combined capital of $19,220,852, surplus and profits of $6,753,525, and individual deposits of $31,283,511; total banking capital, $34,630,252; total deposits, $50,003,698.

Finance.—In 1893 the assessed valuations of taxable property were, real $424,734,838, personal $172,064,238, total $596,799,076; the bonded debt was $674,000; cash assets $701,668; tax rate 47·5 cents per $100. The State board of education held $2,312,596 irredeemable bonds, issued by the State and counties for public-school purposes. These bonds were not considered a part of the State debt, and the interest on them was paid by the State from its revenues. In the fiscal year ending June 30, 1893, the collections of internal revenue were: from distilled spirits, $24,434,213; tobacco, $1,805,870; fermented liquors, $343,087; oleomargarine, $8,492; penalties, $9,104; total, $26,601,036.

Means of Communication.—There are 3,629 miles of railway in operation. In 1892 the corporations had a combined capital of $107,582,036, funded debt of $138,333,361, total investment of $216,338,454, and net earnings of $10,213,848. The total valuation of railway property was $31,814,855, as reported by the companies, and $52,316,038 as assessed by the State railroad commissioners. Within the State and on its borders are ten rivers, which afford 2,000 miles of navigable water. There is one canal, at Louisville, which enables loaded vessels to pass around the falls of the Ohio without breaking bulk. It is 2 miles long, was completed in 1831 at a cost of $742,869, and in 1894 was being enlarged by the U. S. Government at a cost much beyond the original appropriation.

Churches.—The census of 1890 gave the following statistics of the principal religious bodies:

DENOMINATIONS.	Organizations.	Churches and halls.	Members.	Value of church property.
Baptist	1,441	1,417	153,668	$2,364,238
Roman Catholic	222	220	92,504	1,800,550
Methodist Episcopal South	989	948	82,430	1,539,567
Disciples of Christ	632	610	77,647	1,321,510
Baptist, Colored	378	375	50,345	406,949
Methodist Episcopal	425	415	29,172	762,090
Presb. in the U. S. of America	171	174	16,915	996,750
Cumberland Presbyterians	213	200	15,458	254,600
African Methodist Episcopal	90	106	13,972	181,201
African Methodist Episcopal, Zion	55	55	7,217	86,830
Protestant Episcopal	47	57	7,161	758,800

Schools.—The permanent school fund of the State is $2,312,596, and the total expenditure for public education in 1893 was $1,798,116. There are 7,073 public and 287 private schools in the State; 14 colleges for male students and 18 for female; 59 academies; 5 medical, 4 theological, 1 law, 1 dental, 1 pharmaceutical, and 2 normal schools; and an agricultural college. The children of public school age comprise about 585,000 white and 115,000 colored; the enrollment is 339,550 white children and 47,998 colored; and the highest attendance, 285,891 white and 38,994 colored.

Libraries.—In 1892 there were 69 libraries of 1,000 volumes and upward each, which contained 355,114 bound volumes and 18,062 unbound pamphlets. They were classified as follows: General, 10; school, 19; college, 19; college society, 6; law, 1; theological, 4; medical, 2; public institution, 1; Y. M. C. A., 1; scientific, 2; society, 3; and historical and scientific, 1.

Post-offices and Periodicals.—On Jan. 1, 1894, there were 2,584 post-offices, of which 2 were first-class, 10 second-class, 41 third-class, 53 presidential, 2,531 fourth-class, 348 money-order offices, and 13 postal-note offices. There were 26 daily, 2 tri-weekly, 8 semi-weekly, 228 weekly, 1 bi-weekly, 6 semi-monthly, 30 monthly, and 1 quarterly periodicals; total, 302.

Charitable, Reformatory, and Penal Institutions.—There are institutions for the blind and the deaf and dumb in Louisville and Danville; asylums for the insane in Anchorage, Lexington, and Hopkinsville; a house of refuge in Louisville; a large penitentiary in Frankfort and a branch in Eddyville completed in 1890; and the usual county and religious institutions.

History.—In 1669 Robert Cavelier, Sieur de la Salle, seeking a great river supposed to flow across the North American continent to the Pacific Ocean, paddled his canoe down the Ohio river to the falls, and there being deserted by his companions, returned to Canada. Nothing came of this discovery of Kentucky. In 1750 Dr. Thomas Walker, in behalf of the Loyal Company, and Capt. Christopher Gist, in behalf of the Ohio Company, passed through Kentucky in search of lands for their respective companies; but before they could locate lands and settle emigrants the French, Indian, and Revolutionary wars successively intervened. Daniel Boone and five companions made explorations of the region in 1769, and James Knox, with forty hunters, followed the same year. Log cabins were built by white men in 1773 and 1774, and in 1775 permanent settlements were made by James Harrod at Harrodsburg, Daniel Boone at Boonesboro, Benjamin Logan at Stanford, and possibly by Sanders Stuart at Louisville. About this time Richard Henderson, in behalf of the Transylvania Company, purchased the greater part of Kentucky from the Cherokee Indians, and began settling colonists. In 1776 George Rogers Clark organized a successful movement to break the power of the Transylvania Company, and succeeded by inducing the Virginia Legislature to establish the county of Kentucky, embracing all the lands claimed by the Transylvania Company. He next turned his attention to the hostile posts in the Illinois country, and succeeded in 1778–79 in wresting Kaskaskia, Vincennes, etc., from the British.

But for this conquest of Gen. Clark it is probable that the western boundary of the U. S. would have been fixed by the peace convention of 1783 along the Alleghenies instead of the Mississippi river. In 1784 began a movement for separating Kentucky from Virginia, and although both parties were willing to separate, eight conventions called for the purpose failed to accomplish it. A final convention in Danville on July 26, 1790, passed a resolution favoring independence, and petitioned Virginia to grant it and Congress to accept it. Virginia agreed to the separation, and Congress voted an enabling act for the admission of Kentucky into the Union as a State Feb. 4, 1791, to take effect June 1, 1792.

The first Legislature met in Lexington on June 4, 1792. The third session was held in Frankfort in 1793, and that city was then made the State capital. The first constitution was in force from 1792 till 1800; the second, from 1800 till 1850; the third, from 1850 till 1891; and the fourth, which was ratified by popular vote in Aug., 1891, is now in force. Under the first constitution the two stumbling-blocks of the State were the Indians and foreign intrigues. There were no Indians in Kentucky, but they were numerous upon the northern borders. In fighting these hostiles the people, though nearly always victorious, had not been successful under Gen. Clark in 1786, nor under Gen. Harmer in 1790, and had met with great losses under Col. Todd in 1782 and under Gen. St. Clair in 1791; but under Gen. Wayne in 1794 they fought the successful and final battle with their foes of twenty years at the Fallen Timbers. Difficulties of a different kind which they had to contend with were intrigues of the Spanish, the French, and the British. These conspiracies, which had existed for ten years in the State, and had shown themselves in the preliminaries of the peace of 1783, were finally disposed of in 1797, when Thomas Power, as the emissary of Spain, met with a cold reception from his supposed friends, and had to leave the State to avoid more serious consequences. Under the second constitution the money question became the chief subject of anxiety. There was very little money in the country, and barter was the leading medium of trade. Silver could not be had except in limited quantities, and the bitter experience which came of the paper issues of the Revolutionary war was against the circulation of paper money. In 1802, however, the Kentucky Insurance Company, under the pretext of forming a company for insuring cargoes on the western waters, got a charter from the Legislature in which a clause was fraudulently inserted, giving the right to issue paper money. The paper issue thus begun in fraud was nurtured by law until it ran its whole course of folly and disaster. In 1806 the old Bank of Kentucky was chartered with a capital of $1,000,000, afterward increased to $3,000,000, and in 1818 forty independent banks were created with an aggregate capital of $7,920,000. In 1820 the Bank of the Commonwealth was chartered with a capital of $2,000,000. None of these banks except the old Bank of Kentucky pretended to pay specie for its notes, and each of them, except it, conducted its business on anything but sound banking principles. All these banks ended in bankruptcy, as might have been expected, and thereby the State was taught a lesson in finance by which it profited. In 1833 the Legislature began to authorize banks upon sounder financial principles, and the Bank of Louisville, with a capital of $2,000,000 in 1833, the Bank of Kentucky, with a capital of $5,000,000 in 1834, and the Northern Bank of Kentucky, with a capital of $3,000,000 in 1835, were chartered, with such safeguards as were suggested by the defects of previous charters. These three banks still exist in Kentucky, and the State owes much to their mode of doing business. The abundance of money under the early banking system of the State led to speculations which in turn made money scarce, and then followed what was known as the relief laws, passed by the Legislature from 1822 to 1826. The old court of appeals for declaring these relief laws unconstitutional was legislated out of existence, and a new one established in 1824; but the question of old court and new went into the popular elections of 1826, and a Legislature was returned which set aside the new court and restored the old. The third constitution swept away every federal feature of the first and second, and made all officers in the State from the district magistrate to the chief justice of the court of appeals elective by popular vote. The principal debt of gratitude that Kentuckians owe to this constitution, however, is the position in which it fixed the school fund and the provision it made for public education. The sum of $1,225,768, which had then accumulated from all sources as an educational fund, was set apart to be used forever in the interest of public education. This fund has since increased to $2,312,596, and 6 per cent. interest thereon, supplemented by an annual tax, makes the total amount expended by the State each year in the education of its children $1,798,116. Under this constitution, made when slavery existed, it was necessary for the Legislature to enact some specific laws for the slaves set free by the U. S. Government. Among the laws passed in their behalf was one in 1872, giving them the right to testify as witnesses in courts, and another in 1874 providing for a separate fund and separate schools for the colored children educated at the expense of the State. The last constitution made some radical changes in the previous organic law of the State, and time alone can determine how well it provides for the enlarged wants and growing requirements of the people.

In war with civilized nations or with savages Kentuckians have always been distinguished for valor and persistence. In the war of 1812 they fought bravely under Harrison in the North and under Jackson in the South. In the Mexican war they accompanied Taylor from victory to victory, and marched with Scott in triumph to the capital of the country. In the civil war they contributed more men in proportion to their numbers than any other State in the Union. Out of a population of 1,155,684 at the beginning of the civil war, 80,000 went into the Union army and 40,000 into the Confederate, a total of 120,000, or more than one in every ten of the entire population.

GOVERNORS OF KENTUCKY.

Isaac Shelby	1792–96	Charles S. Morehead	1855–59
James Garrard	1796–1804	Beriah H. Magoffin	1859–61
Christopher Greenup	1804–08	James F. Robinson	1861–63
Charles Scott	1808–12	Thomas E. Bramlette	1863–67
Isaac Shelby	1812–16	John L. Helm	1867
George Madison	1816	J. W. Stevenson	1867–71
G. Slaughter	1816–20	Preston H. Leslie	1871–75
John Adair	1820–24	James B. McCreary	1875–79
Joseph Desha	1824–28	Luke P. Blackburn	1879–83
Thomas Metcalfe	1828–32	J. Proctor Knott	1883–87
John Breathitt	1832–34	Simon B. Buckner	1887–91
J. T. Morehead	1834–36	John Y. Brown	1891–95
James Clark	1836–39	William O. Bradley	1895
C. A. Wickliffe	1839–40		
Robert P. Letcher	1840–44		
William Owsley	1844–48		
John J. Crittenden	1848–50		
John L. Helm	1850–51		
Lazarus W. Powell	1851–55		

AUTHORITIES.—John Filson, *The Discovery, Settlement, and Present State of Kentucky* (1784); Harry Toulmin, *A Description of Kentucky in North America* (1792); Gilbert Imlay, *A Topographical Description of the Western Territory of North America* (1792–97); William Littell, *Political Transactions in and Concerning Kentucky* (1806); Humphrey Marshall, *The History of Kentucky* (1812, 1824); Mann, Butler, *The History of the Commonwealth of Kentucky* (1834–36); Lewis Collins, *Historical Sketches of Kentucky* (1847); T. S. Arthur and W. H. Carpenter, *The History of Kentucky* (1852); William B. Allen, *The History of Kentucky* (1872); Richard H. Collins, *Collins's Historical Sketches of Kentucky* (1874); N. S. Shaler, *Kentucky, a Pioneer Commonwealth* (1885); William H. Perrin, *The History of Kentucky* (1885–88); Z. F. Smith, *The History of Kentucky* (1886, 1892); Reuben T. Durrett, *The Centenary of Kentucky* (1892); Filson Club publications; State reports, etc.

R. T. DURRETT.

Kentucky River: a stream which rises in the mountains of Letcher County, flows in a tortuous northwesterly course some 250 miles, reaching the Ohio at Carrollton. Its middle and south forks join the main stream in Owsley County. Its head-streams flow through a rough region abounding in iron, coal, and salt. Great amounts of money have been expended in improving the navigation of this beautiful stream, which steamboats now ascend to Frankfort, 60 miles, and flat-boats for 150 miles. At high water cargoes are floated down from its head-streams.

Kentville: post-village; capital of King's co., Nova Scotia; on the river Cornwallis, and on the Windsor and Annapolis Railway; 59 miles N. E. of Annapolis (see map of Quebec, etc., ref. 2–B). It contains the principal offices, car-shops, and engine-house of the railway, and has one weekly paper. The scenery is fine, the soil fertile, and the mineral wealth great. Pop. of sub-district (1891) 1,686.

Kenyon College: an institution of learning situated at Gambier, O., comprising three distinct schools—the theological seminary, Kenyon College, and the grammar school.

It was founded in 1825 under the corporate name of the Theological Seminary of the Protestant Episcopal Church in the Diocese of Ohio, and opened at Worthington, near Columbus. The school was transferred to Gambier in 1828, and the seminary and college faculties were organized separately by an act of the Legislature, which conferred upon the former power to confer degrees in divinity, and upon the latter power to confer degrees in the arts and sciences. A new constitution was adopted in 1891, changing the corporate name to Kenyon College, by which name alone the institution had always been known. There are three departments: Bexley Hall, the theological seminary; Kenyon College, the collegiate school; Kenyon Academy, the preparatory school. The college is well equipped with apparatus, has a library of 30,000 volumes, and its property amounts to $570,000 in value. In 1894 there were twenty-one instructors and 200 students. The total number of graduates was nearly 700. Theodore Sterling, M. D., LL. D., was elected president in 1891. CHARLES F. BRUSIE.

Ke'okuk: city; Lee co., Ia. (for location of county, see map of Iowa, ref. 7–K); on the Mississippi river, near its confluence with the Des Moines river, and on the Chi., R. Is. and Pac., the Keo. and W., the St. L., Keo. and N. W., the Tol., Peoria and W., and the Wabash railways; 46 miles S. of Burlington, 205 miles N. of St. Louis. It is at the foot of the lower rapids, which are 12 miles long, with a fall of 24 feet, and at the head of navigation for large steamboats. The U. S. Government has constructed a ship-canal, 9 miles long, around the rapids, at a cost of about $8,000,000, and a dry dock at a cost of $125,000. The city is built on limestone bluffs 150 feet high, overlooking the river; is in an agricultural, fruit-growing, and stock-raising region; and has gas, electric-light, water, and sewerage plants, electric street-railway, paid fire department, and a public park. There are 24 churches, 7 public-school buildings (valued at $130,000), Roman Catholic academy, Lutheran school, 2 business colleges, 2 medical colleges, U. S. court-house and post-office (cost $150,000), a public library with 10,000 volumes, several other libraries, 2 hospitals, a national bank with capital of $100,000, a State bank with capital of $100,000, 2 other banks, and a monthly, 2 daily, and 5 weekly periodicals. The Mississippi is here spanned by an iron railway and highway bridge, 2,300 feet long. The city has direct steamboat communication with St. Louis and St. Paul, and is distinctively a jobbing and manufacturing center. During the civil war it was the rendezvous for State troops, and military hospitals and a national soldiers' cemetery were established. Pop. (1880) 12,117; (1890) 14,101; (1895) 14,287. EDITOR OF "THE GATE CITY."

Kephren: See KHAFRA and EGYPT, ANCIENT.

Kepler, or **Keppler**, JOHANN: astronomer; b. at Magstatt, near Weil, Würtemberg, Germany, Dec. 27 (or 21), 1571; was educated in a Protestant monastic school at Maulbronn, and, having shown aptness for learning, was sent in 1588 to the University of Tübingen. He studied mathematics and astronomy, and his proficiency was such that in 1594, at the age of twenty-three, he was appointed Professor of Mathematics at the University of Gratz in Styria, where the same year he published an almanac, and in 1596 a cosmographical treatise filled with crude fancies drawn from a mixture of theology with mathematics. In 1599 a series of religious persecutions began in Styria, and culminated two years later in the expulsion of the Protestant professors from the University of Gratz. Kepler had visited Tycho Brahe, the most eminent astronomer of the time, at Benach, near Prague, in 1600, and joyfully accepted an invitation to aid him in the calculation of a new set of Rudolphine astronomical tables ordered by the Emperor Rudolph II., who was ambitious of scientific honors and wished to replace the Ptolemaic and Copernican tables by others bearing his own name. Unfortunately, Kepler, who entered upon his new labors in Sept., 1601, as assistant imperial mathematician, found it impossible to live in harmony with Tycho. Tycho died in the following month (Oct. 24), and Kepler succeeded to his post, with a nominal salary of 1,500 florins per annum, but, the imperial treasury being low and payments rare and irregular, he had to eke out a livelihood by casting nativities. Astrology was then an admitted branch of astronomy, and in a treatise on that subject, *De Fundamentis Astrologiæ* (1602), Kepler expounded the influence of planetary aspects upon human destinies. In a work published in 1606, *De Stella Nova in pede Serpentarii*, etc., Kepler, besides describing a new star in the constellation of the Serpent, made the correction of four years in the era of the birth of Christ which has since been accepted. In 1609 appeared his greatest work, the *Astronomia Nova*, compiled from the observations of Tycho Brahe, supplemented by his own, in which the motions of the planet Mars were made the basis for two of the important corrections of the received astronomical theories known as KEPLER'S LAWS—namely, the ellipticity of the planetary orbits, and the fact that the RADIUS VECTOR (*q. v.*) of every planet passes over equal areas in equal times. These brilliant discoveries were, as Kepler truly said in his title-page, "wrought out by persistent research extending over many years," the mathematical calculations having been ten times repeated for every opposition of Mars. Kepler's financial condition was not improved by these wonderful researches; his salary was 12,000 crowns in arrears; in 1613 he removed to Linz. At Linz, Kepler worked out the third and greatest of his immortal laws—namely, "that the squares of the periods of revolution of any two planets are to each other as the cubes of their mean distances from the sun." This discovery was made, as Kepler was careful to record, on May 15, 1618, after seventeen years of study upon the observations of Tycho; it was published in 1619 at Linz, in a folio volume, *Harmonices Mundi Libri V.* At the invitation of Wallenstein, Kepler removed in 1629 to Sagan in Silesia, and soon after received an appointment as professor at the University of Rostock. Having gone to Ratisbon in 1630 to negotiate (but in vain) for the payment of his long arrears of salary, he died there Nov. 15, and was buried in St. Peter's churchyard. Kepler published, besides the works already specified, *Epitome Astronomiæ Copernicæ, in VII. libros digesta*, etc. (Linz, 2 vols., 1618–22); a treatise on *Dioptrics* (Frankfort, 1611; London, 1653); several series of *Ephemerides*, and numerous minor productions. He left twenty-two volumes of MSS. Those containing the correspondence were printed in 1718; the remainder were included in a new edition of his works published at Frankfort in 8 vols. (1858–70).

Kepler's Laws: See KEPLER, JOHANN.

Keramics, or **Ceramics**: the art of making objects of clay or some natural earth, or in the case of soft porcelain of an artificial mixture of earths and minerals, which vessels are made solid and durable by exposing them to a great heat; also the objects themselves, taken collectively; also the study of the art and of its history. In each of these senses the term covers and includes a number of rather general terms, such as earthenware, pottery, stoneware, porcelain, as well as many names of separate and distinct kinds of ware. An attempt will be made here to explain the exact meanings of the more general terms and the differences between them. This is the more necessary because many of these terms are used in a very careless way; thus earthenware, which is really almost synonymous with keramic ware, is generally used for coarse and soft pottery only, and pottery, which should mean the art of making vessels of any kind, is applied sometimes to all keramic wares except porcelain, and sometimes to all except porcelain and stoneware. The term earthenware may be taken (as it is by some writers) as the common name of the softer and coarser varieties. Under it are grouped crucibles, firebrick, common bricks and roofing-tile, rough red pottery such as common flower-pots, hard baked earthenware or terra-cotta, the chief use of which is in the way of architectural ornaments, and finally coarse pottery covered by a fine and smooth opaque glaze or enamel, which protects it and also gives it an ornamental aspect. This last variety may be called faïence.

Nearly all the famous wares which play so important a part in the history of the decorative arts are included under earthenware, taken in this general sense. Thus the famous Greek painted vases are either of terra-cotta or of a softer earthenware with a surface very slightly glazed or enameled. Nearly all the splendid ornamental wares of the sixteenth and seventeenth centuries belong to the class of enameled pottery; thus majolica, the enameled terra-cotta called *Della Robbia* from the great artists who used it for their important compositions (see ROBBIA), Palissy ware (see PALISSY), Dutch decorative pottery or Delft, and the many kinds of French ware, as Moustiers, Rouen, Nevers, etc., are all varieties of faïence.

All the above-named wares, and all kinds of earthenware as above limited in meaning, have a porous paste. If a broken edge is touched to the tongue, the tongue seems to cling to it, as it takes up the moisture very rapidly; but in

stoneware, the next great division, the paste is not porous, it is partly vitrified throughout its whole mass, and is much more compact. It is stoneware that is used for vinegar-jugs and pickle-jars and German beer-mugs. The most ornamental kind of stoneware is that known as *grès-de-Flandres*, or Flemish ware, and also as Cologne ware; it is gray in color, hard and smooth, mottled, and decorated with blue; its peculiar ornamentation is by means of patterns in low-relief, made by stamps, and also by the very quaint and peculiar shapes given to the vessels made of it. This ware has generally a very thin glaze, made either by the further vitrification of the surface in the heat of the oven, or by means of common salt.

The third great division is porcelain, the peculiarity of which ware is its translucency. Chinese and Japanese porcelain had been imported into Europe for many years before any serious attempt was made in Europe to produce a similar ware. The various experiments tried in the seventeenth century resulted in what is called soft or tender porcelain, which is indeed hardly a keramic ware at all, as it is composed of many different ingredients and scarcely at all of natural clay or other earth. At length a porcelain clay was found in Europe, and the hard porcelain of Sèvres, Vienna, and Berlin began to be made at the national factories of those cities toward the close of the eighteenth century.

Keramics is a most fascinating study because of the beauty of many of the wares included in it; because of the connection between our knowledge of ancient history and sociology, and the discoveries of earthenware tiles, vessels, and fragments of all sorts; and because of the enormous number of varieties and the long-continued study required to master their peculiarities and to discriminate between them and between the valuable and the inferior specimens. Keramics is one of the two or three most important kinds of decorative art, and it has the immense advantage over all others in the enduring quality of its productions. A piece of pottery may last for many centuries, while glass, bronze, textile fabrics, and practically all other objects but those of gold, will decay more or less rapidly.

The bibliography of keramics is by itself a vast subject. Besides many books and articles on keramic art in general, almost every branch of it has been the theme of a host of writers. Many of the books are very large and costly, and a complete library on the subject would cost many thousand dollars. Champfleury's *Bibliographie Céramique* and Smith's *List of Works on Pottery and Porcelain*, in the library of the South Kensington Museum, are attempts at bringing together the titles of books, etc. A very recent book, convenient and not expensive, is Garnier's *Dictionnaire de la Céramique*, and it may be said that the newest books accessible should generally be preferred, because there have been a great number of statements made hastily and on insufficient evidence which later writers have shown to be false or unproved. Birch's *Ancient Pottery*, the work of an officer of the British Museum, is much referred to for Greek vases and other wares of classical times. Marryatt's *Pottery and Porcelain* may be referred to with considerable confidence. Prime's *Pottery and Porcelain of all Times and Nations* is very full, and is useful. Jacquemart's *Histoire de la Céramique* has been translated into English and is much cited, but is hasty and ill-considered in classification. Jaennicke's *Grundriss der Keramik* (1879); Bushell's *Oriental Ceramic Art* (1897) is authoritative and magnificently illustrated. No satisfactory study of the subject can be pursued without using the special works on Greek pottery, faïence, porcelain, Oriental pottery, etc., with those on potters' marks and monograms, and many of those on archæology of different epochs. See POTTERY AND PORCELAIN.

RUSSELL STURGIS.

Keratin [from Gr. *κέρας, κέρατος*, horn; cf. Lat. *cor'nu*, horn: Eng. *horn*]: a nitrogenous substance or a mixture of substances, forming the basis of a large class of epidermal tissues, such as horn, hair, feathers, wool, nails, cuticle, etc. It is insoluble even in gastric or pancreatic juice, but is decomposed by sulphuric acid into leucin and tyrosin.

Kératry, kā'rāā'tree', AUGUSTE HILARION, de: politician and author; member of an old family of Brittany; b. at Rennes, France, Oct. 28, 1769. After the restoration of the Bourbons he was a warm and courageous supporter of liberal measures, and contributed very much to the revolution of 1830. Under Louis Philippe he held a prominent position, was several times re-elected as deputy, and in 1837 was made a peer of France. He opposed Napoleon III. strongly, and after the *coup d'état* he lived in retirement. D. in Nov., 1859. Besides a great number of pamphlets and minor essays, among which was *Questions à l'ordre du jour* (1837), he wrote several novels and books of art-criticism, *Frédéric Styndall* (1827); *Saphira* (1835); *Du beau dans les arts d'imitation* (1822).

Kératry, ÉMILE, de, Count: politician and author; son of Auguste Hilarion de Kératry; b. in Paris, France, Mar. 20, 1832. He abandoned the legitimist traditions of his family, served as a volunteer during the Crimean war, then as a French guerrilla in the Mexican campaign 1863–65, and published several articles denouncing the frauds and impolicy of the imperial intervention in Mexico. He thus gained some celebrity, and in 1869 was returned to the Corps Législatif as an opposition deputy by the Brest electoral district. When the revolution of 1870 burst out, de Kératry was made at first prefect of police of Paris; then as general of division he organized nearly fifty battalions in Brittany; came into conflict with Gambetta and the lawyers, whom he accused of incapacity; and was prefect of Toulouse and of Marseilles under the Thiers government (1871–72). Among his works are the comedy of *La Guerre des blasons* (1860); the drama of *La Vie de club* (1862); and pamphlets on the Mexican expedition and other political subjects: *La Contre-guérilla* (1867); *L'élévation et la chute de Maximilien* (1867); *Mourad V., prince, sultan, prisonnier d'état* (1878); and *À travers le passé, souvenirs militaires* (1887).

Kerbela, kār-bā'la, or **Meshed-Houssein**, me-shed'hoo-sān': a city of Asiatic Turkey; in the vilayet of Mesopotamia; 50 miles S. W. of Bagdad (see map of Turkey, ref. 8–J). It has five gates, an extensive and well-supplied bazaar, and many khans. Houssein, the most revered martyr of the Shiite Mussulmans, son of the Caliph Ali and of the prophet's daughter Fatima, was massacred here (680). His magnificent tomb is annually visited by about 200,000 pilgrims. Pop. estimated at 20,000. EDWIN A. GROSVENOR.

Keresan Indians: a family of PUEBLO INDIANS (*q. v.*). The name is a native term of doubtful derivation, but comprehends all members or tribes constituting the stock, and has therefore been aptly adopted by Powell as the family title. They were called Los Querez, or Quirix, by the chroniclers of the expeditions of Vasquez de Coronado, their discoverer and first conqueror, and later explorers.

Tribes and Pueblos.—These tribes are named according to the pueblos they inhabit, which, beginning with the most northern, are Cochití, Santo Domingo, San Felipe, Sia (Cilla or Cia), Santa Ana, Laguna, and Acoma. The pueblos may be grouped geographically and, to some extent according to their original relations, in three divisions: those standing on or near the Rio Grande del Norte, New Mexico (harboring the Cochitimi); those located farther W. on the Jemez, tributary of the Rio Grande (of the Kiwomi); and those situated over 70 miles to the S. W., yet still near a tributary of the Rio Grande, the Acomami. The pueblo of Acoma belonging to the third group is perched on an isolated rock-mesa fully 500 feet above the surrounding plain, and disputes with Zuñi the claim of being the oldest inhabited town in North America.

General Characteristics.—With the exception of the Acoma and Laguna Indians, who, from their intermixture with the Zuñis, partake of the physical characteristics of the latter, the Keres are a small people—smaller even than the mesa-dwelling Tusayan Indians. The men are generally spare and dark, the women thick set and comparatively fair. All have round or broad faces, small eyes, gross, prognathous jaws and mouths, and usually flattish noses, fleshy and broad at the nostrils. They are, however, typical Pueblos, having earlier been, along with the Zuñians, the purest and oldest representatives of the desert or original Aridian Indian stock, and of the Pueblo cultus and mode of life.

Their villages are either situated on the great level plains of the Rio Grande, where, as at Santo Domingo, they form irregular squares made up of smooth adobe houses arranged in longer or shorter cellular rows, rising in terraces like horse-blocks, from the inner courts, one, two, and very rarely three stories in height, or again, laid out as at Acoma, in two or three uniform and unbroken parallel rows of chambers, terraced from one side only and attaining a height of three stories. Both the sociologic and mythic organizations and institutions of the Keresans are so akin to those of these other Pueblos that they need not be enlarged on.

The partial ownership of the anciently far-famed turquoise mines has developed (more than among the neighbor-

ing Tañoans) a guild, and even a clan, of turquoise-workers and a set of traders in their products, who, from their usage of awaiting all custom at home, have made the nearest approach to a mercantile state yet attained in Indian life. Their proximity to the great river has also had a vast effect on them. Their indemnity from dependence on rain for growth subsistence, weakening the native institutions and worship, thereby weakened also the opposition to the new faith the Franciscans in the fifteenth century sought to implant. Hence the native lore has been to a greater degree than elsewhere mixed with the teachings and faith of the missions. The Lagunas, under the example of some educated and upright American gentlemen who have married among them, are advancing to a fair state of practical civilization for which the earlier Catholic training fitted them.

History.—The Keres are referred to in the creation legends of the Zuñis, as the "Drinkers of the Dew," because their small houses were scattered abroad on hills remote from permanent water. According to their own and other traditions, they inhabited for centuries the caveate dwellings and associated ruins of the deep cañons considerably W. of the Rio Grande, whence they descended south and eastward to the Rio Grande. They were confined in 1630 to seven pueblos nearer the Rio Grande, and numbered only 4,000 in all. Their subsequent history is to a great extent interwoven with that of all the other pueblo tribes of both New Mexico and Arizona.

The headquarters of the commissary-general of the order of San Francisco was located at San Felipe, and that pueblo became the point of departure for all ecclesiastical orders and expeditions. Hence the Keresan language, especially its cult terminology, has exercised a considerable influence on the languages of other tribes.

Population.—The total present population of the Keresan Indians is 3,560, distributed as follows: Cochiti, 268; Santo Domingo, 670; San Felipe, 554; Santa Ana, 253; Sia, 106; Acoma, 566; Laguna, 1,143.

Authorities.—In addition to the Spanish authorities from Castañeda to Benavides, see Bandelier, especially in his various *Reports of Investigations among the Indians of the Southwestern United States*, etc., in *Papers of the Archæological Institute of America*; Bourke, *Moquis of Arizona*, etc. (pp. 15 and 49–50); Gatschet, *United States Geographical Survey to 100th Meridian* (vii., 117); *Magazine of American History* (259, 1882); Powell, *Indian Linguistic Families of America, North of Mexico*, in Seventh Annual Report of the Bureau of Ethnology. See also the articles on Indians of North America, Pueblo Indians, Shoshonean Indians, Tañoan Indians, and Zuñian Indians.

Frank Hamilton Cushing.

Ker'guelen Island [named from its discoverer, Ives Joseph de Kerguélen-Trémarac (1745–97)]: an island in the Indian Ocean, 100 miles long and 50 miles broad; is in lat. 49° S. and lon. 70° E. It has many bays, inlets, and surrounding islets. A harbor at the northern extremity was one of the stations for American and British observers of the transit of Venus in Dec., 1874. Seals formerly abounded, but are now extinct; large flocks of wild fowl still remain. The island is barren, covered with moss, and has but a few flowering plants, the most important of which is the so-called Kerguelen's Land cabbage, the *Pringlea antiscorbutica*, a cruciferous plant, having a head somewhat like that of the cabbage. It has pungent qualities, like those of horseradish and mustard, and abounds in a volatile oil. It is antiscorbutic, and is valued as food by mariners. Coal deposits have been found which may give the island some commercial importance. Kerguelen was appropriated by the French Government in 1893.

Revised by C. C. Adams.

Kerite: See India-rubber.

Kerkuk', or **Chehr Zor** (anc. *Corcura*): Kurdish town of Asiatic Turkey; in the vilayet of Mosul, about half way between the cities of Mosul and Bagdad (see map of Turkey, ref. 6–J). The town stands on an eminence, the sides of which are almost perpendicular. It contains three Roman Catholic churches and numerous mosques. Inexhaustible supplies of naphtha in the vicinity furnish the chief commodity. Pop. 10,079. E. A. G.

Kermadec': group of five small islands in the South Pacific, 450 miles N. E. of New Zealand. Area about 270 sq. miles. They are uneven and wooded. Great Britain took formal possession in 1887 and attached the islands to the New Zealand government.

Kerman' (erroneously **Kirman**): the ancient *Caramania*, a province of Persia, extending along the Gulf of Persia, from Farsistan in the W. to Baluchistan in the E. It comprises an area of about 65,000 sq. miles, with only 600,000 inhabitants. The northern part is a desolate plain, where no life can exist, and even the southern mountain-land, though interspersed with fertile and beautiful valleys, is mostly barren and rugged rocks. The province is very little known, except the route from Baluchistan along the southern border of the desert, and that from the capital, Kerman, to the seacoast. Kerman has a breed of camels and goats famous for their long, silky hair.

Kerman: the capital of the province of Kerman, Persia; in lat. 29° 48′ N., and lon. 56° 30′ E. (see map of Persia and Arabia, ref. 4–I). In the eighteenth century it was very flourishing. Its manufactures of shawls and carpets are still celebrated, and it has some importance as a fortress. Pop. (1878) 41,170.

Kermanshah': town of Persia; the capital of a district of the same name in the province of Irak-Ajami; in lat. 34° 30′ N. and lon. 46° 37′ E. (see map of Asia and Arabia, ref. 2–F). It is a flourishing town, with elegant mosques and palaces and beautiful promenades, and is noted for the manufacture of Persian carpets. In the vicinity is the celebrated rock of Behistun, whose trilingual inscription furnished the key to the Assyrian and old Persian languages. Kermanshah carries on a very brisk trade with Bagdad, Teheran, and Ispahan. Pop. 32,000.

Ker'mes, or **Scarlet Grain** [*kermes* is from Arab. *ḳirmiz*, name of the insect, probably orig. from Sanskr. *kṛmi-*, worm; from a deriv. Arab. *ḳermazī-*, come, viâ Fr. and Span. *crimson* and *carmine*]: a dyestuff once used extensively for producing a blood red. It is still employed in Spain, Africa, and the East, but is largely replaced elsewhere by Cochineal (*q. v.*). Kermes is the dried bodies of *Coccus ilicis*, an insect inhabiting the kermes oak, an evergreen shrub-oak of Spain and the Levant. Kermes furnishes a more durable but less brilliant color than cochineal. See Dyestuffs.

Kermes Mineral: amorphous trisulphide of antimony, essentially Sb_2S_3. The preparation used in medicine contains oxide of antimony, and is hence called oxysulphide of antimony. The mode of preparation is simply to boil the commercial gray sulphide of antimony with an alkaline carbonate, filter, and cool for twenty-four hours, when a brown-red powder is deposited, which is washed and dried. The pure amorphous trisulphide is obtained by fusion, and sudden cooling in water, of the native crystalline trisulphide, also by dissolving the latter in caustic potash, and precipitating with an acid. It is harder than the native sulphide, and its powder is red brown, but lighter in color than the impure compound containing oxide used in medicine under the name of mineral kermes. See Antimony.

Ker'messe, or **Kirmess** [from Dutch and Flem. *kermis*, *kerkmis* (: Germ. *kirmes*, *kirchmesse*); *kerk*, church + *mis*, mass]: formerly religious and parochial festivals, but now more exclusively ordinary and secular enjoyments. These are nearly the same in Flemish countries, Belgium, and Holland, as in any other country of old Europe; but the kermesses of Flanders are more extensively known, because the custom was more strictly adhered to, and because attention was called to them through some celebrated paintings of Teniers and other great Flemish artists. Dances, banquets, target-shooting, comical and even clerical processions, formed the bulk of popular amusement during the kermesses, which were sometimes rather licentious affairs—a motive which induced Joseph II., then ruler of Flanders, to order that they should all be celebrated on the same day. That rule disappeared with the Austrian domination.

Kerner, Justinus Andreas Christian: physician and poet; b. at Ludwigsburg, Würtemberg, Sept. 18, 1786. Through the assistance of Prof. Ph. Conz, who in 1804 had become Professor of Classical Literature there, he was enabled to study medicine at the University of Tübingen. Here he met Uhland, G. Schwab, Karl Mayer, and other members of the Suabian school with whom he published in 1812 the *Poetische Almanach*, in which these poets appeared for the first time as a distinct school. In 1811 he had already anonymously published *Reiseschatten von dem Schattenspieler Luchs*, a collection of highly humorous sketches. Having been made county physician at Weinsberg in 1878 his hospitable home became a gathering-place for German poets and writers. As a physician he made himself famous through his in-

vestigations in animal magnetism and somnambulism. His first collection of poems appeared in 1826, and disclosed a lyric of exceptional talent who had schooled himself especially by the study of the popular song, though also in his poetry he showed a peculiar fondness for the mysterious and demoniacal in human nature. This latter characteristic is still more pronounced in the later collections of his poems: *Der letzte Blüthenstrauss* (1852) and *Winterblüthen* (1859). D. Feb. 21, 1862. See *Bilderbuch aus meiner Knabenzeit* (1839), an autobiography of his early youth; Aimé Reinhard, *Justinus Kerner und das Kernerhaus in Weinsberg* (1862); Marie Niethammer, *Justinus Kerners Jugendleben und mein Vaterhaus* (1877); D. Fr. Strauss, *Justinus Kerner in kleine Schriften* (1866). JULIUS GOEBEL.

Kern River: a stream which rises in Tulare co., Cal., flows S. and S. W. through a grandly picturesque region, and finally divides into two parts—one flowing N. W. and N. into Tulare Lake, and one into the tule-region about Kern and Buena Vista lakes, with which it is connected. Its upper waters abound in fine trout. Its waters are finally discharged into Tulare Lake.

Keroli', or **Kerowlee'**: a native state and city of Eastern Rajputana, India. The state lies on the left bank of the Chambal river and that of its tributary, the Banas. Area, 1,208 sq. miles. The surface is hilly; much of the country is covered with jungle in which wild beasts abound. The chief crop is barley. Pop. 150,000, chiefly Mina, a race allied to the Bhils. The town, capital of the state, is in lat. 26° 30′ N., lon. 77° E. Pop. 30,000 (see map of N. India, ref. 6–D). It is in a very picturesque situation, and has a fine palace and some beautiful temples of remarkable architecture. The town dates from the fourteenth century.

MARK W. HARRINGTON.

Kerosene [irreg. from Gr. *κηρός*, wax, whence Eng. *cereous*]: a term applied by Abraham Gesner in 1846 to oil distilled from coal in Prince Edward Island. It afterward became the general term for those hydrocarbon oils, suitable for burning in lamps, that were obtained from the distillation of bituminous coal and shale. Since the discovery of petroleum it has also been applied to the illuminating oils obtained from that source. Most of the kerosene now used is refined petroleum. Chemically considered, it consists of a mixture of hydrocarbons of the paraffine series. See the article PETROLEUM. Revised by S. F. PECKHAM.

Kerrville: town; capital of Kerr co., Tex. (for location of county, see map of Texas, ref. 5–G); on the Guadalupe river, and the San Ant. and Aran. Pass Railway; 68 miles N. W. of San Antonio, 83 miles W. by S. of Austin. It is in a stock-raising and farming region, and has several roller flour-mills. Pop. (1880) 156; (1890) 1,044.

Kerry: county in the province of Munster, Ireland; bounded N. by the estuary of the Shannon and W. by the Atlantic. Area, 1,853 sq. miles. The surface is mountainous; the highest mountain of Ireland, Carran Tual, 3,414 feet, is found here, and the scenery is often very beautiful, as, for instance, around the lakes of Killarney. The soil is rather inferior. Oats, potatoes, and turnips are the chief crops; dairying and fishing the chief occupations. The principal towns are Tralee and Killarney. Pop. (1891) 79,136.

Kerseymere [another form of *cassimere* (*cashmere*), changed by analogy of *kersey*, kind of coarse cloth]: a thin, fine-wool fabric manufactured chiefly in the west of England, and often called kersey, for brevity. Also a coarse-twilled, long-wool fabric for men's wear, made mostly in the north of England; this also is called kersey. The modern cassimeres are plain or figured woolen or cotton and woolen goods, made in the U. S. and Europe, and designed for men's wear.

Kershaw, JOSEPH BREVARD: soldier; b. at Camden, S. C., Jan. 5, 1822; served in the civil war from the first battle of Bull Run, July, 1861, where he commanded a regiment of South Carolina volunteers which was raised principally by himself; subsequently, as brigadier-general, he commanded a brigade throughout the Virginia Peninsula campaign of 1862; at the second battle of Bull Run; engaged in the capture of Harper's Ferry, Sept. 15, 1862, and in the battle of Antietam two days later; at the battle of Fredericksburg, where his command held the strong position of Marye's Heights, so fatal to their opponents; at Chancellorsville and at Gettysburg; transferred to the West with the corps of Longstreet, he was engaged in the battle of Chickamauga and the subsequent siege of Knoxville. Returning to Virginia in 1864, a major-general, he commanded a division in the final campaign of Lee's army, terminating at Appomattox Court-house. In 1877 he was elected judge of the fifth circuit of South Carolina. D. at Camden, S. C., Apr. 13, 1894.

Kertch (the ancient *Panticapæum*): town in the government of Taurida, Russia; on the eastern side of the Crimean peninsula, on the Strait of Kaffa (see map of Russia, ref. 10–D). It was a flourishing town, with an extensive trade and 23,000 inhabitants, when in 1855 it was taken by the allied French and British in the Crimean war and sacked by the soldiery. *Panticapæum* was founded by the Greeks of Miletus in the sixth century B. C. It was the capital of the ancient kingdom of Bosporus, was annexed to the Roman empire by Pompey 63 B. C.; conquered successively by the Huns (375), the Genoese (1280), the Turks (1475), and the Russians (1771). It is alleged to have been a residence of Mithridates, the ruins of whose palace are found on a hill adjoining Kertch. Since the devastations of the Crimean war the town has recovered rapidly, especially since the improvement of its harbor. Grain, fish, linseed, rape-seed, wool, and hides are exported. Pop. about 29,084.

Kerviler kăr'vĕē lā', RENÉ POCARD: civil engineer and writer; b. at Vannes, France, Nov. 13, 1842; was educated at the Polytechnic School and at the École de Ponts et Chaussées. After several minor employments he was sent in 1874 to St.-Nazaire to construct the Penhouët basin, the walls of which are formed of large hollow piers of masonry sunk 90 feet to a sloping rock upon which they were bedded with great skill. (See *Ann. Ponts et Chaussées.*) Besides various memoirs on Celtic and Gallo-Roman archæology, he has published many papers on the origin and history of the French Academy, its more conspicuous protectors, the earlier academicians, upon Brittany at the academy in the seventeenth and eighteenth centuries, upon controverted questions in history and science and other topics. He was made engineer-in-chief in 1882, and was decorated with the cross of the Legion of Honor. W. R. HUTTON.

Ker'vyn de Let'tenhove, JOSEPH MARIE BRUNO CONSTANTIN: historian; b. at St.-Michel, Flanders, Belgium, Aug. 17, 1817; engaged in historical researches in early life, and became one of the most distinguished authorities upon the antiquities of Belgium. Among his works are *Étude sur les Chroniques de Froissart* (1856); *Histoire de Flandre* (6 vols., 1847–50), both of which obtained premiums for distinguished merit; *Jacques d'Artevelde* (1863); an edition of the *Lettres et Négociations de Philippe de Commines* (1867); *Istoire et croniques de Flandre* (2 vols., 1879–80); *Relations politiques des Pays-Bas et de l'Angleterre* (1882–87, 5 vols.); *Les Huguenots et les Gueux* (1883–86, 6 vols.); *Marie Stuart, 1585–87* (1889), and numerous memoirs published by the academies of France and Belgium. D. Apr. 3, 1891.

Revised by C. K. ADAMS.

Kestrel [also *castrel*, *kestril*, from O. Fr. *cercelle* > Mod. Fr. *sarcelle*, teal < Lat. *querquedula*, kind of duck]: one of the smallest and most abundant of European hawks, the *Falco tinnunculus*, called also *windhover*, from its habit of maintaining itself in one place in the air, with its head to the wind. It is a great devourer of mice and other vermin.

Keswick, kes'ik: a market-town of Cumberland, England; 22 miles S. S. W. of Carlisle, at the foot of Skiddaw Mountain, and beside Keswick Lake, or LAKE DERWENTWATER (*q. v.*) (see map of England, ref. 4–F); noted for its picturesque scenery and as the residence of the poet Southey. It is one of the principal centers of interest to all visitors to the Cumberland lakes, and it forms the point from which the ascension of the Skiddaw is generally begun. Keswick was once noted for the manufacture of lead-pencils, the plumbago for which came from the mines in Borrowdale. Lead is still found in the adjacent hills. Large quantities of char, caught in the lakes, are potted in Keswick. Pop. (1891) 3,905.

Ket'teler, WILHELM EMANUEL, von: ecclesiastic and polemical writer; b. at Münster, Westphalia, Dec. 25, 1811; was educated in the Jesuit college at Brieg, in Switzerland; studied law at Göttingen, Berlin, Munich, and Heidelberg, and entered the civil service of his native city, but suddenly gave up his civil career, under the influence of the Galitzic circles, began to study theology, and was ordained priest in 1844; appointed provost of the Hedwigskirche in Berlin in 1849, and elected Bishop of Mayence in 1850. The restoration of the Roman Catholic Church to its mediæval power and splendor was the grand idea of his life, and for that

idea he fought with courage and perseverance. At the Council of the Vatican he voted with the minority, and even left Rome before the council was closed. (See his *Das allgemeine Concil*, 1869.) When the dogma of the infallibility of the pope was promulgated, Ketteler immediately and unconditionally submitted. He clearly saw the danger which arose to the Roman Catholic Church from the establishment of a German empire under the Protestant house of Hohenzollern, and he opposed the movement openly and with all his might. He believed that the policy of Prince Bismarck was antagonistic to the Church of Rome, and his opposition was violent and unintermittent. (See his *Der Arbeiterstand und das Christenthum*, 1864.) His writings consist mostly of minor pamphlets of a polemical character, such as *Freiheit, Autorität, und Kirche* (1862) and *Hirtenbrief über den Syllabus* (1865), but they often made a great impression. D. at Burghausen, in Upper Bavaria, July 13, 1877. Revised by C. K. Adams.

Kettering: town; in the county of Northampton, England; 75 miles N. N. W. of London by rail (see map of England, ref. 10–I). There are important iron-works in the immediate neighborhood. The town dates back to the thirteenth century; its privilege of market was granted to it by a charter of Henry III. in 1227. Pop. (1891) 19,454.

Keuh-fow, Kiah-fow, Kio-foo, or **Chü-fü**: a walled city of China; in the department of Yenchow and province of Shantung. The city is small, but neat and clean, and is noted as the birthplace of Confucius (*q. v.*). The chief temple of Confucius is here. It stands in a large inclosure full of fine old trees, pavilions, tablets, temples, and other commemorative edifices. The grand hall is an imposing two-storied building 78 feet high. The upper veranda is supported by ten marble pillars, each in one piece, 22 feet high and about 2 feet in diameter, wreathed with dragons cut in high-relief. The eaves are heavy and elaborately constructed, and resplendent in red and blue and gold. The roof is of yellow-glazed porcelain tiles. Within the building stands the statue of Confucius, 18 feet in height, in a gorgeously curtained shrine, supported right and left by statues of his disciples. To the E. of the Confucian buildings is the residence of the Duke of K'ung, the direct lineal descendant of the sage. Outside the north gate is the cemetery of the K'ung family, where lie the ashes of the great teacher under a mound 20 feet high and 100 feet in circumference. R. L.

Keuka Lake: See Crooked Lake.

Keuper, koi'per, **The**: the uppermost of the three groups into which rocks of the Triassic or New Red Sandstone period are divided. It is represented in Europe in different localities by two very different sets of strata, supposed to be of contemporaneous origin—the one a series of red and yellow fresh-water marls and sandstones, and the other a more recently recognized series of marine strata, known as the Hallstadt and St. Cassian beds. Whether any portion of the American Jura-Trias is the quivalent of the European Keuper is an open question. Revised by Israel C. Russell.

Kew: village and parish; in the county of Surrey, England; opposite Brentford, in Middlesex; 8 miles from London (see map of England, ref. 12–J). Kew Gardens and the pleasure-grounds extend along the Thames from Kew Green to the borders of Richmond. Kew Palace, an unpretending brick house of moderate size, became royal property in the early days of George III., who here played his favorite part of "Farmer George." A cottage, secluded in the upper part of the park or pleasure-grounds, is still preserved with its furniture as it was left by Queen Charlotte. This and the untenanted palace remain in the possession of the crown. The later interest of Kew centers in its botanic gardens, established in 1760 by the mother of George III. The large and choice collections of living plants were maintained for about eighty years as the private property of the sovereign, under the administration of the two Aitons—father and son. In 1840 the ground became national property under control of the commissioners of woods and forests, and a year later Sir William Jackson Hooker became the first director. In 1865 Sir Joseph Dalton Hooker became director, and in 1885, Dr. William Turner Thistleton-Dyer. Under these administrators and the liberal support of Parliament, the royal gardens have become the most important botanical establishment in the world, not alone as respects the conservatories and collections of living plants, but in the museums of vegetable products, and above all the great herbarium and botanical library. There are 248 acres in the grounds, of which 70 are in the botanic garden proper, the remainder being the arboretum. Students are admitted at any time, and the public every day after twelve o'clock. The Kew *Bulletin*, devoted to economic botany, is published monthly.

Sketch map of Kew Gardens.

See Oliver's *Guide to the Royal Botanic Gardens and Pleasure Grounds* (Kew, 1881), and Dyer's *Historical Account of Kew to 1841*, in Kew *Bulletin*, No. 60 (1891).
Charles E. Bessey.

Kewanee: town; Henry co., Ill. (for location of county, see map of Illinois, ref. 3–C); on the Chi., Burl. and Q. Railroad; 32 miles N. E. of Galesburg. It is in an agricultural and bituminous coal-mining region; contains 13 churches, 3 graded-school buildings, public library with 6,000 volumes, 3 national banks, and 3 weekly newspapers; and manufactures foundry and machine-shop products, agricultural implements, carriages and wagons, soil-pipe, pumps, and house-heating apparatus. Pop. (1880) 4,207; (1890) 4,569; (1893) special census, 7,963. Editor of "Courier."

Ke'weenaw Series: in American geology, a great group of rocks of Algonkian age. They consist chiefly of sandstones, conglomerates, amygdaloids, and traps, the last two being eruptive rocks which were originally poured upon the land in immense sheets, being afterward buried by sands and gravels. The total thickness reaches a maximum of about 40,000 feet. The beds have been bent into a huge trough which holds the western end of Lake Superior, outcropping on both shores and constituting Isle Royal. In Michigan a broad belt follows the lake shore from Keweenaw Point to the State boundary, beyond which it covers a large area in Northern Wisconsin. In Minnesota the rocks occupy the coast from Duluth to Grand Portage Bay, and in Canada they constitute the islands and peninsulas near Thunder, Black, and Nipigon bays. They contain the celebrated copper deposits of the Lake Superior region, which from 1845 to 1892 afforded 53 per cent. of the total production of the U. S. In 1892 55,000 tons were mined, valued at $14,150,000. See the article Algonkian Period, and consult Irving's *Copper-bearing Rocks of Lake Superior*, monograph v., *United States Geological Survey*.
G. K. Gilbert.

Kew-Kiang: same as Kiu-Kiang (*q. v.*).

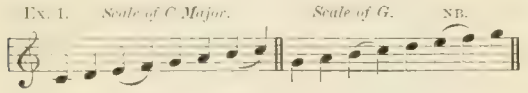
Kew Magnetometer: a portable instrument for the determination of the horizontal force of the earth's magnetism. It was devised for the use of the magnetic observatory at Kew, England, from which it takes its name. The instrument is intended for carrying out the method described by Gauss (Göttingen, 1833). It is the best known of portable magnetometers, and is in general use among civil engineers

all over the world for the purpose of the determination of the elements of the magnetic field of the earth. See MAGNETISM.

E. L. NICHOLS.

Key: in modern music, the scale in which every regular composition is written, or purports to be written. The first or root-note of that scale, from which all its steps or degrees are reckoned and derive their character, is called the *keynote* or tonic. These scales or keys are either major or minor, no other "modes" being recognized in what is distinctively known as modern music. The normal form of a scale in the *major* mode is that of C; and the scale of A gives the normal form of the *minor* mode. But under certain conditions scales similar to those of C and A may take their rise from *any* point or degree of the diatonic-chromatic scale —i. e. we may form a scale commencing on D, E, F, etc., or on B♭, E♭, C♯, etc.; and as there are twelve degrees in the original scale (viz., C), the number of possible scales will be twelve in the major mode and twelve in the minor. The composer has therefore a choice of twenty-four keys, differing both in acuteness and in certain peculiarities of expression. It will be found that each of those additional scales is imperfect in its natural order of tones and semitones, differing more or less in form from the pattern scales of C and A, and therefore requiring an adjustment of certain intervals to render it fit for use. Thus, on comparing a scale beginning on G with that of C, as in Ex. 1, the place of the semitone at NB. (as indicated by the slur) does not correspond with that in the key of C, thus rendering the new scale imperfect and practically useless:

Ex. 1. *Scale of C Major.* *Scale of G.* NB.



To remedy this it becomes necessary that the F in the scale of G should be raised a semitone by means of a sharp, by which alteration the two scales will now be brought into agreement. In music written in the scale of G major every F will therefore become *F sharp* (unless when contradicted occasionally by a ♮); and for convenience' sake in writing, a sharp on F is placed once for all near the clef at the beginning, and called the *signature*. The case may be further illustrated by comparing the distance of the letters in the following example:

Ex. 2. *Scale of C.*

C——D——E—F——G——A——B—C.

Scale of G. *a*

G——A——B—C——D——E—F——G.

To bring the latter into correspondence with the former, it is evident that we must move the F at *a* half a step nearer to G, which is the office of a sharp when expressed in notes. In the key of D major there are needed *two* such rectifications of the scale, and accordingly two sharps—viz., F and C—are placed at the beginning. In A major *three* sharps are required; and all the other keys, major and minor, need similar adjustment by the use of sharps or flats, even to the number of seven, the object being simply to bring them into conformity with the established order of the scale. The succession of the keys, both major and minor, with the sharps or flats required for the rectification of their scales, is shown in Ex. 3:

Ex. 3. KEYS WITH SHARPS.

Maj.	*Min.*	*Sharps.*
C.	A.	—
G.	E.	F.
D.	B.	F—C.
A.	F♯.	F—C—G.
E.	C♯.	F—C—G—D.
B.	G♯.	F—C—G—D—A.
F♯.	D♯.	F—C—G—D—A—E.
C♯.	A♯.	F—C—G—D—A—E—B.

KEYS WITH FLATS.

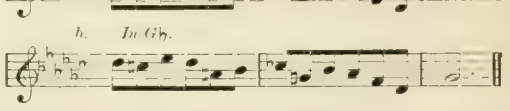
Maj.	*Min.*	*Flats.*
F.	D.	B.
B♭.	G.	B—E.
E♭.	C.	B—E—A.
A♭.	F.	B—E—A—D.
D♭.	B♭.	B—E—A—D—G.
G♭.	E♭.	B—E—A—D—G—C.
C♭.	A♭.	B—E—A—D—G—C—F.

The signatures of these keys or scales are written as in Ex. 4, where the *keynotes* of the respective scales are also added, the upper note being the major, and the lower one its relative minor, or that having the same signature:

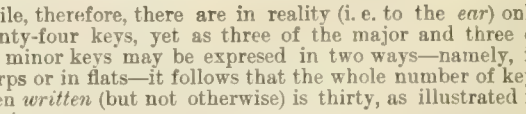
Ex. 4. C G D A E B

Though there are in reality only twelve major and twelve minor scales, corresponding in number with the degrees of the diatonic-chromatic scale, yet in the example just given it will be noticed that the number is *fifteen* of each mode, or *thirty* in all, instead of twenty-four. This is explained by observing that there are in the example three major and three minor keys or scales which are in *sound* identical with certain others, though they are differently *written*. These are called the "enharmonic" keys—i. e. keys having two names, and written variously or indifferently in sharps or in flats. They are F♯ and G♭, B♯ and C♭, and C♯ and D♭, with their relative minors. It is evident that F♯ and G♭, though different to the *eye*, are the same to the *ear*, when played on ordinary keyed instruments; and therefore the same *sounds* are produced, and the same finger-keys are used on the organ or pianoforte, whether a piece is written and performed in the key of F♯ or in that of G♭. From which it follows that a given strain or movement may be written by a composer in either of those keys at pleasure, the effect on the ear being precisely the same whether written in six sharps or six flats. In Ex. 5, for instance, the notes at *a* are in sound (and under the fingers) identical with those at *b*:

Ex. 5.—*a.* *In F♯.*



b. *In G♭.*



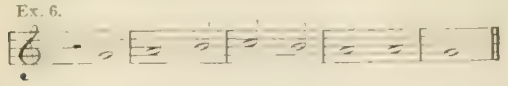
While, therefore, there are in reality (i. e. to the *ear*) only twenty-four keys, yet as three of the major and three of the minor keys may be expresed in two ways—namely, in sharps or in flats—it follows that the whole number of keys when *written* (but not otherwise) is thirty, as illustrated in Ex. 4.

To find the tonic or *keynote* of any piece or movement, it is ordinarily sufficient to refer to the *last note in the bass* (which is almost always the tonic), and then to ascertain from the *signature* whether the key is major or minor. Should the final bass-note, for instance, be C, and no sharps or flats be found at the clef, the key is that of C *major*; but if we find three flats at the clef, we know from this signature that the key is C *minor*. This, however, is only a general rule, to which there are several exceptions, as when in old music a movement in B♭ is written with the signature belonging to F—i. e. with *one* flat only—the second flat being inserted before each E in the piece as an accidental. Also, in discursive pieces, digressions into new keys often occur, including whole movements, without any change of the signature, the necessary flats, sharps, or naturals being inserted before the notes themselves where necessary. Occasionally also in ecclesiastical compositions the last note of the bass is not the *keynote* or tonic, but the *dominant* with its major triad. With these and similar exceptions kept in view, the *keynote* and the scale and mode of a composition may be generally ascertained by reference to the final bass-note and the signature.

It is far more difficult, however, to find the key of a given *melody* than of a piece comprising two or three parts in *harmony*, because a melody may be founded on certain notes which are common to *several scales* or keys, and will neces-

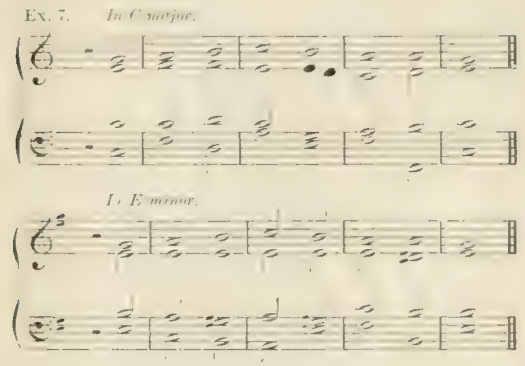
sarily be equivocal until settled by the addition of harmony. In demonstration of this, see the melody or theme in Ex. 6, which at first appears to be in G major:

Ex. 6.



Though this may readily and very naturally be harmonized in G major, yet the key in which the composer conceived it *may* possibly prove to be C major or E minor, as illustrated by the harmony in Ex. 7:

Ex. 7. *In C major.*



In E minor.

The keynote of a melody can not therefore be fully ascertained unless that melody includes in its range *all* the notes of a scale, thereby identifying itself with that scale by elements and progressions which would be foreign to any other.

Respecting keynotes, it may also be remarked that in keys with sharps the keynote in major is always on that letter which is *one semitone above the last sharp* of the signature. Thus if there are two sharps, F♯ and C♯, the keynote is *D*. When F, C, and *G* are sharped, the keynote will be *A*, and so on. In keys with flats the keynote in major is on the letter *a fourth below* (or a *fifth above*) *the last flat* at the clef. Thus in two flats, B♭ and *E*♭, the keynote is B♭. In three flats, B♭, E♭, and *A*♭, the keynote will be E♭, and so throughout. The keynote in *minor* is always a minor third below the major, as A below C, G below B♭, etc. In keys with sharps the minor keynote is also one whole tone below the last sharp of the signature. Thus in two sharps, F♯ and C♯, it is B; in three sharps, F♯, C♯, and G♯, it will be F♯, and so on. In keys with flats the minor keynote is a sixth below the last flat. Thus in two flats, B♭ and E♭, it is G, and in three flats, B♭, E♭, and A♭, it will be C. To recollect the *order* of major keys in sharps, reckon *upward by perfect fifths*, as from C to G, then G to D, D to A, and so onward. This gives the succession of major keys in regular order from one to seven sharps. In major keys with flats, *reckon downward by perfect fifths*, as from C to F, F to B♭, etc., and the succession of keys in regular order from one to seven flats will be found. This rule applies also to minor keys.

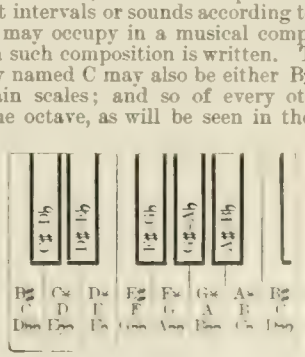
Revised by DUDLEY BUCK.

Key. ERNST AXEL HENRIK, M. D.: pathologist; b. in Småland, Sweden, in 1832; entered the University of Lund in 1848; became a licentiate in medicine in 1857, and M. D. in 1862; was assistant surgeon in the Seraphim Hospital, Stockholm, from 1858–59; in 1861 studied histology with Max Schultze in Bonn, and pathological anatomy with R. Virchow in Berlin; in 1862 became Professor of Pathological Anatomy in the Caroline Institute, Stockholm; was associate editor of *Medicinskt Arkiv* from 1863–68, and editor of *Nordiskt Medicinskt Arkiv* from 1869; in 1882 represented the city of Stockholm in the lower house of Parliament. His contributions to histology and pathology have received universal recognition, the French Academy awarding him the Montyon prize for his *Studien in der Anatomie des Nervensystems und des Bindegewebes* (Stockholm, 1875–76). S. T. ARMSTRONG.

Keyboard, or **Finger-board**: in an organ, pianoforte, or other similar instrument, the series or range of short levers, usually covered with ivory and ebony, on which the fingers of the performer operate. Each of these levers is called a *key*, the longer or white ones representing the diatonic scale of C major in several successive octaves, and the shorter or black ones furnishing the intermediate sharps and flats requisite for the other scales. The keyboard is frequently denominated a *bank*, *row*, or *set* of keys, and in organs of considerable size there are two, three, and sometimes four, such sets. The clavichord, virginal, spinet, and harpsichord of former days were also furnished with keys, the latter frequently having two sets, and in some cases four and even more. Besides the keyboards for the fingers, organs are usually provided with a set of keys for the feet, the former being distinguished as the *manuals*, and the latter as the *pedals*. The keyboard has reached its present perfect form only after several centuries of experiment and improvement. In its rudest elementary form we may trace its existence in the small and roughly constructed organs of the eleventh and twelfth centuries. It appears to have comprised at that period only a few parallel levers of much larger size than our present keys, and requiring a strong pressure to move them.

The structure or plan of the keyboard now in use is comparatively modern, and its very outline or conception presupposes such a knowledge of the diatonic-chromatic scale as was not attained till many years after the time of Guido. The probability therefore is that for a long period the early keyboards consisted merely of two or three octaves of short levers operating on pipes tuned in the natural order of the scale, with, possibly, an extra key in each octave for a flat seventh or other needed interval. The adjustment of the keyboard so as to comprise *all* the intervals would, from the necessity of the case, be dependent on the regulation of the elements of the chromatic scale; and for this reason we can not date the formation of our present keyboard further back than about the close of the twelfth century or the beginning of the thirteenth, when the structure of the scale began to be more clearly apprehended.

The ordinary keyboard comprises tones and semitones, but excludes all lesser or inharmonic intervals. Each black key is the *sharp* of the white key on its *left*, and the *flat* of the white key on its *right*. From this it follows that every black key serves two distinct purposes, being a sharp in one relation, and a flat in another. This apparently defective arrangement is unavoidable, on account of a certain irregularity in the scale, which if strictly met would require us to have one black key for C♯ and another for D♭; and so with F♯ and every other black key. In *reality*, C♯ and D♭ are not the same sounds, nor are D♯ and E♭ the same; but to avoid the complexity of mechanism which would arise from the use of quarter-tone keys, and the multiplication of pipes or strings, the scale is so "tempered" as to make each black key give a middle or compromise tone, which shall sufficiently answer for a sharp in the one case and a flat in the other, though not truly or exactly representing either. This same "tempering" takes place also on the white keys for a similar reason. Hence all the finger-keys on the board, whether white or black, come to be representative of two or more different intervals or sounds according to the place and relation they may occupy in a musical composition, or the scale in which such composition is written. Thus the white key ordinarily named C may also be either B♯ or D♭♭ when used in certain scales; and so of every other finger-key throughout the octave, as will be seen in the following example:



On the pianoforte it would not be possible to express the minute differences here referred to without a multiplicity of additional strings and corresponding changes in the arrangement of the keyboard. Several organs have been built with keyboards and extra pipes to give quarter-tones or enharmonic intervals. In those instruments each black key is divided into two portions, one of which is used for sharps and the other for flats, thereby securing much richer and purer harmony than can be obtained from organs tuned on either the equal or the unequal temperament. Harpsichords, as already noticed, were constructed centuries ago with additional strings and rows of keys, for the purpose of obtaining *without* temperament the advantage of quarter-tones. See TEMPERAMENT. Revised by DUDLEY BUCK.

Key Islands: same as KEI ISLANDS, *q. v.*

Keynote: See KEY.

Keyport: town; Monmouth co., N. J. (for location of county, see map of New Jersey, ref. 4-E); on Raritan Bay, and the Central Railroad of N. J.; 24 miles S. by W. of New York. It contains 7 churches, graded-school buildings that cost $32,000, 2 hotels, many summer boarding-houses, new system of water-works, and 3 weekly newspapers. There are two carriage and wagon factories, sash and blind factory, clam-bouillon factory, and a brick-making plant representing an investment of $1,750,000. Pop. (1890) 3,411; (1895) 3,386.
EDITOR OF "ENTERPRISE."

Keyser: town; capital of Mineral co., W. Va. (for location of county, see map of West Virginia, ref. 5-K); on the Potomac river, and the Balto. and Ohio and the W. Va. Cent. and Pitts. railways; 23 miles S. W. of Cumberland, Md. It is in an agricultural and stock-raising region, and is an important shipping-point for grain, wool, and cattle. There are four churches, several graded schools, and a weekly newspaper. Pop. (1880) 1,693; (1890) 2,165; (1893) estimated, 2,500.
EDITOR OF "MOUNTAIN ECHO."

Keyser, PETER DIRCK, M. D.: surgeon; b. at Philadelphia, Pa., Feb. 8, 1835; studied at Delaware College until 1851; entered the chemical laboratory of Prof. F. A. Genth at Philadelphia; went to Europe in 1854; graduated in the medical department of the University of Jena, Germany, in 1864; returned home same year and entered the army hospitals as acting assistant surgeon U. S. army. In 1868 he became surgeon in charge of the Philadelphia Eye and Ear Infirmary; in 1870 also ophthalmic surgeon to the medical department of the German Society of Philadelphia; and in 1872 one of the surgeons to the Wills Eye Hospital in Philadelphia. In 1853 he published his chemical analyses of the allanites from Reading, Pa., Bethlehem, Pa., and Orange co., N. Y.; also analyses of thalite and of owenite (thuringite) from Harper's Ferry, Va., and in 1854 the analysis of thuringite from Germany, and the analysis of barnhardite from Cabarrus co., N. C. He has written *On the Recovery of Sight after Gray Atrophy of the Optic Disks* (1871); *On the Use of Chloral Hydrate after Eye Operations* (1871); *Report on Operations for Cataract* (1874); *On Congenital Hereditary Dislocations of both Lenses*; *Ruptures of the Choradix*; *Phosphatic Degeneration of the Cornea* (1874), and other works on kindred subjects.

Keys of Florida: See KEY WEST and FLORIDA.

Keystone: See ARCH.

Key West [Span. *cayo hueso*, bone-quay; *cayo*: O. Fr. *caye*, sand-bank > Fr. *quai*, quay, probably of Celtic origin; Span. *hueso*: Ital. *osso*: Fr. *os* < Lat. *ossum*; the Eng. *West* in the name is a perversion by popular etymology]: city (settled in 1822); capital of Monroe co., Fla. (for location, see map of Florida, ref. 8-D); on the island of Key West, at the entrance to the Gulf of Mexico; 110 miles N. by E. of Havana; 430 miles S. by E. of Tallahassee. The island is the extreme southern boundary of the U. S., and the city the most southerly one in the country. The island is of coral formation, is 7 miles long and from 1 to 2 miles broad, has a general elevation of only 11 feet above sea-level, and is covered with a thin layer of soil of extreme fertility. The city is a port of entry and, by reason of its connection with the Gulf of Mexico, an important naval station, and is protected by Fort Taylor, a casemated fortification on an artificial island within its excellent harbor. There are two lighthouses on the island, one within the city, and the latter has direct steamship communication with New York and New Orleans. The principal industries are cigar-making, sponging, fishing, and wrecking, and a considerable business is done in fancy turtle and other shell work. In 1893 the imports amounted to $661,680, and the exports, which comprised salt, turtles, sponge, fruit and vegetables, and cigars, to $1,119,470. There is a national bank, capital $100,000, and another with capital of $50,000, and a weekly and three daily newspapers. Pop. (1880) 9,890; (1890) 18,080; (1895) 16,502.
EDITOR OF "EQUATOR-DEMOCRAT."

Khabur [: Gr. Χαβόρας, from Heb. *chābor*, liter., joining together, or *Khebār*, liter., length]: a river in the vilayet of Mesopotamia, Asiatic Turkey. After a N. to S. course of over 200 miles, it empties into the Euphrates at Kerkesieh (anc. *Circesium*). The attempt of biblical scholars to identify this river with the Chebar (Ez. i. 1, 3), on the banks of which the captive Israelites were located, is probably not justified, that river being farther S. in "the land of the Chaldeans."
EDWIN A. GROSVENOR.

Khafra (Chafra, Cephren, Kephren) [the Χεφρῆν of Herodotus and Diodorus]: the fourth (according to Manetho, the third) king of the fourth Egyptian dynasty; the builder of the second largest pyramid of Gizeh. (See Herodotus, ii., 127; Diodorus, i., 64.) The construction of the great Sphinx has also been credited to him, but monumental evidence carries it back to the time of Cheops (Khufu), the second king of the same dynasty, to whom restorations of the image are ascribed. The length of his reign is variously given, sixty-six years (Manetho), fifty years (Herodotus), fifty-six years (Diodorus), and eight years (Turin papyrus).
See EGYPT, ANCIENT.
CHARLES R. GILLETT.

Khaiber Pass: a celebrated defile through the mountains between the Punjaub, India, and Afghanistan. See KHYBER PASS.

Khairpur: a feudatory Mohammedan state of Sind, British India, extending from the left bank of the Indus to the desert of Thar. Area, 6,109 sq. miles. The country is arid except along the Indus and its derivative, the Eastern Narra, but wheat and indigo are raised between these two streams. Jungle abounds and wild beasts and serpents are numerous. The inhabitants are mostly Jats. Pop. 13,000. The capital is Khairpur, 15 miles from the left bank of the Indus, in lat. 27° 31′ N., lon. 70° E. It is a dirty city, now in decadence, situated in a marshy plain. Gold ornaments, embroideries, and arms are manufactured here. Pop. 7,000.
MARK W. HARRINGTON.

Khaled, haa-led′: Mussulman general; b. at Mecca in 582 A. D. As commander of the Koreïsh cavalry he defeated the prophet Mohammed at the battle of Ohud (623). He was converted to Islam (629); in the same year he gained the desperate battle of Muta, and received from the prophet the title of "the Sword of God." He subdued the revolted Arabs (632), conquered Irak Arabi (633), captured Bosrah (634), gained over the generals of the Emperor Heraclius I. the battles of Aiznadin (634) and Yermouk (636). A noble though ferocious character, he was hated by the Caliph Omar and died in disgrace at Emesa (642).
E. A. G.

Khal'kas [so named from one of their ancient chiefs]: those tribes of Mongols who occupy the steppes of Northern Mongolia, and who were the last to acknowledge the supremacy of the Manchu dynasty which now rules in China. They are divided into Eastern and Western Khalkas. See MONGOLIA.

Khallikhan, hăăl-lĕĕ-kaan′, IBN (also called SHEMS ED-DIN ABUL ABBAS AHMED): author; b. at Arbela, near the Tigris, in 1211; lived in Cairo, and in Damascus, of which he was chief cadi, where he died 1282. He composed a valuable *Biographical Dictionary of the Illustrious Men of Islam*.
E. A. G.

Khamain: See CAMBODIA.

Khan [Fr. *khan*: Turk. *khān*, from Pers. *khān*, prince, from the Tartar]: title of Tartar and Mongol sovereigns and magnates. As now affixed to Persian names it means hardly more than esquire. Also a CARAVANSERAI (*q. v.*).

Khandesh', or **Candesh**: a district in the Bombay Presidency, British India, E. of Guzerat and N. of the Nizam's Dominions. Area, 9,944 sq. miles. Pop. 1, 250,000. Formerly a part of the Mogul empire, it was annexed in 1818.

Khan'dwa, or **Cundwa**: capital of Nimar district, Nerbudda division, Central Provinces, British India; station on the railway from Bombay to Allahabad, and terminus of the railway northward to Indor (see map of S. India, ref. 2-D). It is an ancient town and is rapidly growing in importance. The British village is 3 miles E. of the native one. Pop. 15,000.
M. W. H.

Khania: See CANEA.

Kharkov: government of European Russia, traversed by the Don and its affluents. Area, 21,041 sq. miles. It is low, mostly level, but very fertile. Wheat, wine, and tobacco are raised in great quantities, and cattle and sheep are reared in large numbers. The rearing of bees and silkworms is also an important industry. Manufactures are unimportant, but have developed since the middle of the nineteenth century. Pop. 2,343,808.

Kharkov: the capital of the government of Kharkov, European Russia; on the Kharkova, an affluent of the Don; has railway communication with Kurch, Mariupol, and Odessa (see map of Russia, ref. 9-D). It is a flourishing town, with several good educational institutions, including a university with about 1,000 students. This was long a cen-

ter of nihilistic movements. The city has four annual fairs, which are much frequented, especially the wool-fair in spring, at which the value of the wool sold generally amounts to $5,750,000. Pop. 188,469.

Khartum': founded by Mohammed Ali in 1823; was the chief town in Egyptian Sudan (see map of Africa, ref. 4–G). It was on the Blue Nile, about 2 miles from its junction with the White Nile, in a level but very fertile plain, and had a considerable trade, being the center of several caravan routes. It was taken by El Mahdi Jan. 27, 1885, and made the scene of a frightful massacre. In 1886 it was razed to the ground by Khalifa Abdullah, the Mahdi's successor. Most of the building material was removed to Omdurman, across the White Nile, which is now the metropolis of the Mahdist domain. Khartum (1892) was nothing but a heap of mud ruins. Revised by C. C. Adams.

Khasia (kaa'si-ăă) **and Jaintia** (jīn'ti-a) **Hills**: an independent political agency of Central Assam, British India. In the Khasia hills there are twenty-five feudatory states under elective chiefs. The total area of the agency is 6,157 sq. miles. Pop. 170,000. Chirapunji was the capital of the district until 1864, when it was transferred to Silang.

Khatmandu', or **Katmandu**: the capital of Nepal, Hindustan; in lat 27° 42′ N. and lon. 85° 15′ E. (see map of N. India, ref. 6–H). It is poorly built, many even of its temples being of wood; the streets are narrow and dirty. It has no great commercial importance. Pop. 50,000.

Khayyam, Omar: See Omar Khayyam.

Khazars, or **Chazars**: a powerful tribe probably allied to the Georgians and Armenians, though their ethnology is very obscure; settled in the regions between the Don, the Volga, and the Caucasus, and at various times between the second and the eleventh centuries playing a conspicuous part in Eastern politics, though after the twelfth century vanishing completely from the records of history. They formed an independent state and had kings of their own. Their capital, Itil, was populous, well built, and a commercial center of considerable importance. Conquered in the seventh century by the Moslems and compelled to embrace Mohammedism, the Khazars recovered again in the eighth and ninth centuries, and seem to have had their most brilliant period in the tenth, but were utterly vanquished in the eleventh by the rising Slav power in Russia. See Klaproth, *Tableau Historique du Caucase* (1827); d'Ohsson, *Peuples du Caucase* (Paris, 1828).

Khedive, ke-deev' [from Turk. *khidīv*, from Pers. *khidīw*, king, lord, sovereign]: the official title of the Viceroy of Egypt, first conferred (May 14, 1867) by special firman of Sultan Abdul Aziz on Ismaïl Pasha (*q. v.*), fifth viceroy. A second firman (Aug. 4. 1868) vested succession to the title in the khedive's descendants in direct line. Probably the sultan willingly made this innovation in the Mussulman order of succession, hoping in like manner to transmit his throne to his son, Yusuf Izzeddin; moreover, the annual tribute of Egypt to the Sublime Porte was raised from £376,000 to £720,000. Ismaïl Pasha, an able, ambitious and unscrupulous ruler, made the most of his title and opportunities, developing all the resources of Egypt and thereby arousing the suspicions of the sultan and the opposition of Great Britain, which did not wish a strong government near the Suez Canal. He was deposed June 25, 1879, and was succeeded by his son Mohammed Tewfik Pasha (b. Nov. 19, 1852; d. Jan. 7, 1892), in turn succeeded by Abbas Pasha (b. July 11, 1874), third khedive. Since the bombardment of Alexandria by the British fleet (July 11 and 12, 1882), and the immediate occupation of Egypt by British troops, the office of khedive has possessed only nominal importance. Edwin A. Grosvenor.

Khelat': the capital of Baluchistan; in lat. 28° 52′ N. and lon. 66° 33′ E.; situated in a narrow valley 6,800 feet above the sea. It is surrounded with walls, and has some importance as a fortress, but it is ill built and dirty, and its trade and manufactures are of very little consequence. Pop. estimated at 14,000. Revised by M. W. Harrington.

Khemnits'er, Ivan Ivanovich: writer of fables; b. in the government of Astrakhan, Russia, Jan. 5, 1745. His father, a German immigrant and doctor, wished him to follow the same profession, but the boy took such a dislike to his medical studies that, when only thirteen, he entered the army. After serving for twelve years he retired, and in 1770 was given a place in the School of Mines, in which he remained until 1781, when he resigned. Shortly after he was appointed consul-general at Smyrna, where he soon became homesick, fell into deep melancholy, and died Mar. 20, 1784. Khemnitser was in disposition remarkably like his model, La Fontaine—child-like, kindly, sweet-tempered. His fables are characterized by perfect simplicity and shrewd, good-natured satire. Although a few are translations from the French and German, the majority are his own. The first volume of them was published in St. Petersburg in 1779 under the anonymous title of *Basni i Skazki* (Fables and Tales) *N. N.*, without giving the date. The third edition, which was the first full one, appeared in 1799 (3 vols., St. Petersburg), and there have been some fifteen others. For a translation of four of Khemnitser's fables, see Bowring's *Russian Poets* (London, 1821). A. C. Coolidge.

Kheper, Khepera: an Egyptian deity whose emblem was the scarabæus (*ateuchus sacer*). His qualities were derived from those of the beetle, which was supposed to perpetuate its species without the aid of the female. The scarab was used as an amulet in connection with the dead. The god is called "father of the gods," and was regarded as self-created as well as creator of all things. In process of time he became identified with the rising sun, and so typified the resurrection. He was represented in human shape surmounted by a beetle or with a beetle-shaped head. His emblem is found in frequent combination with the figures and emblems of other gods. See also Scarab.

Charles R. Gillett.

Kheras'kov, Mikhail Matveevich: poet; b. Oct. 25, 1733; grandson of a Wallachian refugee who went to Russia in the reign of Peter the Great. He was brought up in the corps of cadets, and first served in the army. Later, when the University of Moscow was founded (1755), he was made one of its staff, besides being at the same time director of a theater. From 1778 to 1802 he was curator of the university, and in the course of his career had various orders and titles bestowed upon him. Kheraskov was a prolific poet of the pseudo-classical school then in vogue. His most famous production was his epic *Rossiada* (1779), which describes the conquest of Kazan from the Tartars by Ivan the Terrible in 1522. It abounds in dryads, fairies, demons, enchanted groves, etc., as well as heroes, heroines, and incidents imitated from Homer or Tasso. In the history of the development of Russian literature it holds an important place, although now unreadable and forgotten. Another epic, *Vladimir Vozrozhdennyĭ* (Vladimir Born Again), describing the conversion of Russia under St. Vladimir, was less successful. D. Sept. 27, 1807. His complete works (12 vols.) were published in Moscow in 1796. A. C. Coolidge.

Kherson', or **Cherson**: government of European Russia, bordering on the Black Sea, W. of the Dniester. Area, 27,523 sq. miles. The northern and eastern parts are hilly, fertile, and have splendid forests. Tobacco is extensively cultivated; cattle, sheep, and silkworms are reared. Pop. 2,026,853.

Kherson, or **Cherson**: town of European Russia, the capital of the government of Kherson; on the right bank of the Dnieper, 19 miles above the mouth of that river (see map of Russia, ref. 10–C). It was founded in 1778 by Potemkin; has several good educational institutions, some manufactures of salt, leather, and rope, extensive ship-building, and a large trade in timber. Pop. (1889) 61,824.

Khiva, kee'vaă: a vassal state of Russia; on the left bank of the Amu Darya. It is of triangular form with the long side on the river, extending from Bokhara, lat. 41° N., to the Sea of Aral. To the E. are Turkestan and, for a short distance, Bokhara; to the S. and W. the Transcaspian district of Russia. Area, 22,320 sq. miles.

Physical Configuration.—Khiva is simply a large artificial oasis in a great sandy desert. The water for irrigation is derived entirely from the Amu Darya, or Oxus. This stream rises in the Hindu Kush Mountains, and emptied not many centuries ago into the Caspian Sea, but now empties into the Sea of Aral. The old river-bed leaves the present course in the territory of Khiva, and along the ancient course through this territory sweet water can be obtained by digging. The ordinary well-water is bitter and salt. From the present stream, and especially in the region of the old bed, canals have been run for considerable distances westward, and the water for irrigation is obtained from them. The Amu Darya brings down much silt, but it has no fertilizing qualities. Over the desert there are clumps of bushes composed of pygmy locust-trees.

Climate.—This is continental in character, but not unhealthful, and the Khivans often live to a great age. It is very hot in summer, but refreshing E. and S. E. winds often occur. During the autumn and a part of winter a wind from the steppes prevails, and brings with it a very fine sand, with uncomfortable results. The winters are very cold, with little snow. The river is frozen from November until February. Spring comes on early and vegetation is well advanced by March. The rains are very slight.

Productions.—The chief cultivated plants are wheat, barley, millet, cotton, lentils, melons, poppy, tobacco, and hemp; fruits and the vine are also cultivated. The dromedary is very common, the ass less so. There is a very fine and highly esteemed breed of horses, but the ordinary horses are small and weak. Cattle are not common, and the only race of sheep is the fat-tailed. Deer, antelope, jackals, wolves, and foxes abound. The hawk is employed in hunting.

Population.—The inhabitants belong to two distinct races, Iranian and Turkish. The former are the Tajiks or Sarts, the aborigines, formerly a subject people, but now the more numerous and also more important. They speak a Persian dialect, and form the great body of urban and agricultural population. The rest of the population belongs to the Turkish race, but falls into three distinct sub-races, the Usbegs, the Turcomans, and the Kara-Kalpaks. They are all nomadic. The Usbegs were the conquering race in the fifteenth century, and the family of the reigning khan belongs to them. They remain in the towns in winter but under tents in summer. The Turcomans of Khiva are of the same race as those scattered over the rest of Central Asia. They are nomadic and devoted to brigandage. The Kara-Kalpaks of the khanate occupy a small territory in the northwest, near the Sea of Aral. They are like the Usbegs, but more gentle and industrious.

Administration.—The reigning khan (1893) is Syed Mahomed Rahim Khan; b. about 1845, succeeded his father in 1865. The state came under a Russian protectorate in 1872. The government is a military despotism which was administered with great cruelty until the Russian agent took up his residence in the capital. Russia has the right of free trade and of free navigation of the Amu. The khan has engaged to furnish the land necessary for Russian establishments, and to put through public improvements initiated by the Russian Government. He was, moreover, bound to pay an indemnity of 1,753,600 roubles, and for this sum his khanate is under mortgage. The religion is Mohammedan. The export of cotton in 1888 was 57,000 bales.

History.—From the very earliest times there has existed in the region of Khiva a country called by the Greeks Charismia, and later by the Arabs Kwaresm and Kharism. It appears to have been for centuries a part of the great Persian empire. Later it fell into the hands of eastern conquerors, but flourished as an independent empire in the thirteenth century. At this time it appears to have extended from the Hindu Kush to the Caspian. It soon fell before Genghis Khan, and after a turbulent existence, again before Tamerlane. In 1512 it was conquered by the Usbegs and has since remained in their hands. At the beginning of the nineteenth century the power of the Khan of Khiva extended from the Caspian to the Sea of Aral and the Amu, but his territory has shrunk under Russian aggression until what little is left is held on Russian sufferance.

References.—Abbott, *A Journey from Herat to Khiva* (1843); MacGahan, *Campaigning on the Oxus* (1874); Wesselovsky, *Historisch-Geographischer Versuch der Beschreibung des Khanats von Chiwa* (1874); Wood, *The Shores of the Lake Aral* (1876); Burnaby, *A Ride to Khiva* (1884).

Mark W. Harrington.

Khiva: capital of the khanate of the same name; in lat. 41° 23′ N.; 20 miles W. of the Amu Darya; 276 feet above sea-level (see map of Asia, ref. 4–D). It is on an irrigation canal, branches of which penetrate the town and nourish the numerous lines of shade-trees which render it attractive. Fine carpets and common silks and cottons are made there. Before the Russian occupation it was the greatest market for slaves in Turkestan. Pop. fluctuating; about 6,000 in summer, 10,000 to 15,000 in winter. M. W. H.

Khmelnitskiĭ, Nikolaĭ Ivanovich: writer of comedies; b. in St. Petersburg, Russia, Aug. 11, 1789. As soon as he had finished his education he entered the service of the state, took part in the war of 1812–13, and afterward filled several civil posts. In 1829 he was made governor of Smolensk, where he organized the first industrial exhibition ever held in Russia. In 1837 he was appointed governor of Archangel, but resigned next year and lived in St. Petersburg until his death, Sept. 8, 1846. Though his comedies have little originality and are no longer played, in his day they had considerable influence on the Russian stage. By his translations from the French of Molière and others, as well as by his own pieces, which are well-written imitations, Khmelnitskiĭ did much to purify and improve the dramatic taste of his countrymen. Among the best known of his plays are *Tsarkoe Slovo* (The Word of the Tsar)), *Russkiĭ Faust* (The Russian Faust), *Govorun* (The Prattler), *Vozdushnye Zamki* (Castles in the Air), etc. Complete works, 4 vols., St. Petersburg, 1849. A. C. Coolidge.

Khodavendik'iar, or **Brussa**: a vilayet or province of Anatolia, Asiatic Turkey; S. of the Sea of Marmora; traversed by the Keshish-Dagh Mountains (one of the many ranges anciently called *Olympus*), and comprising parts of ancient Bithynia, Mysia, and Phrygia. Area, 26,248 sq. miles. Pop. estimated, 1,300,000. Capital, Brussa.

Khoi: town; in the province of Azerbijan, Persia; 75 miles N. W. of Tabriz; in lat. 38° 37′ N., lon. 45° 15′ E. (see map of Persia, ref. 1–F). It is one of the best-built cities of Persia, with broad and straight streets traversed by canals and planted with trees. It has considerable trade, and the surrounding plain produces much fruit, grain, rice, and cotton; but the locality is somewhat unhealthful. Pop. variously estimated from 20,000 to 35,000.

Khojak Tunnel: an important political and strategical railway tunnel, 2½ miles long through the Khwaja Amran range, about 60 miles N. of Quetta, at an elevation of 6,400 feet above the sea, and 2,000 feet above the surrounding country. It forms the most serious engineering difficulty between Shikarpur and Kandahar.

Khojent', or **Khojend**: the ancient *Jaxartes*; capital of the district of Syr Darya, Turkestan, Asiatic Russia; on the right bank of the Syr Darya river (see map of Asia, ref. 4–D). It is a populous town, but decaying, important only on account of its transit trade, which, however, has greatly decreased since the occupation by Russia. Duty is paid here on all merchandise entering Khokan from Bokhara. Pop. (1888) 34,800. Revised by M. W. Harrington.

Khokand', **Kokand**, **Khokan**, or **Kokan**: a former independent khanate of Central Asia, now the Russian province of Ferghana.

Khokand', **Kokand**, **Khokan**, or **Kokan**: a city of Ferghana, Russian Turkestan; 100 miles S. E. of Tashkent, on the Karasu, an affluent on the N. of the Syr Darya; lat. 40° 32′ N., lon. 70° 57′ E.; altitude above sea-level, 1,300 feet (see map of Asia, ref. 4–E). Till 1875 it was the capital of an independent khanate of the same name. After Russian occupation it remained for some time the capital of the province of Ferghana, but the waters were found to be unwholesome to the Russians, and the capital was transferred to Marghilan. Khokand is a modern city, and is one of the most animated and attractive in Turkestan. The palace of the former khan is a unique structure, rendered brilliant by its bright enameled bricks, and so large that the Russian troops find within it the space necessary to manœuver. The bazaar is one of the finest, richest, and busiest of Central Asia. Pop. (1886) 54,043. Mark W. Harrington.

Khomĭakov', Alekseĭ Stepanovich: author; b. in Moscow, Russia, May 1, 1804. He was well educated; served for a time in a guard regiment, resigned and traveled in Western Europe. He returned to the army for the campaign of 1828–29 against Turkey, after which he once more left the service. Henceforward, residing in Moscow or on his estates in the country, he devoted himself to literature until his death from cholera Sept. 23, 1860. His two tragedies, *Ermak* and *Dimitriĭ Samozvanets* (The Impostor), met with no great success; they show a fine command of language, but are rather cold and unreal. His lyrics are deservedly more popular. Khomiakov was an ardent Slavophil, and many of the best known of his poems are about Russia's brother Slavs, or else patriotic pieces composed during the Crimean war. He was also a writer of prose, especially theological treatises in French and English, in which he upheld the Orthodox Church against the Catholics and Protestants of the West (1 vol., Prague, 1867). There have been two editions of his poetical works (Moscow, 1861 and 1868). A. C. Coolidge.

Khonds, or **Kandhs**: an uncultivated people of India in Orissa, the Mahals and Jaipur, or in terms of the modern

Indian governments, in Eastern Central Provinces, Southern Bombay, and Northern Madras. They are Dravidians, small, black, approximating the negritos. The name is from the Sanskrit *kho*, or mountaineer. The government of their internal affairs is patriarchal. They formerly practiced infanticide and human sacrifices, but the British Government has prevailed on them to give up these criminal practices. They differ from the Gonds, though the similarity of the names has caused much confusion. The Gonds are a related people, whose territory lies on the head-waters of the Nerbudda river, to the W. of the territory of the Khonds. See DRAVIDIAN LANGUAGES. MARK W. HARRINGTON.

Khong, or **Kong**: an island in the Cambodia or Mekong river, and a village on it. The island is about 350 miles, in an air-line, above the mouths of the river, and 50 miles below Bassac. It belongs to Siam, but has (1893) been claimed by the French. It is at the head of the great cataracts of the Mekong; lat. 14° 6′ N., lon. 105° 46′ E. It is 4 or 5 miles long, of attractive appearance, and its position gives it promise of great importance. The village of Khong is on the east side of the island. Pop. 8,000 or 10,000. M. W. H.

Khonsu, **Khons**, **Chonsu**, **Chensu**: an Egyptian deity, associated in the Theban triad, with Amon-Ra and Mut as their son. He was a moon-god, and was identified in later times with Thoth (Khonsu-Thoth), and by the Greeks with Hercules. A special sanctuary was erected for him at Thebes (Karnak) by Ramses III., and this temple was further decorated by the Pharaohs of the twenty-first dynasty. He was represented in human form with the head of the sparrow-hawk, surmounted by horns and the sun-disk, and was one of the few deities whose image has been found in gold. An Egyptian legend tells that his image was taken to the land of "Bechten," where he exorcised an evil spirit from the king's daughter, the sister-in-law of the Pharaoh.

CHARLES R. GILLETT.

Khorassan′ (the country of the sun): the northeast province of Persia, adjoining Afghanistan and the Russian Transcaspian province. Area, 140,000 sq. miles. It is one of the richest countries in Persia, and is very fertile, except in the desert areas of the south and west. The climate of the mountainous parts is temperate in summer and cold in winter. Fruits, cotton, and tobacco are raised in large quantities, and the mountains are rich in ores and precious stones. The Russian Transcaspian railway touches its northern border, and the British expect to establish through it a trade route from Afghanistan. Pop. 860,000. The principal cities are Meshed (the capital; pop. 60,000), Kuchan, Mohammedabad, Shirwan, Boston, and Turshis. M. W. H.

Khorsabad′: a village of Asiatic Turkey; about 13 miles N. E. of Mosul, occupying the site of the Assyrian capital *Dûr-Sharrukin* (i. e. castle of Sargon), the remains of which were discovered by P. E. Botta in 1843 (see map of Turkey, ref. 6–J). The palace of Sargon, excavated at the expense of the French Government, afforded the first historical inscriptions in cuneiform characters found in ancient Assyria, and led to the more famous discoveries of Layard on the site of Nineveh. The excavators of Khorsabad erroneously gave the name of Nineveh to that place. See Botta and Flandin's magnificent publication, *Monuments de Ninive* (5 vols., chiefly of plates, Paris, 1847–50), and the articles ASSYRIA and ASSYRIAN EXPLORATIONS.

Revised by D. G. LYON.

Khosru′, **Khosrau**, or **Chos′roes** [*Chosroes* is from Gr. Χοσρόης, from Pers. *Khos′ru*]: the name of two Persian monarchs of the Sassanid dynasty: I. NUSHIRVAN (noble spirit), called by historians THE JUST, one of the greatest of Oriental sovereigns, third son of Kavādh, Kobad, or Cobades, by whose will he succeeded to the throne at Ctesiphon Sept. 12, A. D. 531, to the exclusion of his elder brothers, whom he is said to have put to death as a precaution.

Unreliable legends give different accounts of the birth and education of Khosru. According to Firdausī, his mother was the daughter of a king of the Huns; while Eutychius and many Persian histories assert he was the offspring of a noble lady of Khorassan, and was born about 500, while his father Kobad was a refugee in that province. The Greek historian Procopius relates that Kobad solicited the Byzantine emperor Justin to adopt Khosru, in order to strengthen his title to the throne, and that the proposal was accepted, and the young prince was on his way to Constantinople, when a sudden rupture put an end to the project and implanted in the prince that hatred of the Greeks which he afterward displayed. This tale is a puerile invention, though repeated by some modern writers. The hereditary war between Greeks and Persians had broken out afresh in 521, and was carried on languidly in Armenia, Syria, and Mesopotamia until the accession of Khosru. Justinian had come to the throne of Constantinople in 527, and being desirous of concentrating his energies upon the war with the Vandals in Africa, he concluded with Khosru an ignominious peace (533) by agreeing to pay an annual tribute of 440,000 pieces of gold. One of the conditions made by the Persian monarch was that seven Greek philosophers, who had been persecuted as pagans and had taken refuge in Persia, should be allowed to return to their homes and reside there under Persian protection. During the preceding reign a politico-religious sect, called after their founder Mazdak, had arisen in Persia, inculcating communistic or socialistic principles. Kobad had at one time favored, but at a later period endeavored to subdue them, seizing the leaders by stratagem and massacring many of the sectarians. A formidable civil war was the result, continuing into the reign of Khosru, who finally suppressed the sect. The actions of the two monarchs in this respect have been much confused with each other, many events, especially the execution of Mazdak, being attributed to both, and it is now impossible to recover the facts of the case.

One of the earlier measures taken by Khosru was the administrative division of his vast empire into four viceroyalties—Assyria, Media, Persia, and Bactriana. He is charged by the Byzantine historians with having incited one of his vassals, Almondar, the Arabian prince or king of Hira, to invade Syria, in violation of the peace. Be this as it may, the war broke out afresh. Khosru marched an army into Syria in 540, imposed enormous contributions upon the principal cities, took Antioch (June) after a gallant defense, and nearly destroyed that eastern metropolis of the Byzantine empire. Belisarius, the conqueror of Africa, was sent to conduct the war (541), and by a bold irruption into Mesopotamia forced Khosru to return to the defense of his own states. Belisarius being recalled, the invasion of Syria was renewed (542); the return of that general to the field caused the Persians to recross the Euphrates, and his second recall for the Italian campaign (543) again gave the victory to Khosru. After a brief truce the war was renewed in Colchis and Lazica, provinces lying at the foot of the Caucasus, which had revolted from Persia by the aid of Justinian, and continued with numberless alternations of fortune until 562, when the Byzantine emperor consented to pay an annual tribute of 40,000 pieces of gold, and remained in possession of the disputed provinces. Southern Arabia was soon afterward conquered by Khosru; the Armenians revolted from him in 569 with the support of the Emperor Justin II., and the war between the two empires was renewed in 571, with the usual alternations of fortune. Syria was again ravaged by the Persians, but Khosru was completely defeated in a great battle at Melitene in Lesser Armenia in 576, and died at Ctesiphon in Mar., A. D. 579, leaving the throne and the hereditary war to his son Hormazd (or Hormisdas) IV.

The reign of Khosru is accounted by the modern Persians the most glorious period of their annals. All the Oriental virtues are ascribed to him, and there can be no doubt that the government was administered with vigor and sagacity. Learning was powerfully stimulated by the translation of the best Sanskrit and Greek works, agriculture and commerce received impetus, and many magnificent cities were built. The boundaries of the empire were extended beyond the Indus and the Oxus, and diplomatic relations were maintained with all the realms from Africa to China.

II. PARVÉZ, PURWIZ, or PERWIS (the conqueror), grandson of Khosru I., succeeded his father, Hormazd IV., who was deposed in A. D. 590 by a rebel general named Bahram, who reigned for a year. The young Khosru took refuge with the Greek emperor Mauritius, by whose aid he regained the throne, and in recompense ceded a great part of Mesopotamia, besides paying a large sum of money. On the murder of Mauritius by Phocas (602), Khosru made war upon the usurper, nominally to avenge the death of his benefactor, and within a few years conquered Syria, Egypt, and Asia Minor. He took Antioch in 611, Damascus and Jerusalem in 614, Alexandria in 616, Chalcedon in 618, and Ancyra in 620, thus bringing the war to the gates of Constantinople. Heraclius had succeeded to the throne in 610, but the Persian conqueror, blinded by good fortune, refused proposals for peace. With the wealth of so many kingdoms he built a palace of unparalleled magnificence at Dastagerd,

60 miles E. of Ctesiphon, in a park laid out upon a corresponding scale. After twelve years of defeats, the Emperor Heraclius began in 621 a series of campaigns in which he recovered all his lost possessions, reduced Khosru to extremities, and even ravaged his palace of Dastagerd. In consequence of these misfortunes, Khosru was deposed and murdered by his son Shirweh (Siroes) in Feb., 628. It was during his reign that Mohammed proclaimed the doctrine of Islam. He summoned Khosru by letter to recognize him as the prophet of Allah, and when the former tore the letter in pieces, Mohammed predicted, "Thus will God tear his kingdom and reject his supplications."

Revised by A. V. Williams Jackson.

Khotan' (locally **Ilchi**, Chinese *Yuten*): a city of Eastern, or Chinese, Turkestan, on the Khotan Darya; lat. 37° 8′ N., lon. 80° E.; 180 miles S. E. of Yarkand, on the route between Yarkand and Lassa (see map of Asia, ref. 5–E). It was formerly, according to Abulfeda and other Mohammedan geographers, a city of great importance, and is still a large place, inclosed with earthen ramparts and with broad streets, though ill built. It has manufactures and a thriving trade in silk fabrics, leather, and paper, and in *yu*, the jasper of the ancients. The inhabitants are chiefly Uzbek Tartars, and the place is celebrated for its musk and for the beauty of the native population. Pop. 40,000.

Revised by M. W. Harrington.

Khotin', or **Chotin**: a fortified town of Southern Russia; in Bessarabia; on the Dniester; 15 miles S. W. of Kamenitz (see map of Russia, ref. 9–B). It is an important military post, which has belonged to Turks, Poles, and Austrians, and, after many vicissitudes, finally passed into Russian hands in 1812. Khotin is the Russian form of the name which appears in many other dialectical forms as Khotchim, Chotchim, Choczim, Chocim, Chotin, etc. Pop. 21,000.

Khufu: Egyptian form of the name of Cheops, the Greek Suphis (*q. v.*).

Khulum', **Khulm**, or **Tashkurgan'**: town of Afghanistan; on a river of the same name; in lat. 36° 40′ N., lon. 68° 5′ E. It consists of about 20,000 houses, one story high, built of clay or sun-baked brick, with conical roofs, and surrounded with walls; it is defended by two citadels. Melons are extensively cultivated in the vicinity.

Khunaten [Egypt. *Khu-en-Aten*, i. e. Glory of the Sun-disk]: the name adopted by Amenhotep (Amenophis) IV., the last important king of the eighteenth Egyptian dynasty, at the time of his attempt to introduce a solar monotheistic worship into Egypt. He was the son of Amenophis III. and Queen Ti, and was probably a Libyan. He left Thebes, the previous royal residence, and built Khut-Aten (Horizon of the Sun-disk), in Middle Egypt, whose ruins are now called Tell el-Amarna (27° 40′ N. lat.). In spite of the fact that he built at Heliopolis, Memphis, Thebes, and in Nubia, there is a dearth of dated monuments from his reign, so that the date of his attempted religious reform is uncertain. The main points of interest in connection with Khunaten are his removal to Tell el-Amarna of the cuneiform correspondence carried on by his father with Asiatic princes and other persons (see Tell el-Amarna), and his religious reforms. In the New Kingdom, Ra-Harmachis, Tum of Heliopolis, Horus of Edfu, Amon of Thebes, and Khnum of Elephantine, all passed as practically one deity with various attributes, though the worship of each continued in the ancient endowed temples. All these cults Khunaten proposed to abolish, substituting therefor the worship of the sun itself under the name of Aten, the sun-disk. The names of the gods, especially of Amon as the chief deity (see Hyksos), were erased from the monuments. The change in his own name was dictated by hatred of Amon and was in honor of Aten. The reformation was backed by force and was opposed by various interests, chief of which was that of the priesthood of endowed temples. The innovation was short-lived, in spite of its splendor, and scarcely survived Khunaten himself. The relapse which followed was complete, being proportioned to the violence used by the unfortunate monarch. So far as actual proof is forthcoming this was the nearest approach to monotheism which Egyptian history ever knew. Accompanying this movement there was a change in the ideals and methods in art, but it, too, was of short duration. Charles R. Gillett.

Khuzistan' [Pers. district of the Khuzes]: the ancient *Susiana*, now a geographical designation, formerly a province of Persia, bordering on the Gulf of Persia.

Khvostchinsk'aĭa, Nadezhda Dmitrievna: author (better known under the pseudonym of *V. Krestovskiĭ*); b. in Riazan, Russia, in 1825. She early showed a love for poetry, and at twenty-two made her first appearance in print by contributing two poems to a newspaper. These were followed by others, and in 1850 she wrote a story, *Anna Mikhaĭlovna*. Encouraged by its success, she made a visit to St. Petersburg, where she gave to the public a second tale that attracted attention; then, on her return home, settled down to the career of a popular and most prolific writer. D. in 1889. Among the best of her novels are *The Baritone*, *V. Ozhidaniĭ Luchshago* (Waiting for Something Better), and particularly *Bolshaĭa Medveditsa* (The Great Bear). They show keen observation and a power of psychological analysis, in spite of a tendency to idealize; but the plots are far from perfect. Many of her short stories are excellent. The pseudonym, *V. Krestovskiĭ*, is unfortunate, as, besides a writer of vaudevilles, there is also a well-known contemporary novelist of that name; and this has led to much confusion. Her poems, which, however, have no great merit, are signed with her own name. In 1859 appeared a complete edition of all she had then written (6 vols.). In 1883 a new one was begun.

A. C. Coolidge.

Khy'ber Pass: a gorge in the Khyber Mountains, nearly 30 miles long, inclosed by cliffs of slate, rising almost perpendicularly on both sides to the height of 1,000 feet. It is the principal, and for artillery the only available, road between the Punjaub and Afghanistan. A railway now runs from the E. to Peshawar, near the head of the pass, and a small British territory at the pass is called by its name. Pop. 10,000. M. W. H.

Khyen', **Khyeng**, or **Kayen'**: an uncultivated people of Burma, living on the eastern and southern slopes of the Arrakan-Yoma; probably a branch of the Karens.

Kiachta, kē̆e-aak'tăa, or **Kiakhta**: town of Siberia; in the Russian government of Transbaikal, near the Chinese frontier; 180 miles S. E. of Irkutsk (see map of Asia, ref. 3–G). It was established in 1727 as the exclusive mart for the trade between China and Russia, which was chiefly conducted by means of annual fairs. The trade sometimes amounted to 10,000,000 roubles per annum, but has decreased since the treaty of Peking (1860), which permitted commerce along the whole frontier of the two empires. Kiachta has a fortress containing the government and customs buildings, and is the residence of many Russian merchants. Pop. 4,000.

Kiangnan: the two Chinese provinces of Ngan-hwuy and Kiang-Su.

Kiang-Si, kyang'-see': an inland province of China, between lat. 24° and 30° N., and between lon. 113° and 118° E. It has Hupeh and Ngan-hwuy on the N., Hunan on the W., Kwangtung on the S., and Cheh-kiang and Fuh-kien on the E. Area, 72,176 sq. miles. Pop. 24,534,118. It is mountainous, being traversed from S. W. to N. E. by the Nan-shan range. (See China.) The Kan-kiang, which rises in the Meiling Mountains and flows northward into the Yangtse through Poyang Lake, is the principal river. The principal productions are tea, pottery, grass-cloth, hemp, paper, and tobacco. Kiang-Si has long been noted for its literary activity. Capital, Nan-chang-foo.

Kiang-Su: a maritime province of China, between lat. 31° and 35° N., and between lon. 116° and 122° E., bordering on the Yellow Sea, with Shantung on the N., Ngan-hwuy on the W., and Cheh-kiang on the S. Area, 44,500 sq. miles. Pop. 20,905,171. It forms part of the Great Plain (see China), and is low and level. The soil is exceedingly fertile. Tea, silk, cotton, sugar, and medicines are the principal articles of trade. Rice is also extensively produced. The Grand Canal (*q. v.*) runs through the whole length of the province. Capital, Kiang-ning-foo, better known to foreigners as Nan-king. The name Kiang-Su is made up of the first syllable of the capital, and that of Su-chow, another city of the same province celebrated for its beautiful women.

Kickapoos: See Algonquian Indians.

Kicking-horse Pass: the pass across the Rocky Mountains utilized by the Canadian Pacific Railway. It is in lat. 51° 28′ N., reaches an elevation of 5,000 feet, and is considered very picturesque. It was named from an accident which happened to its discoverer, Dr. Hector, in 1857.

Kidd, William: navigator; the Robert Kidd of popular tradition; was the son of a Scotch Nonconformist preacher.

He became a sailor, and in 1691 received an award of £150 from the council of New York for services in behalf of the colony. In 1696 he sailed from Plymouth, England, in command of the Adventure galley, fitted out for the suppression of piracy, but, according to the general belief, he became a pirate himself. He came in 1698 to New York with a large amount of treasure, which was seized by the Earl of Bellomont; and an additional treasure which Kidd had buried on Gardiner's island was also recovered. Kidd himself was sent to London, where he was hanged May 24, 1701—not for piracy, but for the murder of William Moore, a seaman. The trial was very unfair, and there is some reason for believing that Capt. Kidd was not guilty of the crimes which have made his name so notorious. After his death the report spread that Kidd and his crew had buried additional treasure previous to his capture, and portions of the coast were searched in the hope of recovering it, but no part of it has ever been found. Revised by F. M. Colby.

Kidder, Daniel Parish, D. D.: clergyman and author; b. at Darien, N. Y., Oct. 18, 1815; studied in Lima, N. Y., and at Hamilton College, New York, and graduated at the Wesleyan University, Connecticut, in 1836. He joined the Genesee conference and preached in Rochester, N. Y., 1836–37; went as missionary to Brazil 1837–40; was transferred to the New Jersey conference, serving two pastorates, 1841–44; was corresponding secretary of the Sunday-school Union and editor of Sunday-school publications and tracts 1844–56; was Professor of Practical Theology in Garrett Biblical Institute 1856–71; held the same position in Drew Theological Seminary 1871–81; was corresponding secretary of the board of education 1880–87. He published *Mormonism and the Mormons* (New York, 1842); *Sketches of a Residence and Travels in Brazil* (2 vols., 1844); *Brazil and the Brazilians*, in connection with Rev. J. C. Fletcher (Philadelphia, 1857); *Homiletics* (New York, 1864); *The Christian Pastorate* (Cincinnati, 1871); *Helps to Prayer* (1874). D. at Evanston, Ill., July 29, 1891. Revised by J. F. Hurst.

Kid'derminster: town; in the county of Worcester, England; on both sides of the Stour, near its influx in the Severn, and 14½ miles by rail N. of Worcester (see map of England, ref. 10–G). Its carpet manufactures are very celebrated. They were established in 1735. At first only Scotch carpets were made, but in the course of ten years the manufacture of Wilton and Brussels carpets was also introduced. That which has given the Kidderminster carpets their great name is the permanency of their colors, due to peculiar properties of the water of the Stour. (See Carpets.) Kidderminster was anciently called *Chiderminster*, and was a royal manor from the period of the conquest until the reign of Henry III. Pop. (1891) 24,803.

Kidnaping [< provincial *kid*, child + *nap*, snatch]: a common-law misdemeanor, which consists in the False Imprisonment (*q. v.*) and Abduction (*q. v.*) of a person. Although Blackstone (4 *Commentaries* 219) insists that transportation to a foreign country is an essential element of the crime, other authors do not; and in *State* vs. *Rollins*, 8 New Hampshire 550, it was decided that it is not necessary to the offense that the party should be carried out of one country into another. If the party is seized and an actual transportation takes place, though not from the country, the offense is complete. The free consent of one capable of consenting to the act would prevent its being a crime. Fraud or fear may be equivalent to force, as in other cases of false imprisonment. If a child is assigned to one of its parents under a decree of divorce, the other parent, or his agent, who carries it off without authority, kidnaps the child. In most countries this offense has been defined by statutes which must be consulted. Francis M. Burdick.

Kid'ney [M. Eng. *kidnei*, for older *kidnere*; **kid*, belly; cf. Goth. *qiþus*, womb, Icel. *-koiðr*, belly + *nére*, kidney: Germ. *niere*, kidney]: an excretory organ in the body of vertebrates (an imperfect analogue being found in exceptional invertebrates), whose function is the elimination of the urine, an aqueous solution of various effete organic products and of inorganic salts, the *débris* of nutrition and metamorphosis of tissues. These excretory products—water, salts, and organic matter—are separated from the blood. In the kidney, as in other glands of similar type, arterial branches elaborately subdivided are brought in close contact with a system of gland tubules for the removal of the components of urine by transudation and secretion. In fishes, the kidney presents a simple, rudimentary form—one straight tube or ureter extending the entire length of the body, and receiving, at right angles, numerous tufts of tubules which interdigitate with blood-vessels. Reptiles have a more definite organ—a localized mass of tubules. Birds have relatively large kidneys. Mammals, especially man, have the most perfectly developed renal organs, presenting the greatest multiplication of tubular surface in a compact form.

The kidneys in man, two in number, are situated in the posterior part of the abdominal cavity, behind the peritoneum, one on either side of the spine in the lumbar region, and extend from the eleventh rib to near the crest of the ilium. The kidneys are retained in position by their blood-vessels and by the connective tissue in which they are imbedded. A kidney is bean-shaped, or ovoid, with a concave depression, notch, or "hilus" on one side; is of a brownish-red or maroon color; in consistency is dense, firm, but fragile; measures about 4 inches long, 2 in width, and 1 in thickness; in weight varies from 4½ to 6 oz. in the adult male, and half an ounce less in the female. Relatively, the human kidneys constitute $\frac{1}{230}$th of the weight of the body. The kidney is invested by a strong fibrous capsule loosely attached by areolar or connective tissue. Although an organ so small, it presents, by virtue of its compact and elaborate arrangement of vascular tufts and extensive tubular structure, a surface for excretory work equal to six times that of the entire surface of the skin. (*Mapother.*) A longitudinal section of the kidney (Fig. 1) displays a hollow organ, consisting apparently of a thick wall folded around the internal cavity at its hilus or concave side. Two distinct portions are noticeable: (1) the cortex, or external peripheral zone occupying the outer third of the organ, composed of the dark, granular cortical substance; (2) the *medulla*, forming the inner two-thirds and presenting a series of pinkish, fan-shaped, or pyramidal masses, the *Malpighian pyramids*, whose bases look toward the cortex, while their apices converge upon the central cavity. From the bases of the Malpighian pyramids a number of much smaller wedge-shaped groups of tubules extend into the cortex, their apices lying not far from the outer border of the organ; these are the *medullary rays* or pyramids of Ferrein. By the presence of these rays the cortex is divided into a number of areas, the space between the neighboring rays appearing granular and known as the *labyrinth*. These latter tracts contain small dark bodies, seen with the unaided eye, which are the *Malpighian bodies*, and mark the beginning of the uriniferous tubules, which thus correspond in number with the former. The uriniferous tubule starts as an expanded capsule of Bowman, which surrounds a convoluted tuft of capillary blood-vessels, the *glomerulus*, in such a manner that the tuft really is inclosed by an invagination of the capsule, a layer of the latter being pushed before the blood-vessels in the development of the tuft; there are therefore two layers of Bowman's capsule, the inner of which closely surrounds the vascular tuft, the blood-vessels thus lying outside of the cavity of the capsule. Opposite the point of entrance of the blood-vessels the tubule is greatly constricted, the *neck* joining the expanded capsule with the following segment, the *proximal convoluted tubule*, distinguished by its large diameter and tortuous course; succeeding this part, the tube becomes spiral, this *spiral portion* lying within the medullary ray as far as the border of the medulla, where the tube suddenly narrows into the *ascend-*

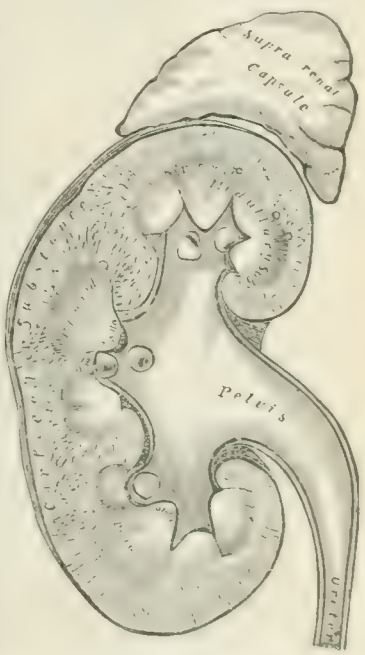


Fig. 1. Longitudinal section of kidney, showing cortex and Malpighian pyramids, with the cortical columns between.

ing limb of Henle's loops. This extends far into the papilla, where suddenly bending upon itself, forming the *loop of Henle*, the tube passes through the medulla into the medullary ray of the cortex as the *ascending limb* of the loop, and enters once more the labyrinth as the *irregular* tubule; this is soon succeeded by the *distal convoluted* portion, which, in turn, gives place to the *arched collecting* tubule leading into the *straight collecting* canals. These latter

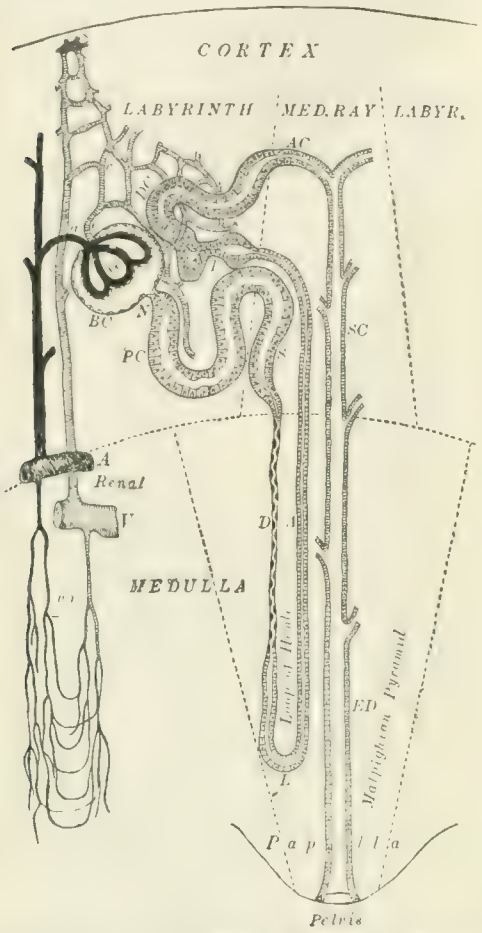


FIG. 2.—Diagram of kidney, showing the course of the uriniferous tubules and of the blood-vessels; the medulla is represented as greatly shortened. The various divisions of the tubule—Bowman's capsule, neck, proximal convoluted, spiral, descending and ascending limbs of Henle's loop, irregular, distal convoluted, arched collecting, straight collecting, and excretory duct—are indicated by their initial letters; *a*, *e*, and *c*, respectively, the afferent, efferent, and capillary blood-vessels; *s*, stellate vein; *v r*, straight vessels.

unite with their fellows, becoming larger in their journey through the medulla, and finally, as the large *excretory tubes* of *Bellini*, empty at the summit of the Malpighian pyramids by orifices into which a bristle may be passed.

The uriniferous tubules consist of a well-developed basement membrane, inside of which lies a single layer of epithelial cells; these latter elements within the portions of the tubule occupying the labyrinth are active in elaborating the constituents of the urine, and are therefore classed as active glandular epithelium, while the cells lining the collecting tubules are largely passive, forming the investment of excretory ducts. The character of the epithelium of the tubules varies in the several divisions of the canal, but, with the exception of the capsule of Bowman and the descending limb of Henle's loop where the squamous type prevails, the cells are more or less columnar in character; in the active segments, the epithelium is often indistinctly divided into individual cells, and, further, often displays a striation within the protoplasm of the cells, these "rods" being well seen in the irregular portion of the tube.

The renal artery, a branch of the aorta, enters the kidney at its hilus, within which it divides into its larger trunks, passing through the medullary substance to the bases of the pyramids; here the arteries break up into two sets of vessels, one passing through the center of the tracts corresponding to the labyrinth toward the surface of the cortex, the other coursing centrally within the medulla, dividing into numerous vessels which, from their straight parallel courses, are known as the *vasa rectu*. The branches supplying the cortex run directly toward the periphery of the organ, giving off short arching lateral twigs which bear upon their ends the Malpighian tufts, surrounded by Bowman's capsule, together with which they form the Malpighian bodies. The positions occupied by the cortical vessels correspond to the spaces between the lobules of which the kidney, in its fœtal stage, is formed; these vessels are therefore called *interlobular*, and are imbedded within a small amount of connective tissue. In certain animals, as the sheep, ox, etc., the lobules are retained, the surface of the kidney presenting indications of this separation. Occasionally in man the organ exhibits lobulation from the arrest of the fusion which, ordinarily, takes place even before birth.

The vessel supplying or bringing blood to the tuft is termed the *afferent* vessel, and a companion vessel leaving the tuft is the *efferent* vessel: the latter conveys the contained blood to the capillaries which pass between the uriniferous tubules; the blood from these passes into a rectangular meshed venous network lying among the tubules, from which it is principally gathered by the large interlobular veins accompanying the arterioles: a certain amount of the venous blood, however, is collected by stellate veins situated beneath the free surface of the organ.

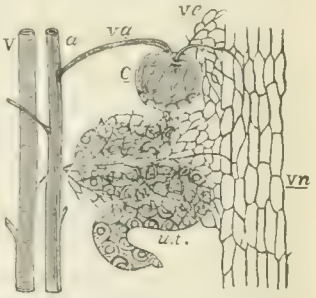


FIG. 3.—Blood-vessels in the kidney: *a*, artery conveying blood by afferent vessel *va* to tuft of capillaries within the capsule *c*; *ve*, the efferent vessel removing blood to network of capillary veins *vn*, and into vein *v*; *ut*, uriniferous tubule.

The lymphatics of the kidney are arranged as two sets, the superficial, which lie beneath the capsule, and the deeper, accompanying the blood-vessels into the interior of the organ and communicating with the lymphatic clefts between the tubules. The nerves of the kidney are numerous branches from the sympathetic system; the larger trunks follow the blood-vessels into the parenchyma, while the terminal fibrilla pass between the tubules, forming networks about the basement membrane. The greater part of the sinus or central cavity of the organ is occupied by the expanded funnel-shaped termination of the ureter, the pelvis; the space between the latter and the walls of the sinus is occupied by areolar tissue supporting the blood and lymphatic vessels and nerves, and contains usually some fat. The pelvis divides into a number of short, wide tubular projections, the calices, which closely embrace the protruding apices of the Malpighian pyramids, the papilla; more than one of these latter may be inclosed within a single calix.

During the early life of the fœtus, the kidney is preceded by a large excretory organ, the Wolffian body, which for a time performs the functions of a kidney, having a canal, the Wolffian duct, corresponding to a ureter. Later, an outgrowth from this duct is developed, and grows into a mass of tissue near the Wolffian body; from the primitive ureter are developed the ramifying tubular divisions which later become the uriniferous tubules, the connective tissue and vascular portions of the organ originating from the mesodermic area to which the primitive tubules penetrate. As the permanent kidney becomes developed the renal part of the Wolffian becomes atrophic, and finally disappears. The kidney bears a direct and complementary relation to the functional activity of the sweat glands of the skin. As is to be anticipated from its ceaseless and exacting labor, the kidney is subject to many forms of disease. See BRIGHT'S DISEASE, CALCULUS, and DIABETES. G. A. PIERSOL.

Kido Takayoshi: statesman, and one of the founders of modern Japan; b. in the province of Choshiu, Japan, about 1833. His province was one of the first to raise the standard of revolt against the Tokugawa shogunate, and he was one of the chief organizers of the imperialist army; after peace was restored he became a privy-councilor; was a member of the embassy which visited the U. S. and Europe

in 1872, but returned to receive the appointment of Minister of State, which he held for a time; was next appointed to a distinguished position in the imperial household, and in the early part of 1875 again entered the cabinet. D. June, 1881.
Revised by J. M. Dixon.

Kid'ron, or **Cedron** [from Heb. *Kidron*, liter., turbid]: a small stream or brook in the valley E. of Jerusalem; memorable in many scenes of biblical history.

Kieff, or **Kiev**, kyev: fortified town; capital of the government of Kieff, Russia; on the right bank of the Dnieper (see map of Russia, ref. 9–C). It is one of the oldest and most beautiful cities of Russia. It consists, properly speaking, of three towns, each with its own walls and fortifications—namely, Petchersk, with the famous monastery of Petcherskoi, containing the tombs of many Russian saints; Kiev proper, with the celebrated Cathedral of St. Sophia, built in 1037; and Podol, which is occupied by the middle and lower classes. Kieff has a university attended by over 2,000 students, and several other educational institutions. Its manufactures are not important, but its trade is extensive. It was founded in the ninth century; in 1124 no less than 400 churches are said to have been destroyed by fire. To-day the city has more than seventy imposing churches. Pop. (1891) 183,640. Revised by C. H. Thurber.

Kiel, keel: town; in the duchy of Holstein, Prussia; on the Kieler Fjord (see map of German Empire, ref. 2–E). It is well built and beautifully situated, has a university (founded 1665; 500 students, 1893), some manufactures, and an important trade. Its harbor is one of the best on the Baltic, deep and safe, and very strongly fortified; it is the station of the German fleet in the Baltic, and the seat of all institutions belonging to the German navy. Kiel belonged to the Hanseatic league, and possessed the right to the trade between Germany and Denmark. The peace between Denmark and Sweden was concluded here Jan. 14, 1814. Pop. (1890) 69,172. C. H. Thurber.

Kiel, keel, or **Kilia'nus**, Kornelis: Dutch scholar; b. at Duffel (near Antwerp) about 1537; d. at Antwerp in 1607. He studied at Louvain, then went into the famous Plantin printing establishment at Antwerp as a corrector of proofs. He early showed himself a remarkable student and friend of his mother-tongue, and his translations of the portion of Comines's *Mémoires* dealing with Louis XI. and of Guicciardini's account of the Netherlands, are important monuments of Dutch prose of the Renaissance. He is chiefly known, however, for his great *Etymologeticon Theutonicæ Linguæ*, issued in 1583 by Plantin (again *cura* G. v. Hasselt, Trajectæ Bat., 1777), the first really valuable work of Dutch lexicography. See Hoffmann v. Fallersleben, *Horæ Belgicæ*, vii., p. xviii., *seq.*, Hanover, 1830–62. A. R. Marsh.

Kiel'ce: government of Poland, adjoining the frontier of Austrian Galicia. Area, 3,897 sq. miles. It is watered by the Vistula, produces good wheat and other grains, and has abundant iron mines. Pop. (1890) 700,208. The capital is a town bearing the same name, 96 miles S. W. of Warsaw (see map of Russia, ref. 8–A), with 10,000 inhabitants; seat of a Roman Catholic bishopric and seminary, a mining-school, and a gymnasium. Revised by M. W. Harrington.

Kielland, Alexander Lange: novelist; b. at Stavanger, Norway, Feb. 18, 1849. He studied at the University of Christiania, and was in 1872 admitted to the bar, without ever practicing as a lawyer. From 1872 to 1881 owned and managed some brick-works near his native city. He made several trips abroad, and lived in Copenhagen from 1881 to 1883 and in Paris from 1886 to 1888; during 1889 was the editor of the daily paper *Stavanger Avis*, and in 1891 was appointed burgomaster of Stavanger. Kielland is one of the most important of the modern Norwegian authors. His chief characteristics are a clear and pointed style, a stinging satire, a realistic description, and a skillful composition. The subjects of most of his writings are borrowed from his native city, with the social life of which he is intimately familiar. Kielland's first appearance was as a dramatic author with the little drawing-room piece *Paa Hjemveien* (Homeward Bound, 1878); but his chief success was earned as a novelist. *Novelletter* (1879) and *Nye Novelletter* (1880) are very fine and pointed little sketches of everyday occurrences, all bearing witness of the author's sympathy with the humble and oppressed of society. Then followed in quick succession the larger novels *Garman og Worse* (1880; authorized trans. by W. W. Kettlewell, London, 1885); *Arbeidsfolk* (Working People, 1881); *Else*, a Christmas story (1881); *Skipper Worse* (1882; trans. from the Norwegian by Henry John, Earl of Ducie, London, 1885); *Gift* (Poison, 1883); *Fortuna* (1884); *Sne* (Snow, 1886); *Sankt Hans Fest* (1887); *Jakob* (1891). The larger novels form a kind of family cycle, in so far as the same persons or members of the same family are carried over from one novel to the other. For the stage Kielland has written, besides the above-mentioned little piece, *Tre Par* (Three Pairs, a farce comedy, 1886); *Bettys Formynder* (Betty's Guardian, 1887); *Professoren* (1888). As a comic writer, however, Kielland has not been particularly successful. All of his novels and most of his comedies have been translated into Swedish and German; some also into Dutch and English. P. Groth.

Kie'pert, Heinrich: geographer; b. in Berlin, Prussia, July 31, 1818; devoted himself from early age to the study of geography; enjoyed the instruction of Ritter; explored Asia Minor in 1841–42; was director of the geographical institute of Weimar 1845–52; returned to Berlin and became professor at the university in 1859. His *Atlas von Hellas und den hellenischen Colonien* (Berlin, 1840–46; 3d ed. 1870) and his maps to Robinson's *Palestina* (Halle, 1843) attracted the attention of the scientific world. His *Historisch-geographische Erläuterung der Kriege zwischen dem oströmischen Reiche und den persischen Königen der Sassaniden-Dynastie* was awarded a prize in 1844 by the French Institute. His *Neuer Handatlas der Erde*, forty maps (Berlin, 1881), is the standard work on the subject. Of the numerous maps published by Kiepert may be mentioned his *Atlas der alten Welt* (18th ed. 1878); *Compendiöser allgemeiner Atlas der Erde und des Himmels* (15th ed. 1874); *Atlas antiquus* (10th ed. 1885). He is the author of *Lehrbuch der alten Geographie* (1878); *Travels in Asia Minor* (1842, 1870, 1886, 1890). Revised by A. Gudeman.

Kierkegaard, kir'kĕ'gor, Sören Aabye: philosopher; b. in Copenhagen, Denmark, May 5, 1813. After completing the theological course at the University of Copenhagen, he traveled in Germany, and in 1842 settled in his native town, where he spent the rest of his life. His earliest important work is *Om Begrebet Ironi* (Of the Concept Irony, 1841). This was followed by *Enten-Eller, et Livsfragment udgivet af Victor Eremita* (Either-Or, a Fragment of a Life, edited by Victor the Eremite, 1843), in which he discusses the æsthetic and the ethical conception of life. Of the vast number of articles, sermons, and separate volumes published, many of them pseudonymously, during the succeeding twelve years may be mentioned *Stadier paa Livets Vej* (Stages of Life, 1845); *Afsluttende uvidenskabelig Efterskrift* (Final Unscientific Postscript, 1846); *Kjærlighedens Gjerninger* (Deeds of Love, 1847); *Indövelse i Kristendom* (Christian Training, 1850); *Til Selvprövelse* (For Self-examination, 1851); *Öjeblikket* (The Moment, 1855)—a collection of pamphlets. After his death appeared *Synspunktet for min Forfattervirksomhed* (The Point of View of my Literary Activity) and several volumes of miscellaneous articles. Kierkegaard contrasts the "official" Christianity with the real teaching of Christ. He insists upon individuality as the basis of all true religious faith, the intimate relation that should exist between the individual and God, a relation that requires complete renunciation of the world, with suffering as a necessary accompaniment. Possessed of a brilliant style, his influence has been very great not only on religious, but also on literary thought in the north. The most prominent example of the latter is in the character of Brand in Ibsen's drama of that name. D. Nov. 11, 1855. See Geo. Brandes, *Sören Kierkegaard* (Copenhagen, 1877); A. Bärthold, *Die Bedeutung der ästhetischen Schriften Sören Kierkegaards* (Halle, 1879). D. K. Dodge.

Kieselguhr: See Explosives.

Kiesewetter, kee'ze-vet-ter, Guenther: composer; b. in Oberweisbach, Thuringia, Germany, May 30, 1859; settled in the U. S. in 1866. He studied first with his father in Newark, N. J., and later in New York under the best teachers there, and became an expert pianist and violinist. In 1879 he composed a comic opera, *The Barber of Hounslow*; in 1866 his large cantata for male voices, *Die Hermannschlacht*, was performed in Newark, and later in other places. He has also composed songs, piano pieces, marches, and overtures for orchestra, and much chorus music.
D. E. Hervey.

Kiesewetter, Rafael Georg: b. at Holleschau, Moravia, Aug. 29, 1773; studied philosophy and law at Olmütz and Vienna; held different government offices in Vienna; re-

tired in 1845, and died Jan. 1, 1850. His writings are of great interest for the scientific study of music, especially *Geschichte der europäisch-abendländischen Musik* (1834) and *Der weltliche Gesang vom frühen Mittelalter bis zur Erfindung des dramatischen Stils* (1841).

Kiev: town in Russia. See KIEFF.

Kilauea, kē̆ lăă'-ō̆o ā'-ăă: a volcano in Hawaii, one of the Sandwich islands; one of the largest in the world. It is in constant activity, and in the eruption of 1840 sent forth for three weeks a river of molten lava which varied from a few hundred feet to 3 miles in width. The crater is 8 miles in circumference, and varies from 300 to 1,500 feet in depth. Mauna Loa, another famous volcano, is only 16 miles distant. See VOLCANOES.

Kildare: an inland county of the province of Leinster, Ireland. Area, 654 sq. miles. The ground is mostly level or slightly undulating, consisting largely of reclaimed bog; the soil is a deep and fertile loam; wheat, oats, and barley are the principal crops. Horses of an indifferent breed and improved breeds of cattle and sheep are reared. The county is almost destitute of manufacturing industry. The chief towns are Athy, Maynooth, and Kildare. In the center of the county is the famous Curragh of Kildare, consisting of a plain of about 5,000 acres, used for military encampments and for athletic sports. Pop. (1891) 69,988.

Kildare: market-town and parish in the county of Kildare, Ireland; 30 miles S. W. of Dublin (see map of Ireland, ref. 9–H); famous as the seat of one of the oldest Catholic bishoprics (said to have been founded about 500), for the Parliament held there in 1309, and for the Curragh races, held in April, June, September, and October. Pop. 1,333.

Kildees: See CULDEES.

Kilian, or **Cilian**, SAINT: an Irish bishop; b. in County Cavan. About 689 he went as a missionary to Franconia, Germany, whose ruler he converted, together with his subjects; but the ruler's wife brought about his beheading at Würzburg in revenge for her repudiation by the ruler on Kilian's demand, she being the lawful wife of another man. The day was July 8, 697, and his age is given as fifty-three.

Kilianus: See KIEL, KORNELIS.

Kilima-Njáro (Great Mountain): a mountain discovered (1848) by the missionary Rebmann in Eastern Africa; situated about 175 miles S. of the equator, and the same distance inland from the Indian Ocean. Rebmann's report that Kilima-Njáro was snow-crowned was long discredited. It is believed to be the highest mountain in Africa, and is one of the great volcanic mountains of the eastern part of the continent. All climates from tropical to polar are found on its slopes. After eight attempts to ascend it, Dr. Hans Meyer, on his second attempt (1889), attained the top of the higher of the two peaks, the Kibo summit, where he stood on the edge of a crater over a mile wide and about 19,700 feet above the sea at its highest point. The crater is half filled with snow and ice, and a glacier moves down the west side of the mountain through a break in the crater wall. The upper 1,500 feet are perpetually covered with snow. C. C. ADAMS.

Kilken'ny: an inland county of the province of Leinster, Ireland. Area, 796 sq. miles. The surface is undulating, in some places rising to the height of 1,000 feet; anthracite coal and black marble are found. The soil is light, but fertile, and crops of wheat, oats, and barley are raised. The only city of any importance is Kilkenny. Pop. (1891) 87,154, mostly Roman Catholics.

Kilkenny: town; in the county of Kilkenny, Ireland; on the Nore; 81 miles S. W. of Dublin by rail (see map of Ireland, ref. 11–H). It has several interesting buildings, a college, a grammar school in which Swift, Congreve, Farquhar, and Berkeley received part of their education. The Cathedral of St. Canice dates from the eleventh century, and is the largest ecclesiastical building in Ireland, next to the Cathedral of St. Patrick in Dublin. There are some manufactures of coarse woolens and linens. Pop. (1891) 11,024.

Killar'ney: market-town and parish of Kerry co., Ireland; 44 miles N. N. W. of Cork; situated in the midst of the most beautiful scenery, and about a mile from the celebrated lakes to which it gives its name (see map of Ireland, ref. 13–C). The town contains several hotels, churches, and chapels, a magnificent Roman Catholic cathedral, a dispensary and fever hospital, a poorhouse, etc. Pop. 6,651. The lakes, three in number, are connected with each other; the lower lake is about 4¼ miles long by 2 miles broad; the middle, 1½ miles long by half a mile broad; the upper, 3 miles long. They receive several streams, and are dotted with numerous islands. On a projecting peninsula which divides the middle from the lower lake stand the picturesque ruins of Muckross Abbey and Ross Castle. The lovely and picturesque scenery attracts many tourists in summer.

Killen, WILLIAM DOOL, D. D.: educator and writer in the Irish Presbyterian Church; b. at Ballymena, Antrim, Ireland, Apr. 5, 1806; was educated at Belfast Academical Institution; ordained minister at Raphoe, Donegal, in 1829; appointed Professor of Church History and Pastoral Theology in Belfast Presbyterian College in 1841; made president of the same institution in 1869; and principal of the Theological Faculty of Ireland in 1881. He was one of the authors of *Presbyterianism Defended* (Belfast, 1839), and has since published *Plea of Presbytery* (1840); the continuation of J. S. Reid's *History of the Presbyterian Church in Ireland* (1853; 2d ed. 1867); *The Ancient Church . . . Traced for the First 300 Years* (London, 1859; 5th ed. 1889); *The Old Catholic Church . . . Traced to 755* (Edinburgh, 1871; Italian trans. Florence, 1877); *The Ecclesiastical History of Ireland from the Earliest Period to the Present Times* (2 vols., London, 1875); *The Ignatian Epistles Entirely Spurious* (1886); *The Framework of the Church: a Treatise on Church Government* (1890), etc. C. K. HOYT.

Killer: a name applied to cetaceans of the genus *Orca*, family *Delphinidæ*, or dolphins, and given in allusion to their sanguinary and ravenous habits. They attain 20 feet and upward, have powerful jaws and large, pointed teeth, and are noted enemies of the right whales, as well as other delphinoids, seals, and fishes. The killer of the Atlantic U. S. coast is *Orca gladiator*, and that of the Pacific coast, *O. atra*.

Killiecran'kie: a celebrated pass through the Grampian Mountains, in Perthshire, Scotland, about 15 miles N. W. of Dunkeld. At the northern extremity the government army, under Gen. Mackay, was defeated on July 27, 1689, by the adherents of King James, under Grahame of Claverhouse, Viscount Dundee, who was killed at the moment of victory. The loss on the government side was 2,000, against 900 of Dundee's troops, but the victory was not followed up. The Highlanders were disorganized after the loss of their leader, and the insurrection was soon put down.

Killington Peak: a mountain in Sherburne township, Rutland co., Vt., 9 miles E. of Rutland; the third in height of the Vermont mountains. It is a noble landmark, and the view from its top is very fine. Its height is 4,380 feet.

Kilmar'nock: town; in the county of Ayr, Scotland (see map of Scotland, ref. 12–F); 24 miles S. S. W. of Glasgow. It has manufactures of shawls, carpets, tweeds, winceys, boots, and other articles, and has iron-works, calico-printing works, tanneries, and distilleries. A cheese-fair is held in October. It has a corn exchange, a town-hall, a courthouse, and an academy. In the Kay Park, containing 41 acres, is the Burns monument. Pop. (1891) 28,438.

Kilns: a name given to various kinds of furnaces or ovens constructed of brick or stone, in which a high and uniform heat can be applied to bodies for the purpose of drying, baking, or charring them, such as brick kilns, pottery kilns, charcoal kilns, etc. The best kiln for any special purpose is that in which the requisite intensity of heat can be produced and maintained under the most perfect control at the least expense for fuel.

Intermittent kilns are those in which the fire is allowed to go out after each burning, to be again started after the kiln is recharged. The simple upright kiln for burning lime with wood-fuel may be taken as an example of the intermittent kiln. It may be built of brick or of other masonry, with a brick lining. On the inside it is circular in horizontal section, tapering slightly, by a curve both up and down, from the circle of largest diameter, which is from 4 feet to 6 feet above the bottom. A kiln of 10 to 11 feet in largest diameter may be about 25 to 28 feet high, 5 to 6 feet diameter at top, and 7 to 8 feet at bottom. There is an arched opening on one side at the bottom, 5 to 6 feet high, through which the wood is introduced and the burnt lime removed. It is advantageous to have a horizontal grating 1 to 2 feet above the bottom, on which to maintain the fire. These kilns are usually located on a hillside, so that the top is easily accessible for charging the kiln, and the bottom for supplying fuel and drawing out the lime.

In charging, the largest pieces of stone to be burnt are first selected, and formed into a rough, dome-like arch, with large open joints, springing from the bottom of the kiln to a height of 5 or 6 feet. Above this arch the kiln is filled in from the top, taking the larger stones for the lower layers, and topping off with those that are smaller. When starting a fire under the dome, the heat should be raised gradually to the required degree, in order to prevent a sudden expansion and probable rupture of the stone forming the dome, which might either cause a downfall of the entire mass above, or choke the draught by the stone breaking up into numerous small fragments. After a bright red heat is once reached through the mass of stone, it should be maintained to the end of the burning, as indicated by a large shrinkage in the volume of the contents, the choking up of the voids between the fragments, and the ease with which an iron rod can be forced down through the stone from the top. A better form of intermittent wood-burning kiln than the one described is shown in Fig. 1, in which the fireplace *b* rests on a permeated brick arch, through which there is a sufficiently free circulation of air to secure the requisite draught. In these intermittent kilns one great defect is the enormous waste of heat which takes place at each burning, for the quantity of fuel expended in raising the contents of the kiln, as well as its thick masonry walls, to the degree of heat necessary to burn lime, has to be repeated each time the kiln is charged. Another special defect is that the stone nearest the dome is liable to become injured by over-burning before the top portions become thoroughly caustic.

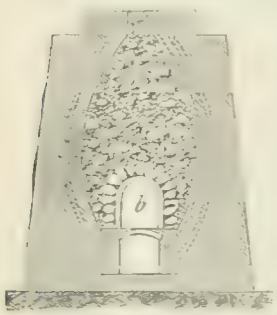


Fig. 1.

Intermittent bell-shaped kilns, using gas-coke or coal for fuel, are extensively employed in Great Britain, France, and Germany for burning Portland cement. They are filled for burning with alternate layers of the raw cement and coke or coal, in the proportion of about one part by weight of fuel to two parts of raw cement, and then ignited at bottom. Three to four days are required for burning, and fully five days, and sometimes more, for the kiln to cool off so that the contents can be removed.

Continuous or Perpetual Kilns.—Materials such as common lime, Roman cement, and the argillo-magnesian cements of the U. S., that do not, like Portland cement, require prolonged intense heat, can be burnt in upright kilns (either bell-shaped, cylindrical, or ovoidal) without intermission in the fires. The kiln is filled with alternate layers of coke or coal and the stone to be burned, and then fired from below with light wood. As the combustion is completed in the lower portion, the burnt stone is drawn out from time to time, usually at least twice every twenty-four hours, allowing the entire mass above to settle down. New layers of fuel and stone are then added at top. Fig. 2 gives a vertical section of the kilns in Ulster co., N. Y., for burning Rosendale cement, the fuel used being very finely broken anthracite coal. The dotted line shows the interior form of kiln preferred at Balcony Falls on the James river, Va. A continuous kiln of the upright form may be operated with either wood, peat, or coal fuel, without interstratifying the latter with the limestone, by maintaining the fires in furnaces at the side of the shaft. The heat and flame are conducted into the shaft, which contains nothing but the material to be burnt. Indeed, this method is necessary when wood, which can not be subdivided into convenient size for intermixture with the stone, is the fuel employed.

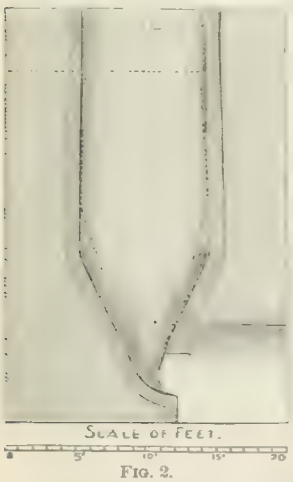


Fig. 2.

Brick Kilns.—Bricks are burnt either in special permanent kilns, charged with the ware and emptied at each burning, or they are piled up in regular systematic layers, with openings between them, so as to form of themselves a temporary kiln, called a *clamp*. Permanent brick-kilns are of various forms, generally rectangular, and they may be arched over on top, when they are termed *close* kilns, or they are left *open*. In *close* kilns the fires are maintained in furnaces at one end, permeate through the bricks in the body of the kiln, and escape through a chimney at the other end. In *open* kilns the fires are maintained under the ware to be backed, and penetrate through the mass upward, escaping on the top. In both kilns the bricks are piled up in courses on their edges, in such manner that the bricks in the different layers cross each other, and are so far separated from each other that the flame finds a free passage between them. In the open kilns, in order better to retain the heat, the entire top of the pile is covered over during the burning with a layer of brick-dust or loam, and while the bricks are cooling off this is further covered with moist clay or sand. Kilns for burning fire-brick should have a fire-brick lining, and are in all respects constructed and operated with more care than is usual for manufacturing common brick.

Pottery kilns are of various forms, but in none is the fuel consumed in the same chamber or in contact with the ware. Porcelain and other finer kinds of clay ware can not even be allowed to come in direct contact with the flame of the furnace, and are therefore always inclosed in clay boxes called *seggars*, in order that the glaze may receive no injury. The kiln in which the celebrated Sèvres ware is baked is a variety of the upright flame kiln, subdivided into two or more compartments or stories by perforated floors, through which the heat ascends from one story to another. The unglazed ware receives its first baking in an upper chamber before it is dipped in the liquid glaze, preparatory to the final baking in the lower chamber. Porcelain ware which has received only its first baking is called *biscuit*, and this is baked in the chamber above that in which it received its first baking. The ware receives its final baking in the lowest chamber, which is next to the fire. The piling of the seggars one above the other for baking is shown in Fig. 3, some in section and others in profile; *g g* are plates of refractory clay called fireguards, set in front of the flues to prevent the flame coming in direct contact with the seggars and to exclude ashes and dust. Light wood-fuel split up small is almost universally used for baking porcelain. Those kinds which burn with a long and vigorous flame, and discharge but little ash and dust into the kilns, are preferred. At Sèvres *poplar* is used, and generally in Germany *pine*. These kilns can be operated at the rate of about one firing per week, and the average endurance of the Sèvres kilns is about 300 firings, or six years. In other places several have been known to last from twenty-five to thirty years. During the baking the heat in the lower chambers reaches from 130° to 160° of Wedgwood's pyrometer (equivalent to from 11,000° to 12,000° C. and from 19,830° to 21,732° F.). On the upper floor the temperature varies from 30° to 60° Wedgwood. Articles of common stoneware and pottery are baked in kilns of much similar construction than the Sèvres kiln. The ware is not placed in seggars piled up in columns, but the flame is allowed to come in direct contact with it. In form they somewhat resemble the ordinary baker's oven, consisting essentially of an ellipsoidal dome of brick, with a brick or earthen floor, and having at one end a furnace and at the other a chimney-flue. In some cases the floor ascends from the furnace to the chimney-flue, in others it is

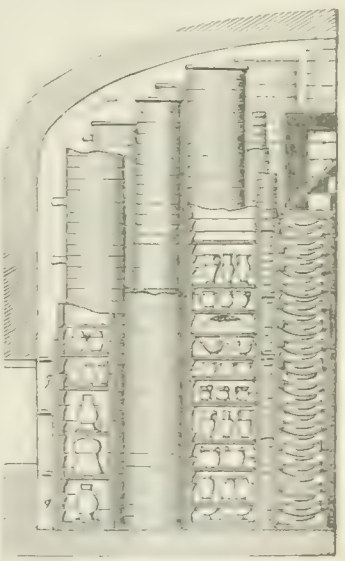


Fig. 3.—Pottery kiln.

horizontal. The larger kilns, which are 50 to 60 feet in length, are usually divided into two compartments by a transverse vertical wall constructed with numerous openings to allow the heat to pass freely through. The compartment next the furnace, being the most intensely heated, is used for baking stoneware. In this the heat frequently attains 120° Wedgwood. The other compartment is used for baking common pottery. With the large kilns about five days of preliminary fire and three days of baking fire are required at each burning. The fuel employed, which may be either wood or coal, determines the details of the furnace.

Charcoal kilns are of a variety of forms and sizes. Those used in the U. S. for making charcoal on a large scale for smelting-furnaces are made of brick, some being rectangular in plan and covered on top with a flat brick arch, while others, known as the beehive kiln, are circular in plan and dome-shaped. A rectangular kiln 40 feet by 16 feet in plan, with side walls 13 feet high, covered over with an arch of 4 feet rise, will hold nearly 90 cords of merchantable wood. As the side walls and arch are habitually made only 8 inches (or one brick) thick as a measure of economy, they are always supported by a timber framework on the outside to prevent their being thrown down by alternate expansion and contraction when in use. The end walls are generally a foot thick. In the side and end walls numerous vent-holes are left, each of the width and thickness of a brick (about 4 inches by 2 inches). In one end of the kiln there is an opening about 6 feet by 6 feet at the level of the floor, through which most of the wood is introduced and the charcoal removed. Above this, near the crown of the arch, there is a smaller opening, 2 feet by 2 feet, for completing the filling of the kiln. Both openings are fitted with boiler-iron doors, and are tightly closed during the burning. There are three vent-holes on top through the crown of the arch, about 10 feet apart, each a foot square, closed with iron dampers. The kiln having been compactly filled to the crown of the arch with wood, cut and split into the usual merchantable sizes, the two end doors are closed, and fires are started in the three vent-holes on top. These holes are at once closed with the dampers, all the small vent-holes below being open. The fire slowly and gradually works its way downward through the mass of wood, its progress being known to a skillful burner by the color and volume of smoke issuing from the lower vent-holes. From six to seven days are required completely to char the contents of a kiln of the dimensions above given. The lower vent-holes are closed from time to time, one after the other, as the burning is completed in their vicinity, and finally, when they are all closed, the kiln is whitewashed all over in order to close all the pores through which the air could enter, and it is allowed to stand four or five days for the fire to go out. When skillfully operated, these kilns will yield 45 bush. of charcoal to the cord of wood. Q. A. Gillmore.

Kilo [= Fr., from Gr. χίλιοι, thousand]: a prefix used in the French metrical system to denote a thousand times the measure indicated by the word to which it is prefixed; as, kilogramme, a thousand grammes, the unit of commercial weight, is equal to 2·20462125 lb. avoirdupois; kiloliter, a thousand liters, a measure of capacity, is equal to 264·18635 gal.; kilometer, a thousand meters, the unit of linear measure, is equal to 0·62138 mile; kilostere, a thousand steres, a measure of solidity, is equal to 35316·58 cubic feet. The latter term is rarely employed, measures of solidity or volume being expressed in cubic denominations of the linear base. See Metric System.

Kilpatrick, Hugh Judson: soldier; b. near Deckertown, N. J., Jan. 14, 1836; graduated at West Point in 1861, and immediately went to the front; was wounded at the battle of Big Bethel in Aug., 1861; assisted in raising a regiment of New York cavalry, and became its lieutenant-colonel; commanded a brigade of cavalry in the Rappahannock campaign; was promoted brigadier-general of volunteers 1863; commanded at the battle of Adie; took part in the battle of Gettysburg, and in the pursuit of the enemy after that battle; commanded a cavalry division in the operations in Virginia in 1863, taking part in many battles. In Mar., 1864, he engaged in a raid toward Richmond and through the Peninsula; in May, 1864, took part in the invasion of Georgia as commander of a cavalry division of the Army of the Cumberland; performed important services in the capture of Atlanta, in the march to the sea, and in the invasion of the Carolinas; on Mar. 13, 1865, received the brevet of brigadier-general for the capture of Fayetteville, and major-general for services in the Carolina campaign; promoted major-general of volunteers, June 18, 1865. He resigned his commission in the regular army 1867; was U. S. minister to Chili 1865–68, and again in 1881. D. at Valparaiso, Dec. 4, 1881. In 1887 his remains were removed to West Point, N. Y. He was a popular general, and gained high reputation as a daring, brilliant, and successful cavalry leader. After the war, aside from his diplomatic missions, he devoted himself chiefly to lecturing, and was a very effective platform speaker on the Republican side. See Moore, *Kilpatrick and our Cavalry* (New York, 1865).
C. H. Thurber.

Kilung, or **Kelung**, kee'loong': a Japanese port; situated on the north coast of Formosa, about 20 miles E. of Tamsui, to which it is subsidiary as a place open to foreign trade; lat. 25° 9′ N., lon. 121° 47′ E. The chief trade is in coal, which is mined extensively in the neighborhood. Sulphur is also obtained in a valley not far from the coal mines. See Formosa and Tamsui.

Kilwa: See Quiloa.

Kilwinning: a town in the county of Ayr, Scotland; 26 miles S. W. of Glasgow; famous for an ancient abbey, now destroyed, which was the birthplace of Scottish Masonry (see map of Scotland, ref. 12–F). Until 1736, when the Grand Lodge of Scotland was formed, all other lodges in Scotland received their charters from "Mother Kilwinning." This prerogative was exercised down to 1807. Eglinton Castle, about a mile from Kilwinning, was the scene of the famous Eglinton Tournament in 1839. Pop. 3,835.

Kimball, Heber Chase: Mormon leader; b. in Sheldon, Franklin co., Vt., June 14, 1801; joined the Mormons in 1832 at Victor, N. Y.; in 1835 became one of the twelve apostles of that sect; in 1838 went to the Mormon colony at Commerce, Mo.; in 1839–41 was a missionary in England; and in 1846 became head priest of the order of Melchizedek at Salt Lake City, where he died June 22, 1868.

Kim'berley: city of Cape Colony, South Africa; near the Vaal river, an affluent of the Orange river; in lat. 29° S., lon. 25° E. from Greenwich (see map of Africa, ref. 9–F). It has the greatest diamond mines in the world. Pop. (1891) 28,718. See Diamond-fields of South Africa.

Kimberley, John Wodehouse, Earl of: statesman; b. Jan. 7, 1826; graduated at Christ Church, Oxford, England, in 1847; succeeded his grandfather as Baron Wodehouse in 1846; was Under Secretary for Foreign Affairs from 1852 to 1856, and again from 1859 to 1861, under the administrations of Lords Aberdeen and Palmerston; was ambassador to Russia in 1856; special minister to several states with reference to the Schleswig-Holstein question in 1863, and Lord-Lieutenant of Ireland from 1864 to 1866, in which latter year he was raised to the Earldom of Kimberley. Under the second Gladstone administration he was Lord Privy Seal (1868) and Secretary of State for the Colonies (1870–74). In 1878 he was nominated a member of the royal commission appointed to inquire into the working of the penal servitude acts, and in 1880, on the return of Gladstone to power, he was appointed Secretary of State for the Colonies in June, 1882, Chancellor for the Duchy of Lancaster, and in December, same year, Secretary of State for India. This position he held until the fall of the Gladstone ministry in 1885, and received the same appointment in the Gladstone government of 1886. On Gladstone's return to power in 1892, the earl entered his cabinet as Lord President of the Council and Secretary of State for India; the latter office he relinquished on his appointment as Secretary of State for Foreign Affairs in Lord Rosebery's cabinet (1894). C. H. Thurber.

Kimberley District: the northern part of Western Australia, especially that part E. of King Sound drained by the Fitzroy and Lennard rivers. It is said to be well watered, fertile, and especially adapted to pasturage. Gold is found in the district. See *Forrest Exploration in Northwestern Australia*, in *Proceedings* of the Royal Geographical Society, 1883.

Kim'chi, David, Rabbi: Hebrew scholar; b. at Narbonne, Provence, in 1160. Little is known of his personal history beyond the fact that in 1232 he was designated by the French and Spanish rabbis as arbiter to settle the heated controversies in the synagogues growing out of the doctrines advanced in Maimonides's *More Nevochim*. His works consist of commentaries on nearly all the books of the Old Testament, some of which are given in the rabbinical Bibles; a Hebrew grammar and lexicon bearing the name of

Miklol (Perfections), which have been the basis of all modern works of the same kind; and a *Refutation of Christianity*, based upon the denial of Messianic predictions in the Psalms. Kimchi exhibited such hostility to Christianity throughout his commentaries that numerous passages were struck out by the Inquisition as a condition of permitting their publication. Several of his works remain in manuscript. D. at Narbonne in 1240. His father, Joseph, and his brother, Moses, were also distinguished rabbis of Provence, the former having been driven from Spain by Mohammedan persecution. Both left grammatical and exegetical writings.

Kinæsthetic Sensations [from Gr. *κινεῖν*, move + *αἴσθησις*, feeling]: sensations arising from the movements or positions of the members of the body. See Muscle-sense.

Kincaid, Eugenio, D. D.: missionary; b. at Westfield, Conn., in 1798; was educated at Hamilton Literary and Theological Institution, now Colgate University. After finishing his studies, he became pastor of the Baptist church at Galway, N. Y., and subsequently served the church at Milton, Pa. In 1830 he was appointed a missionary to Burma, where he labored with remarkable success in Rangoon, Ava, and Prome. In 1842 he returned to the U. S., and spent twelve years in home-work, devoting a portion of his time to raising the endowment of the university at Lewisburg, Pa.; but his efforts were chiefly directed, and with great success, to the development of a missionary spirit in the churches. In 1854 he again went to Burma, and labored with great success in Prome until he was compelled by the sickness of his wife to return to the U. S. in 1865. So long as he was able, he served the missionary union in presenting the claims of the foreign field to the churches. D. Apr. 3, 1883, in Girard, Kan. His life and labors are sketched in a volume entitled *The Hero Missionary*, by A. S. Patton (New York, 1858). Revised by C. H. Thurber.

Kincar'dine: port of entry of Bruce co., Ontario, Canada; on Lake Huron (see map of Ontario, ref. 3–B). It ships grain, lumber, salt, bark, fish, wool, and butter; has some manufactures and two weekly newspapers. Pop. 2,631.

Kincardineshire, or **The Mearns**: county of Scotland; between the Dee, the North Esk, and the North Sea. Area, 383 sq. miles. A great part of the country is covered by the Grampian Mountains, of which Mt. Battock rises to the height of 3,500 feet. At the foot of this mountain range lies the "How o' the Mearns," a low and very fertile tract of land, yielding excellent crops of wheat and oats. Large herds of sheep and short-horned cattle graze on the mountains. Pop. 35,647. Capital, Stonehaven.

Kinchinjin'ga: the third in order of the highest mountains in the world; in the Himalayas; on the boundary between Nepal and Sikkim; lat. 27° 42′ N., lon. 88° 11′ E.; altitude, 28,156 feet for the first peak and 27,815 feet for the second. It is only 849 feet lower than Gaorisankar or Mt. Everest, the culminating point of the Himalayas. The Dapsang, in the Karakorum Mountains, is 127 feet higher than the Kinchinjinga. M. W. H.

Kindergarten [= Germ., liter., children's garden; *kinder*, plur. of *kind*, child + *garten*, garden]: a school for young children conducted according to methods which were originated by Friedrich Froebel. (See Froebel.) Recognizing the need of skillful teaching and training in the earliest period of the child's life, and of basing this work on knowledge of child-nature, Froebel believed that women were naturally best fitted for the task. To secure the earnest co-operation of women, accordingly, in a new and rational system of education became his principal aim. The purpose of this new system was "to remove at least from earliest child-culture all indefiniteness and arbitrariness, all hindering and destroying influences, and to found it upon conscious obedience to the eternal laws revealed to us in nature and in the history of man, as well as in the Word of God." These words have reference to Froebel's first kindergarten (1840) at Blankenburg, of which, with the help of the women of Germany, he wished to make a model institution. In Froebel's opinion, education, even in its earliest phases, should point directly to its consummation, which is creative self-expression. For this purpose it should at every step stimulate self-activity, availing itself of whatever there may be in the child of instinct, impulse, desire, interest, purpose, or hope, using and enhancing every skill. In all this, however, the child is to be placed more and more securely on the basis of man's historic development, and more and more firmly established in the simple truths and benevolent aspirations of Christianity. At no time is Froebel satisfied with mere learning, nor even with ability or skill. In all things he requires a practical outcome. The value of educative effort at every stage is to be measured always by its tendency and effect in making the child permanently strong and self-reliant, sensible and thorough, earnest and cheerful, sympathetic and helpful, all-sidedly efficient, and actively benevolent. He lays, therefore, great stress upon the hand as an educational factor. As such the hand serves a double purpose. In the first place, it serves in the handling of things as an indispensable organ of sense, bringing to the mind valuable data concerning the structure and qualities of the things in the environment. Second, in the arrangement of things and transformation of plastic material in accordance with inner plan or purpose, the hand serves as the executive organ of the mind, completing the mental act through material expression. Not content with leading the pupil from the particular impression to the general thought, Froebel required him to apply what he had gained of general thought to particular ends in outward activity.

In the work with the child, all artificial antagonisms between the educator—mother, kindergartner, or teacher—and the child are to cease. This is formulated in his favorite motto: "Come, let us live with our children." He indicates the practical working of this for the nursery in his *Mutter- und Koselieder*, a collection of simple nursery songs and plays, in which the mother and her child are the actors. The limbs of the child, chiefly its hands and fingers, are the playthings, representing in simple, unaffected symbolism objects of interest to the child in its environments, until finally it learns to represent its thoughts in simple drawings.

In the kindergarten, free, spontaneous intercourse with the things of daily environment furnishes mental stimulation. In songs and games these daily experiences are lifted to higher planes of social enjoyment and æsthetic appreciation. The transition of the inner thought-life thus stimulated into a rich outward life of productive and creative activity is mediated by the gifts and occupations, a series of well-contrived play materials, selected and constructed chiefly on mathematical considerations. In the gifts, the child receives carefully prepared material, representations of solids, surfaces, lines, and points; and the play-work with these stimulates predominantly analytic mental operations, yielding continually new discoveries of relationships and laws of form, direction, and position. In the occupations the child is furnished relatively raw material, which enables him in predominantly synthetic ways to give material expression to ideas in productive, inventive, creative activities, leading to the pursuits of the industries and arts.

The subjoined synoptical table of the gifts and occupations will furnish a fairly clear idea of these valuable educational contrivances. The inner essential meaning of the gift is mentioned first; this is followed by its description:

A. GIFTS.

I. Solids:

1. Things, objects (color).—Six colored, soft worsted balls, about 1½ inches in diameter. *First gift.*
2. Shape.—Wooden ball, cylinder and cube, 1½ inches in diameter. *Second gift.*
   [This has been made more serviceable in Mrs. Hailmann's *second gift beads*, half an inch in diameter, and stained in the six colors.]
3. Divisibility ($2 \times 2 \times 2$). Eight wooden 1-inch cubes, forming together one 2-inch cube. *Third gift.*
4. Dimension.—Eight wooden brick-shaped blocks ($1 \times 2 \times 4$), forming together one 2-inch cube. *Fourth gift.*
5. Direction (obliquity).—Twenty-seven wooden 1-inch cubes, of which three are diagonally bisected and three diagonally quadrisected. *Fifth gift.*
6. Proportionality.—Twenty-seven wooden brick-shaped blocks: three of these are bisected lengthwise, and six crosswise. *Sixth gift.*

II. Surfaces. Wooden tablets. *Seventh gift.*
   [The wooden tablets now used are: 1. Circles and half circles, 1 inch in diameter; 2. Squares and half squares (right isosceles triangles) 1 inch square; 3. Equilateral triangles, right scalene triangles (half equilateral triangles), obtuse isosceles (thirds of equilateral triangles).]

III. Lines:
1. Straight.—Sticks or splints, 1 to 5 inches long. *Eighth gift.*
2. Curved.—Wire rings, half rings, and quarter rings, of various lengths. *Ninth gift.*

IV. Points.—Lentil-seeds, pebbles, etc. *Tenth gift.*

V. Reconstruction.—Softened peas or wax pellets, and sticks with sharpened ends. *Eleventh gift.*

B. OCCUPATIONS.

I. Solid Material.—Plastic clay, sand, cardboard, wax, etc.

II. Surface Material.—Folding papers (square, oblong, triangular, circular); colored crayons, water-colors, etc.

III. Linear Material.—Interlacing slats; intertwining strips; material for weaving and embroidery; drawing material.

IV. Material Emphasizing Points.—Beads, buttons, papers, etc., for stringing; perforating material.

In their organization the kindergartens vary much. An organization nearest the ideal of Froebel places a limited number of children, not exceeding twenty, between the ages of three or four and six, during three hours of the forenoon under the guidance of a woman fitted by disposition and training for this work. The building is fitted up with occupation-rooms and play-rooms, with aquarium and conservatory, gives access to suitable play-grounds, and to a flower and vegetable garden for the children's use; and furnishes ample accommodation for visiting parents and friends, who are encouraged to take part in the play-work of the pupils. With very few exceptions, however, kindergartens are at best approximations to this ideal. In the majority of cases they fall very far short of it, because of unfavorable conditions which in their nature antagonize the principles involved in the work. Among the many varieties of these institutions a few may be mentioned:

In the family kindergarten a few families unite in the engagement of a kindergartner, who takes charge of the children for a few hours each day, usually in the home of one of the families. Older members of the family have free access, and may join in the games, songs, and play-work of the children. The private kindergarten is quite similar to this; it is, however, the business enterprise of the kindergartner, the locality, furniture, and appliances being provided by herself, but it is usually even more subject to the whims of patrons than the family kindergarten. The free kindergarten is the enterprise of benevolent associations, organized in the interest of the children of the working classes. Free kindergartens have naturally suffered much from overcrowding, and from unskilled teaching on the part of volunteer assistants and apprentice teachers; but they have accomplished great good, and are steadily gaining in efficiency. In Germany their place is taken by the association kindergartens (*Vereins-kindergarten*), of which there are two varieties—the *Bürger-kindergarten* for the children of well-to-do tradespeople who are able to pay a reasonable tuition-fee, and the *Volks-kindergarten* for the children of working-people who can pay only nominal fees or nothing. In many countries kindergartens have been established in connection with the system of public schools. In the U. S., Belgium, Italy, and in some portions of the Austrian empire and Switzerland, these hold the same relation to the people as the elementary public schools. They usually suffer, however, from overcrowding, and from a tendency to school-room methods, arising from a desire for uniformity in the work, and the consequent assignment of special periods to the various occupations and games. As a rule, they have two sessions daily, like ordinary day-schools. In France the École Maternelle (originally the Salle d'Asile) has taken the place of the public kindergarten. Its founders were unacquainted with the kindergarten, and borrowed their methods from the infant-schools of Alsace and of England. However, successful efforts have been made to introduce the occupations of Froebel, without, however, changing them into kindergartens.

In spite of the almost hostile attitude of teachers and school authorities, and of the short-comings of Froebel in executive ability, his cause flourished steadily until the time of his death in 1852. The success of the movement was not seriously interrupted even by the hasty prohibition of kindergartens in Prussia on the part of the Minister of Public Instruction, who mistook Froebel for a socialistic enthusiast of the same name. On the contrary, this decree drew to him more closely friends like Middendorf, the Baroness Marenholz-Bülow, Diesterweg, Lange, Koehler, and others, and ultimately secured for his work the approval of the most prominent German educators and philanthropists. After his death Madame Marenholz Bülow devoted her energies to constant and effective efforts for the diffusion of the new system, by her personal efforts securing the permanent introduction of kindergartens and kindergarten work in existing infant-schools in London, Paris, Belgium, Switzerland, and Italy, as well as in many portions of Germany and Austria. The first efforts for the introduction of kindergartens resulting in permanent success in the U. S. were made between 1864 and 1866 in Boston, Mass., Hoboken, N. J., and Louisville, Ky. Through the efforts of Miss Elizabeth P. Peabody and Dr. Henry Barnard, interest in these and other movements soon became quite general in educational and philanthropic circles. In 1873 Miss Peabody began the publication of *The Kindergarten Messenger*, which was united in 1877 with W. N. Hailmann's *New Education*. In 1871 she established the American Froebel Union, which in 1885 became the kindergarten department of the National Educational Association. In 1873 Miss Susan Blow, with the co-operation of Dr. William T. Harris, established a kindergarten in connection with the public schools of St. Louis, Mo., and in a few years succeeded in making kindergartens an integral part of the public-school system there.

Kindergartens are connected with the public-school systems of Boston, Philadelphia, Pittsburg, St. Louis, Milwaukee, St. Paul, Omaha, and many smaller cities of the U. S. At the same time the educational principles underlying kindergarten work have been carried into the primary departments of public schools not only in these cities, but in many others that have not as yet established kindergartens. Extensive systems of free kindergartens have been established by benevolent associations in New York, Baltimore, Detroit, Cleveland, Cincinnati, Chicago, San Francisco, and many other cities. Departments for the training of kindergartners have been established in many of the State and city normal schools, and by a number of free kindergarten associations. In addition to this, private training schools for kindergartners flourish in various sections of the U. S. In 1892 the bureau of education reported officially in the U. S. 1,311 kindergartens, with 2,535 teachers and 65,296 pupils. Inasmuch as reports to the bureau of education are not compulsory, these figures fall far below the truth, and serve only the more fully on this account to indicate the great popularity of these institutions in the U. S. From the U. S. the kindergarten propaganda has spread into Ontario and other provinces of Canada, into the Argentine Republic, and other South American countries.

The methods of using kindergarten materials for education were first indicated collectively in manuals prepared under the direction of the Baroness Marenholz-Bülow—one in German edited by Goldammer (Berlin), and another in French edited by Jacobs (Brussels). Later on, highly improved manuals were edited in Germany by Koehler, and in the U. S. (New York) by Madame Kraus-Boelte. German literature upon the subject of the kindergarten is very extensive. The fundamental works are Froebel's *Menschen Erziehung, Pädagogik des Kindergartens*, and *Autobiography* edited by Wichard Lange, and his *Mutter- und Koselieder*; furthermore, Madame Marenholz-Bülow's *Die Arbeit und die neue Erziehung, Das Wesen des Kindes, Erinnerungen an Froebel, Der Kindergarten des Kindes erste Werkstætte, Woman's Educational Mission, Das Kind und sein Wesen*, and a number of essays on kindred subjects. Among the most notable translations of these are *Reminiscences of Froebel*, by Mrs. Horace Mann; *Mother Play and Nursery Songs*, by Miss Emily Lord; *Education of Man*, by Mr. Hailmann; as well as Froebel's *Autobiography* and Madame Marenholz-Bülow's *Child and Child Nature* and *Hand-work and Head-work* (London). The following are among the most notable original contributions to this literature by English writers: *The Kindergarten*, by Emily Schireff (London); *Kindergarten Culture in the Family and Kindergarten*, by W. N. Hailmann (New York); *Froebel and Education by Self-activity*, by Dr. Courthope Bowen (London); *The Kindergarten Guide*, by Elizabeth P. Peabody; *The Law of Childhood* and *Kindergarten Methods in the Primary School*, by W. N. Hailmann; and *Songs and Games for the Kindergarten*, by Mrs. Eudora Hailmann. Dr. Henry Barnard published in 1881 a valuable collection of papers bearing on the subject in a volume entitled *Kindergarten and Child-culture*, containing among other things translations of

Froebel's *Autobiography*; also Madame Marenholz-Bülow's *Child and Child Nature*, Fichte's *Problem of Popular Education*, and a number of valuable contributions by Madame Schrader, Madame Portugal, Miss Peabody, Miss Susan E. Blow, Mrs. Horace Mann, Dr. William T. Harris, and others. W. N. Hailmann.

Kinetics: See Dynamics.

Kinetoscope, Kinetophone, etc: See Vitascope.

King, Charles: officer and author; son of Gen. Rufus King (1814–76); b. at Albany, N. Y., Oct. 12, 1844. He was educated at Columbia College Grammar School and U. S. Military Academy, West Point, where he graduated as second lieutenant of First Artillery June 18, 1866; was appointed first lieutenant Mar. 15, 1870, and transferred to Fifth Cavalry Jan. 1, 1871; became captain Fifth Cavalry May 1, 1879; retired from active service June 14, 1879, for disability from wounds received in line of duty. He served in garrison and on recruiting duty 1866–69; at Military Academy in department of tactics 1869–71; on garrison and staff duty 1871–74; frontier duty and in Indian campaigns 1874–79. After retiring he was inspector-general Wisconsin National Guard 1882–89; colonel Fourth Regiment Wisconsin National Guard; and commander of cadets Michigan Military Academy 1892. He has published *The Colonel's Daughter* (Philadelphia, 1882); *Famous and Decisive Battles* (1884); *Marion's Faith* (1885); *Campaigning with Crook, and Stories of Army Life* (New York, 1890); *Captain Blake* (Philadelphia, 1891); and other stories and sketches. James Mercur.

King, Clarence, M. N. A. S.: geologist; b. in Newport, R. I., Jan. 6, 1842; graduated at the Sheffield Scientific School of Yale in 1862. In 1863 he went to California, where he joined the geological survey of that State, devoting much time for several years to the exploration of the high Sierras and the great gold belt along the western foot-hills, and he made the first detailed surveys of the Yosemite valley. In 1867 he was placed in charge of the U. S. geological exploration of the fortieth parallel, and made a topographical and geological survey (1867–72) across the widest part of the Cordillera, extending from the Sierras of California to Eastern Wyoming, the reports of the scientific results of which appear among the *Professional Papers of the Engineer Department of the United States Survey* (seven quarto volumes and two atlases, 1870–78). Vol. i., entitled *Systematic Geology* (Washington, 1878), was written by Mr. King, and was the last volume of the series issued. In 1879 the different geological surveys acting under the national Government were organized under one head, and made a separate bureau of the Department of the Interior. Mr. King was made the first director of the survey, a position he held till he resigned in 1881. Since that time he has been engaged in a number of geological investigations. He was elected a member of the National Academy of Science in 1876. He is the author of *Mountaineering in the Sierras* (Boston, 1871), and has contributed a number of articles to various scientific journals, both in the U. S. and in Europe.

Arnold Hague.

King, Edward (Viscount Kingsborough by courtesy): Irish writer on Mexican antiquities; b. at Cork, Nov. 16, 1795. He was a son of the third Earl of Kingsborough. In 1818 and again in 1820 he was returned to Parliament from Cork, but he resigned in 1827, and thereafter devoted himself to his *Antiquities of Mexico, comprising Facsimiles of Ancient Mexican Paintings and Hieroglyphics*, etc. Of this magnificent work, nine volumes and a portion of a tenth were published (London, 1830–48), the last two after his death; four copies are printed on vellum, with colored plates. The whole is accompanied by copious descriptions and notes, the object of which is to prove the ancient settlement of Mexico by a branch of the Israelites. After Lord Kingsborough had spent over £32,000 on his enterprise, he found himself heavily in debt. On the complaint of a paper-seller he was cast into a debtors' prison, where he contracted typhoid fever, and died Feb. 27, 1837. Herbert H. Smith.

King, John Edward, M. A.: philologist; b. at Ash, Somerset, England, July 10, 1858; was educated at Clifton College, Bristol; became fellow and tutor of Lincoln College, Oxford, and later master of the Manchester Grammar School; author (with C. Cookson) of *Sounds and Inflections in Greek and Latin* (1888) and *Comparative Grammar of Greek and Latin* (1890). B. I. W.

King, Rufus, LL. D.: statesman; b. at Scarborough, Me., Mar. 24, 1755; graduated at Harvard College in 1777; studied law, and became a member of the Massachusetts Legislature in 1782. In 1784 he was chosen by that body as delegate to the Continental Congress at Trenton, N. J., where he introduced a measure prohibiting slavery in the Territories. This was afterward embodied in the famous ordinance for the Government of the Northwest Territories presented to Congress at New York July 11, 1787, by Nathan Dane, of Massachusetts. Elected a member of the convention for framing the Federal Constitution, King took his seat May 25, 1787, participated actively in the debates, and was one of the committee on revision of style and arrangement of the articles. After signing the Constitution he returned to Massachusetts, was elected to the State convention for the consideration of that instrument, and was instrumental in securing its ratification, notwithstanding violent opposition. Having removed to New York city in 1788, he was in the following year elected one of the first Federal Senators for New York under the newly established Constitution, his colleague being Gen. Schuyler. He was re-elected in 1795. On the formation of the earliest national political parties, King ranked as one of the leaders of the Federalists. His ardent defense of Jay's treaty with England (1794), both in the Senate and in the press, under the signature of "Camillus," brought him into conspicuous favor with President Washington, who offered him the Secretaryship of State on the resignation of Edmund Randolph, and in 1796 appointed him minister to England. He remained in London eight years, notwithstanding the accession of the opposite party to power in 1801, and discharged the duties of his post during that important epoch of European history with great tact and ability. Returning to New York in 1804, he passed some years in retirement, but was elected to the U. S. Senate in 1813, and again in 1819. Though opposed to the war with Great Britain, he aided in passing the measures necessary for its prosecution, and after the Capitol was burned in Aug., 1814, he made a stirring appeal to the country to avenge the outrage. He took an active part in promoting trade, strongly opposed the establishment of a national bank, procured the enactment of a general measure regulating the sales for cash of the public lands, and in his second term was chiefly conspicuous as leader of the opposition to the admission of Missouri as a slave State, and to the extension of slavery generally. On Feb. 16, 1825, a few days before his final withdrawal from the Senate, he offered a resolution for devoting the proceeds of the sales of public lands to the purchase and emancipation of slaves, and their removal to some foreign country. Later in the same year King accepted a new appointment as minister to England, at the urgent request of President J. Q. Adams, but resigned and returned home the following year (1826), on account of ill-health. D. at Jamaica, L. I., Apr. 29, 1827. He is generally acknowledged to have been an able diplomatist, a wise and liberal statesman, a brilliant orator, a genuine patriot, and a philanthropist of enlarged views and true insight. Revised by F. M. Colby.

King, Rufus: soldier and journalist; son of Charles King, president of Columbia College 1849–63; b. in New York city, Jan. 26, 1814; graduated at U. S. Military Academy; was appointed brevet second lieutenant of engineers July 1, 1833; resigned Sept. 30, 1836, and for two succeeding years was assistant engineer on the Erie Railway, and for four years (1839–43) adjutant-general of the State of New York. Associated during this time and until 1845 in the editorial conduct of *The Albany Advertiser* and *Evening Journal*, in the latter year he removed to Wisconsin, and assumed charge of *The Milwaukee Sentinel*, of which he was editor until 1861, when he was appointed U. S. minister to Rome. At the outbreak of the civil war he entered the army, and in May, 1861, he was appointed a brigadier-general of volunteers, serving as such in various departments in Virginia until Oct., 1863, when he resigned from the army. He was then reappointed U. S. minister to Rome, where he resided until the mission was abolished in 1867. Was deputy collector of customs for the port of New York 1867–69. D. in New York, Oct. 13, 1876.

King, Thomas Starr: clergyman; b. in New York city, Dec. 17, 1824. His father was a Universalist minister in Charlestown, Mass. From 1836 till 1848 he served first as clerk in a store, afterward as a teacher, preparing himself in leisure hours for the ministry. In 1845 he preached for the first time, at Woburn, Mass.; in 1846 was settled over his first parish, that at Charlestown, to which his father had ministered. In 1848 he accepted a call to the

Unitarian church in Hollis Street, Boston, and remained there till the spring of 1860, when he went to California to take charge of the Unitarian church in San Francisco. The outbreak of the civil war roused all his remarkable powers as a writer, speaker, and man, and to his influence is ascribed the change of public opinion in the State from lukewarmness toward the Northern cause to devoted loyalty. Through his exertions the U. S. sanitary commission obtained the generous sums of money that enabled it to carry on its work at the critical period of the war. D. in San Francisco, Mar. 4, 1864. He contributed frequently to *The Universalist Quarterly*, but he published only one book, *The White Hills, their Legends, Landscapes, and Poetry* (Boston, 1859). A few of his papers were collected after his death—*Patriotism, and other Papers* (1864). See also *Christianity and Humanity* (sermon), with memoir by Edwin P. Whipple (1877), and *Substance and Show* (lectures), 1877. In 1850 Mr. King received the honorary degree of A. M. from Harvard College.

King, William Rufus: Vice-President of the U. S.; b. in Sampson co., N. C., Apr. 7, 1786; graduated at Chapel Hill, University of North Carolina, in 1803; studied law and was admitted to the bar in 1806. He was elected to the Legislature of his native State, and afterward to the U. S. Congress, but resigned the latter position in 1816 to become secretary of legation under William Pinckney, American minister, first to Naples and then to St. Petersburg. During his congressional term he was an ardent and able advocate of the war-policy and measures of Mr. Madison's administration. Having removed to the Territory of Alabama on his return from Europe, he became a member of the convention which framed the constitution of the new State, and was elected one of the two U. S. Senators, which position he continued to hold from 1819 to 1844. During the whole of his senatorial career Mr. King was a zealous supporter of the views and policy of Gen. Jackson. In 1844 he resigned his position in the U. S. Senate, and accepted appointment of minister to France tendered to him by President Tyler. The special object of his mission was to prevent France from uniting with England in a joint protest against the incorporation of Texas into the Federal Union. Having been successful in this mission, Mr. King returned to the U. S. Nov., 1846, and remained in private life until 1848, when he was appointed by the Governor of Alabama to fill the unexpired term in the U. S. Senate of Arthur P. Bagby, who was sent by President Polk as minister to Russia. This unexpired term was less than a twelvemonth, but before it was ended Mr. King was again elected by the Legislature to the U. S. Senate for another full term of six years, beginning Mar. 4, 1849. Upon the death of Gen. Taylor, on July 9, 1850, and the accession of Vice-President Fillmore to the presidency in consequence of that event, Mr. King was unanimously elected president of the Senate. He presided over this body with great urbanity, dignity, and ability during the exciting debates of the session. At the presidential election of 1852 he was the Democratic candidate for the vice-presidency of the U. S. with Gen. Franklin Pierce for the presidency; both were elected by large majorities, but Mr. King did not live to perform the duties of his office. His health began to fail rapidly before the close of the canvass in Nov., 1852. Early in Jan., 1853, under advice of physicians, he went to Cuba, but was not able to return by Mar. 4, the day of inauguration. This being anticipated, a special act of Congress was passed and dispatched to him in time, providing for his taking the official oath in Havana. Some weeks afterward he was able to return to his home in Dallas co., Ala., where he died in Apr., 1853.

Revised by C. K. Adams.

Kingbird: popular name given to the *Tyrannus carolinensis*, a familiar little bird found throughout the North American continent. It belongs to the tyrant flycatcher family, devours considerable numbers of honey-bees, and boldly attacks and drives away hawks, eagles, and crows, flying to great heights in its eagerness for the encounter.

King-crab: See Horseshoe Crabs.

Kingfish, or **Opah**: popular name for a fish (*Lampris guttatus*, Retz) which is the sole representative of a peculiar family (*Lamprididæ*), noted for its beautiful colors. It is widely distributed, being found in European seas, in those of China and Japan, and occasionally off the banks of Newfoundland. The name is applied to several other fishes from their excellence as food, notably to a large mackerel, *Scomberomonis cavalla*, and to a *Sciænoid* fish, *Menticirrhus saxatilis*.

Revised by D. S. Jordan.

Kingfisher: town (founded in 1890); capital of Kingfisher co., Okl. (for location of county, see map of Oklahoma, ref. 2–D); on the Chi., Rock Is. and Pac. Railway; 30 miles W. of Guthrie. It is in an agricultural and stock-raising region, and has 3 banks, 3 weekly newspapers, and large general trade. Pop. (1890) 1,134.

Kingfisher: a common name given to birds of the family *Alcedinidæ*, order *Picariæ*, on account of the fish-catching habits of the most familiar species. Kingfishers have long, straight, pointed (rarely slightly hooked) bills, and small, weak feet, whose third and fourth toes are united for the greater portion of their length. The second toe is entirely wanting in the genus *Ceyx*. Many species are crested, many are brilliantly colored, and in one genus (*Tanysiptera*) the middle tail-feathers are long, with racquet-shaped ends. The general habit of these birds is to sit on some branch overhanging the water, whence they dart down upon their prey, return, and devour it. Some species feed on insects, which they capture in a similar manner. The fish-eating birds of the group nest in holes which they excavate in sand-banks to depths of 4 to 15 feet; the insect-eaters build their nests in holes in trees. The eggs are white and smooth. The 125 species of kingfishers are distributed over the greater part of the globe, the Australian

The European kingfisher.

region being richest in species. The European kingfisher is a small bird of brilliant plumage, greenish blue above, yellowish brown below. The common species of the U. S. is the belted kingfisher, *Ceryle alcyon*, which is of a dull blue above, with a band of the same color across the breast. The female has a chestnut bar below, and is of this color on the sides. Under the name of *Halcyon*, the kingfisher was fabled to lay its eggs in nests that floated on the sea and to have power to charm the winds and waves so that during the period of incubation the weather was calm.

F. A. Lucas.

Kingkitao, or **Kienghitao**: the capital of Korea. See Seoul.

Kinglake, Alexander William: historian; b. at Taunton, England, in 1811; educated at Eton and at Trinity College, Cambridge, graduating in 1832; was called to the bar at Lincoln's Inn 1837, and acquired an extensive chancery practice, but retired from the law in 1856. Soon after finishing his studies Kinglake made an extensive Eastern tour, of which he published an account under the title of *Eothen* (1844), which obtained great popularity. He accompanied Lord Raglan in the Crimean war, and wrote, in great part from the papers of that general, a *History of the Crimean War*, of which the first volume appeared in 1863, the fifth, devoted to the battle of Inkerman, in 1874, and the sixth and last in 1888. He devoted the greater part of thirty-four years to the preparation of this history. In point of literary brilliancy the work is entitled to be classed with the histories of Macaulay and Carlyle. The author was especially severe in his judgment of Napoleon III. He entered Parliament in 1857, and became prominent for his anti-Na-

poleonic attitude upon the Conspiracy Bill (1858) and the annexations of Savoy and Nice (1860). D. Jan. 2, 1891.
Revised by C. K. Adams.

Kinglet: the name of several small birds of the genus *Regulus*, family *Sylvida*; so named from the stripe of red or golden-yellow feathers on the head, which suggests a crown. They inhabit the northern parts of Europe, Asia, and North America, and are among the smallest of the perching birds. The common species of Europe is *Regulus regulus*, the North American species are the ruby-crowned kinglet, *Regulus calendula*, and the golden-crowned *R. satrapa*, or golderest. *Regulus cristatus* of Europe is also called goldcrest. F. A. Lucas.

Kingman: city; capital of Kingman co., Kan. (for location of county, see map of Kansas, ref. 7–F); on the Ninnescah river, and the Atch., Top. and S. Fé, the Hutch. and S., and the Mo. Pac. railways; 45 miles W. of Wichita. It is engaged in agriculture and stock-raising, and has a monthly and three weekly periodicals. Pop. (1880) 970; (1890) 2,390; (1895) 1,700.

King of Arms, or, in Scotland, **King-at-Arms**: a herald of the highest rank. The English kings of arms are Garter, Bath (who is not of the college of arms), Clarencieux, Norroy, and one for the orders of St. Michael and St. George (the last not belonging to the heralds' college). Scotland has one, called Lyon, or Lord Lyon king-at-arms. Ireland has one, Ulster king of arms. There have been other English kings of arms, whose offices are now extinct. For these and some continental kings of arms, see Herald.

Kingo, Thomas: Danish hymn-writer; the grandson of a Scotch settler; b. Dec. 15, 1634. He studied theology in Copenhagen, in 1661 was ordained, in 1668 became pastor in his native place, in 1661 published his first collection of sacred songs, *Aandelig Sjungekor* (Spiritual Choir), part ii., 1681, translated into German and Latin. In 1677 he was consecrated Bishop of Fünen and 1683 ennobled. In this latter year he was appointed to compile the first general hymnal for Denmark and Norway (part i., 1689). It did not receive general approval, and the second part was not published. Its place was taken by a collection which, though not compiled by Kingo, included many of his hymns and received the name of *Kingos Psalmebog*. Besides his hymns Kingo wrote some poems. D. Oct. 14, 1703. D. K. Dodge.

King's Beadsmen: See Blue Gowns.

King's (or **Queen's**) **Bench**: See Courts.

Kings, Books of: two of the canonical books of the Old Testament, following the second book of Samuel and preceding the first book of Chronicles. The two books constitute a single literary work, and contain the annals of the Kings of Judah and Israel from the death of David to the Captivity. The Septuagint and Vulgate versions call them the third and fourth books of Kings, reckoning the two books of Samuel as belonging to the same work Ewald and other modern German critics go still further, reckoning Judges and Ruth to belong to the same work, which they call the "Great Book of the Kings," while suggestions have not been wanting that large portions of the Pentateuch and book of Joshua originally belonged to it, constituting an unbroken series of annals from the creation of the world to the dispersion of the Hebrew race. It is certain that the books of Kings, though they continue the history from the point where the books of Samuel leave it, are yet a distinct literary work from the books of Samuel, with a different chronological method (1 Kgs. xiv. 20, 21, etc.), a different formulation of the religious point of view (xv. 3, etc.), a different mode of citing sources (xi. 41, etc.), and differences in literary details. On the other hand, the contrast in many respects with the books of Chronicles, which narrate substantially the same events, is very marked, showing a considerable priority of time in favor of Kings. By a modern German school of criticism the two works are designated as prophetic and priestly, and this antithesis, which is argued to represent a real and long-continued conflict between the two orders of religious teachers, may be accepted so far as to admit a noticeable distinction in this respect between the two historical works. The books of Kings were evidently compiled from previously existing sources, often by the method of simply transcribing long sections. In Kings and Chronicles, sources of two kinds seem to be referred to, public archives, and writings by prophets, such as Nathan, Ahijah, Jehu, Isaiah, etc. There is no reason to doubt that these representations, as thus understood, are correct. The Talmud says that Jeremiah wrote the book. It is customary to sneer at this, but there is no valid objection to the view that he either made the compilation, or else caused it to be made. See the commentaries of Keil (1846; Edinburgh trans. 1857); Thenius (1849); Schlusser (1861); Bähr, in *Lange's Commentary* (American ed. 1872); G. Rawlinson, in the *Speaker's Commentary* (1873); Joseph Hammond, in the *Pulpit Commentary*; J. R. Lumby, in the *Cambridge Bible for Schools* (1886). Revised by Willis J. Beecher.

Kingsborough, Lord: See King, Edward.

King's (or **Queen's**) **Counsel**: an English barrister or sergeant who has been appointed by letters-patent to this position of honor. The distinction has no important consequences to the public. A queen's counsel may be employed by any client; but if his services are to be rendered against the crown, he must obtain a special license to act in the cause. By custom he is entitled to lead—that is, to act as senior counsel in cases—unless he is associated with a queen's counsel of higher standing, and to receive double the fees of an ordinary barrister. Francis M. Burdick.

King's County: an inland county of Ireland; in the province of Leinster, bordering on the Shannon. Area, 772 sq. miles. Toward the S. runs a small branch of the Slieve Bloom Mountains. The soil is tolerably fertile. Pop. (1891) 65,408. Capital, Tullamore.

King's Evil: an old name for scrofula; a disease which for many centuries was professedly cured by the touch of the Kings of England and France. The practice of touching is traced to the times of King Edward the Confessor (1043–66), was employed by Louis XI. of France in 1480, by Charles VIII. at Rome and Naples in 1495, and by Francis I. in 1597. Charles II. of England (1660–84) carried the practice to the greatest extreme of any English monarch, having "touched" nearly 100,000 patients during his twenty-five years' reign. It was last employed in England by Queen Anne (1703–15; Dr. Samuel Johnson was, when a boy, one of her patients); but on the accession of the Brunswick dynasty was discontinued, and a special service for such occasions was omitted from the Liturgy in 1719. The Young Pretender attempted to gain adherents by touching for the king's evil at Holyrood Palace in 1775, and Louis XVI. of France performed the same ceremony at Reims as late as 1775. For curious data on this subject, see Lecky's *History of Rationalism*. See also Scrofula.

Kingsley, Charles: clergyman and author; b. at Holne, Devonshire, England, June 12, 1819; was the son of Rev. Charles Kingsley, at one time rector of St. Luke's, Chelsea, and afterward vicar of Holne. In 1836 he entered King's College, London, but in 1838 removed to Magdalene College, Cambridge, where he graduated with honors in 1842. His first destination was for the law, but after a few months he exchanged that study for theology, and took orders in the Church of England, becoming in 1842 curate, and in 1844 rector, of Eversley, Hampshire, where he resided through life. He early devoted himself to the improvement of the condition of the working classes, acquiring thereby the sobriquet of "the Chartist parson," and was the chief originator of the school of ethics styled "Christian socialism," with which was closely connected that fondness for manly sports travestied as "muscular Christianity." His earliest prose publication was *Twenty-five Village Sermons*, addressed to his rustic parishioners (1849), preceded in 1848 by a dramatic poem, *The Saint's Tragedy*, founded on the career of Elizabeth of Hungary, and followed in 1850 by a novel, *Alton Locke, Tailor and Poet*, the production which first brought him into notice, and by which he will always be best known. It was based upon personal research among artisans and laborers, undertaken in connection with Rev. John Frederic Denison Maurice, and led to the establishment of co-operative associations. This work had an immense popularity in the U. S., and contributed much to determine Kingsley's literary career. In 1860 he was chosen Professor of Modern History at Cambridge; resigned in 1869, in which year he became canon of Chester, and subsequently (1873) of Westminster. He had been since 1859 a chaplain to the Queen. Among his other works are *Westward Ho* (1855); *Yeast* (1851); *Phaëthon* (1852); *Hypatia* (1853); *Alexandria and her Schools* (1854); *Glaucus* (1855); *The Heroes* (1856); *Two Years Ago* (1857); *Andromeda, and other Poems* (1858); *The Roman and the Teuton* (1864); *Hereward* (1866); *The Hermits* (1868); *Madam How and Lady Why* (1869); *At Last, a Christmas in the West Indies* (1871); *Plays and Puritans, Prose Idyls*

(1873); *Westminster Sermons* and *Health and Education* (1874); *Lectures Delivered in America* (1875). A collection of poems, chiefly lyric, was published in 1856, and again in 1875. In 1872 he undertook the editorship of *Good Words*, and in 1873–74 visited the U. S. on a lecturing-tour. D. at Eversley, Jan. 23, 1875. See his *Memoir* by his wife (2 vols., London, 1877; abbr. ed. New York, 1877).

Revised by S. M. Jackson.

Kingsley, Henry: author; brother of Charles Kingsley; b. at Holne, Devonshire, England, in 1830; educated at King's College, London, and Worcester College, Oxford; on leaving college went to Australia, where he remained five years. Returning to England in 1858 he published the *Recollections of Geoffrey Hamlyn* (1859), containing a vivid description of Australian life. This was followed by *Ravenshoe* (1861); *Austin Elliot* (1863); *The Hillyars and the Burtons* (1865), also dealing with Australian life and manners, and several other novels. His style is vigorous and the tone of his works healthful. In 1870–71 he was editor of *The Daily Review*, and became his own war-correspondent in the Franco-German war, participating in the campaign and being present at the battle of Sedan. D. May 24, 1876.

Kingsley, John Sterling, D. Sc.: b. in Cincinnatus, N. Y., Apr. 7, 1854; was graduated at Williams College in 1875, at Princeton College in 1885, and later studied at the University of Freiburg, Germany. He edited *Standard Natural History* (6 vols.); has been editor since 1883 of *The American Naturalist*; was Professor of Zoölogy in Indiana University 1887–89; Professor of Zoölogy, 1889–91, in the University of Nebraska; and is now Professor of Biology in Tufts College.

Kingsmill Group: See Gilbert Islands.

King's Mountain: a mountain range some 16 miles long N. and S., with lateral spurs abounding in marble and iron, mostly in Gaston co., N. C., near the eastern border of Cleaveland County. Its southern extremity is in York co., S. C. The highest point is Crowder's Knob, some 3,000 feet high and very precipitous. Near the southern extremity, in South Carolina, a body of British troops under Lieut.-Col. Ferguson were surprised and attacked (Oct. 7, 1780) by the State militia under Col. Benjamin Cleaveland, and after a most gallant defense nearly all the British troops were made prisoners. The British were in part armed with breach-loading small-arms, then first employed in warfare. This was one of the most bloody contests in the Southern States during the Revolutionary war.

King-snake: (1) A popular name for a harmless snake (*Ophibolus doliatus*) common in the Eastern U. S. The species is remarkable from its great variation in color, and has been divided into eleven local races or sub-species. The one usually known as the milk-snake is *Ophibolus doliatus triungulus*, found from Massachusetts to Florida. It attains a length of 3 feet, is of a yellowish color, having the neck banded and the body marked with numerous blotches or cross bands of reddish brown. Also called chicken-snake and thunder-and-lightning snake. (2) A large non-venomous snake, *Ophibolus getulus*, so named from the popular belief that it destroys other snakes, especially the rattlesnake. It attains a length of 4 feet or more, and is black, marked with yellow or white spots and bands. This subspecies is found E. of the Alleghenies from Maryland to Florida. It will not bite when handled. F. A. Lucas.

King's River: a stream in the northern basin of Nevada; in Humboldt County. It sinks about 50 miles N. W. of Winnemucca. Its valley contains some 75,000 acres of good grazing and tillage land. The bottoms have a heavy growth of blue-joint and redtop grass, and the hills are covered with a fine growth of bunch-grass and white sage. The average elevation is 4,850 feet. The river abounds in trout.

Kingston: capital and chief port of Jamaica, West Indies; on a plain backed by mountains, at the head of Port Royal Bay, on the southern coast (see map of West Indies, ref. 6–E). It is laid out with regular and wide streets, and the better class of houses are neatly built, with wide verandas and surrounded by handsome gardens. Street-cars run to the suburbs, and two lines of railways connect the city with the northern and eastern part of the island. Kingston has a botanical garden, hospital, museum, and library, and various public buildings, and it is the seat of an Anglican bishopric. The harbor is one of the finest in the world, protected from the sea by a long point, at the extremity of which are the forts and naval arsenal of Port Royal. The channel leading to the bay is narrow and about 25 feet deep, and within there is excellent anchorage for the largest vessels. Nearly all the trade of the colony centers here, and the commercial houses of the city have extensive relations with Southern Cuba, Central America, etc., as well as with the U. S. and Europe. The exports are mainly sugar, rum, coffee, dyewoods, and fruits. This is the principal naval station of Great Britain in the West Indies, and a considerable military force is stationed on the highlands behind the city, where the climate is cooler. The mean temperature in the city itself is 78·1° F., with a maximum of 87·8° and a minimum of 70·7°; the annual rainfall is 32·64 inches. Yellow fever has at times been very destructive in the summer months. Port Royal, the former capital, was destroyed by a terrific earthquake June 7, 1692; this led to the foundation of Kingston. The Jamaica International Exposition was opened here in Jan., 1891, by Prince George of Wales (now the Duke of York). Pop. (1891) 46,542. H. H. Smith.

Kingston: city (settled by the French and named Fort Cataraqui in 1672; incorporated as a city in 1838); capital of Frontenac County, Ontario, Canada (for location, see map of Ontario, ref. 3–H); at the junction of Lake Ontario, the Bay of Quinte, and the St. Lawrence and Rideau rivers; on the Grand Trunk, the Canadian Pac., the Kingston and Pembroke, and the Kingston, Napanee and West. railways; 172 miles W. of Montreal. It has a deep, spacious, and well-sheltered harbor; is connected with Ottawa by the Rideau Canal; and in military strength is second only to Quebec, having two large forts, five armed martello towers, and several batteries. An extensive dry dock has been constructed here by the Dominion Government at a cost of $750,000. The city is the seat of a Roman Catholic archbishopric and cathedral, of an Anglican bishopric and cathedral, and of Queen's University, the Royal Military College, the Royal College of Physicians, a Woman's Medical College, and a collegiate institute founded in 1792. There are 22 churches, the provincial penitentiary, provincial insane asylum, 3 orphanages, 2 hospitals, and 2 homes for the aged; gas, water, and electric-lighting plants, electric street-railway, board of trade, 4 banks, and 2 daily and 4 weekly newspapers. The manufactures include locomotives, cars, cotton and woolen goods, ships, pianos, and stoves. Its position makes it an important transshipping point. Count Frontenac established a trading-post here in 1673; La Salle later built a vessel here and started on his voyage toward the Mississippi; de Denouville, Frontenac's successor, lost the fort through treachery toward the Indians; Frontenac, recalled, rebuilt the fort, and the French held the place till 1758, when it was captured by the British, and permanently occupied by them in 1762. It was the capital of Upper Canada in 1841–44. Pop. (1881) 14,091; (1891) 19,264, with suburbs, 22,143.

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